

Ottawa, Ontario  
K1A 0H3

AUG  
AUG - 6 1976

Mr. J. Lupien  
Deputy Minister  
Department of National Health and Welfare  
General Purpose Building  
Ottawa, Ontario

850-S-X751

NHW - RECORDS SERVICES DIV. ADMIN. BR. RECORDS OFFICE	
Referred to.....	2014
File No.....	1000-5-16
Chg'd. to.....	

3 AUG 1976

Dear Mr. Lupien:

SEWAGE DISPOSAL FOR THE CITY OF YELLOWKNIFE

Enclosed for your information is a copy of the DOE brief presented to the Northwest Territories Water Board public hearing held on June 24, 1976, at Yellowknife.

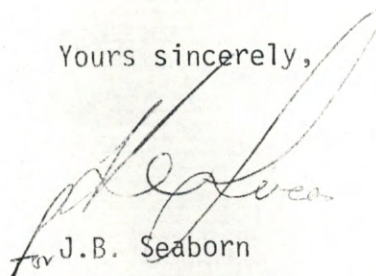
As you are probably aware, the City of Yellowknife has applied to the Water Board to convert part of Kam Lake, Unnamed Lake and Mac Lake to sewage lagoons. From the viewpoint of long term environmental management, Environment Canada considers that the conversion of all or part of these recreationally useful, fish inhabited lakes to sewage lagoons is the least desirable sewage disposal alternative.

The City of Yellowknife, aside from being the capital of the Northwest Territories, represents the headquarters of activity for the Federal government in the Territories. We are therefore very concerned about the potential negative precedent that may be set should the least cost sewage lagoon alternative proposed by the City be endorsed. Furthermore, we fear that the establishment of such a precedent would seriously jeopardize our on-going activities to promote the adoption of sound environmental management practices by other municipalities, particularly those in the North.

Environment Canada would therefore appreciate any support and/or endorsement that your Department can provide for our recommendation that the City of Yellowknife install a properly designed and located sewage treatment plant.

Your consideration of this urgent matter is greatly appreciated.

Yours sincerely,

  
J.B. Seaborn

Enclosure.

RECU 505
SOUS-MINISTRE FÉDÉRAL DE LA SANTÉ
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DEPUTY MINISTER OF NATIONAL HEALTH
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*Previous page  
or page 3*

I am surprised, also, to read the suggestion that "there is a surplus of outstanding recreational lakes in the immediate vicinity of Yellowknife" and that the amount of arsenic in Kam Lake would be relatively unimportant in the presence of ever increasing amount of sewage discharged directly into the lake. I don't believe these are credible arguments for the position that discharge of essentially raw sewage into Kam Lake is an acceptable solution.

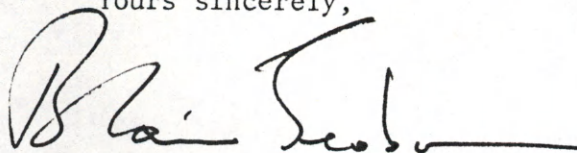
Your Department also expressed a concern regarding the high cost of mechanical treatment and the possible reallocation of funds from other higher priority projects to finance the installation of these facilities in Yellowknife. Our Department is cognizant of this problem and in our correspondence with the Department of Indian Affairs and Northern Development we have requested that "new funds" be made available to avoid any deceleration of other urgently needed municipal servicing programs in the Territories. It should be noted that, at the June 24 Public Hearing on sewage disposal, the citizens of Yellowknife expressed their desire that the City construct and operate a properly designed sewage disposal facility.

At this point in time, I am advised that the important question relates to the adequacy of mixing provided by surface and sub-surface currents in Yellowknife Bay. This, to a large degree, will form the basis for judging the adequacy of various treatment options to protect public health as well as the receiving environment.

*Mixed or  
not its  
still  
sewage*

I trust that members of our respective staffs can work effectively together within the context of the Water Board's September 7, 1976, decision not to allow the use of Kam Lake for sewage disposal and, using all pertinent information available, come to a mutually acceptable solution to the sewage disposal problem in Yellowknife.

Yours sincerely,



J.B. Seaborn



No shortages of lakes  
for recreation

Sault Ste. Marie  
Bay

Park  
Sault Ste. Marie

Excellent for  
sewage  
purification

Peter Baker  
Shooting

Little or no flushing  
action from Yellowknife  
River in summer,  
fall or winter.

Dumping Sewage here should be  
prohibited even with the most  
efficient treatment  
and chlorination.

Indians dis-  
like to drink this  
water  
day

Redrock  
G R E A T S L A V E



P-505

050-5-X751

SEP - 8 1976

Mr. J.B. Seaborn,  
Deputy Minister,  
Environment Canada,  
14th Floor,  
Fortin Building,  
OTTAWA, Ontario.  
K1A 0L3

Dear Mr. Seaborn:

Sewage Disposal for the City of Yellowknife

Thank you for your recent letter and copy of the DOE brief to the Northwest Territories Water Board which was presented at a public hearing in Yellowknife on 24 June.

My departmental representative on the Water Board, Dr. W.H. Frost, has attended most of these deliberations and is generally of the view that sewage lagoons of adequate size work satisfactorily in the Northwest Territories and other systems can cause major engineering and maintenance problems. These include freezing, overflowing, prolonged mechanical breakdowns and the need to be heated in the winter. Our specific comments are as follows.

The recreational advantages of Kam Lake are recognized and if Kam Lake were the only lake with similar advantages in the vicinity of Yellowknife its preservation for recreational purposes would be of more importance but there are so many lakes in proximity to Yellowknife, some already partially developed for recreation, that Kam Lake's importance for recreation is diluted and the City gives it a low priority. Furthermore, as you are aware, Kam Lake has been contaminated over the years by frequent seepages of Con Mine tailings from Pud Lake and, in the past few years, by its use as a sewage lagoon by the City of Yellowknife to serve a nearby district of the city on a continuous basis and on occasion to take the city's total flow of sewage to prevent flooding from the city sewers when pumps to Nevin Lake were inoperative. No health problems have resulted from this. Drainage from Kam Lake is toward the southwest by way of Unnamed Lake and Mac Lake into swampland which is very suitable for the natural purification of sewage. No contamination of Great Slave Lake or other waters in close proximity to Yellowknife would occur.



From a health standpoint there are no serious objections to disposal of sewage into Kam Lake. It would be as safe and as satisfactory as disposal into Nevin Lake has been over the years since 1948 until recently, when the latter lake became too small to accommodate the increased amounts of sewage from a rapidly expanding population. An excellent growth of green vegetation surrounds Nevin Lake which contrasts with the bare rock surrounding most other lakes.

On the other hand, disposal of comminuted sewage into Yellowknife Bay would not be acceptable from a health standpoint. It would be unacceptable even with chlorination, since this would not be adequate to make the water safe for use by Indians and others who live near the shores of the Bay. During fires and periods of high demand, water from the Bay is pumped into the water mains of the City of Yellowknife. Amoebic Dysentery has reached as far north as Snowdrift in the Northwest Territories. Amoebic cysts are known to be resistant to chlorination.

We do not favour the proposal to discharge sewage into Pud Lake. Pud Lake is used by the Con Mine for containment of tailings saturated with arsenic and cyanide salts. Minimal outflow is desirable. Increasing the inflow of liquid by adding water from the sewers would increase the outflow which ultimately reaches Great Slave Lake. Large amounts of sewage and the very large amounts of arsenic which have accumulated over the years are not a desirable combination especially if reduction of pentavalent arsenic to trivalent arsenic compounds occurs extensively. Large amounts of sewage could reduce the containment of arsenic.

With regard to secondary treatment of sewage with nutrient removal followed by chlorination and subsequent discharge into Kam Lake, we have no objections from a health standpoint. However, we do not wish to support this recommendation for several reasons. One would relate to the high cost as compared to the local government proposal which would be relatively inexpensive and adequate to protect health. Another relates to our doubts that the City of Yellowknife has the capability of operating secondary treatment facilities on a continuous basis under local conditions. Raw sewage would be dumped into the lake frequently.

The proposal to convert the Southern Third of Kam Lake into a sewage lagoon is a variation of the local government plan, the advantages and disadvantages of which are not entirely apparent at present. According to Reid, Crowther and Partners Limited Report (1976), the dam would have to be constructed from shot rock which appears to be the only practicable material available. Such a dam would be pervious, expensive and impracticable to render water-tight. The surface area of the lagoon would be reduced from 524 acres to 170 acres if Dam Site No. 3, which is recommended, is chosen. The average retention time would be reduced to 180 days. During May it could go as low as 46 days, whereas retention periods up to 365 days are desirable. A saving feature, however, is the swampland (Peter Baker Slough), southwest of Kam Lake, which would function well during the long daylight hours during May, June and July. The construction of a porous rockfill dam would not guarantee the recreational value of the northern two thirds of Kam Lake.



Mr. J.B. Seaborn

The deficiency of top soil over the irregular surface of the Precambrian Shield makes the installation of sewer extensions outside the city difficult and costly and the use of natural water courses in such rugged terrain is convenient and economically reasonable.

The location of Kam Lake is convenient for sewage disposal and for conveying the liquid to swampland for purification before it reaches Great Slave Lake. No lengthy pipelines need to be constructed through miles of solid rock. The sewers to Kam Lake have already been installed by the city at a cost of \$2,213,000.

There is a surplus of outstanding recreational lakes in the immediate vicinity of Yellowknife and the City has set its priorities with the support of the Territorial Government.

The persistent seepages of Con Mine tailings from Pud Lake to Kam Lake over the years have increased the arsenic content of Kam Lake and its marine life making the consumption of fish from Kam Lake undesirable, but the amount of arsenic in Kam Lake would be relatively unimportant in the presence of ever increasing amounts of sewage discharged directly into the lake.

There are methods of dealing with eutrophication in Kam Lake in future if this becomes a problem. The problem at Nevin Lake is chiefly due to overflow to Back Bay caused by the increase in population.

My department is responsible for the provision of advice to the Commissioner of the Northwest Territories in matters affecting the public health. Kam Lake was selected by our Public Health Engineers and Engineering Consultants as a suitable place for sewage disposal. Considerable planning and work took place before the Northern Inland Waters Act was passed. We have now reached the point where the Northwest Territories Water Board must reach a decision on the basis of the evidence presented by the public, by its technical committee and by the various government agencies.

I appreciate your bringing this matter to my attention and thank you for the opportunity of exchanging views.

Yours sincerely,

ORIGINAL SIGNED BY  
ORIGINAL SIGNÉ PAR

Jean Lupien

Jean Lupien.

sbn

TYPED AUGUST 27, 1976  
WHF/sbn



Ottawa, Ontario  
K1A 0H3

AUG  
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Mr. J. Lupien  
Deputy Minister  
Department of National Health and Welfare  
General Purpose Building  
Ottawa, Ontario

NHW - RECORDS SERVICES DIV. ADMIN. BR. RECORDS OFFICE	
Referred to.....	2075
File No.....	9 AUG 1976 /000-5-11
Chg'd. to.....	

Dear Mr. Lupien:

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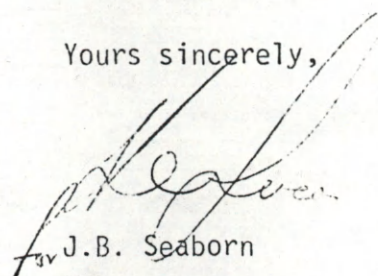
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The City of Yellowknife, aside from being the capital of the Northwest Territories, represents the headquarters of activity for the Federal government in the Territories. We are therefore very concerned about the potential negative precedent that may be set should the least cost sewage lagoon alternative proposed by the City be endorsed. Furthermore, we fear that the establishment of such a precedent would seriously jeopardize our on-going activities to promote the adoption of sound environmental management practices by other municipalities, particularly those in the North.

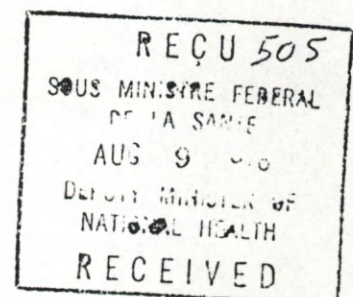
Environment Canada would therefore appreciate any support and/or endorsement that your Department can provide for our recommendation that the City of Yellowknife install a properly designed and located sewage treatment plant.

Your consideration of this urgent matter is greatly appreciated.

Yours sincerely,

  
for J.B. Seaborn

Enclosure.





P.A.

Ottawa, Ontario  
K1A 0H3

AUG  
AOU - 6 1976

Mr. J. Lupien  
Deputy Minister  
Department of National Health and Welfare  
General Purpose Building  
Ottawa, Ontario

NHW - RECORDS SERVICES DIV.  
ADMIN. BR. RECORDS OFFICE

Referred to.....

3 AUG 1976

File No. 1000-5-14

Chg'd. to.....

Dear Mr. Lupien:

SEWAGE DISPOSAL FOR THE CITY OF YELLOWKNIFE

Enclosed for your information is a copy of the DOE brief presented to the Northwest Territories Water Board public hearing held on June 24, 1976, at Yellowknife.

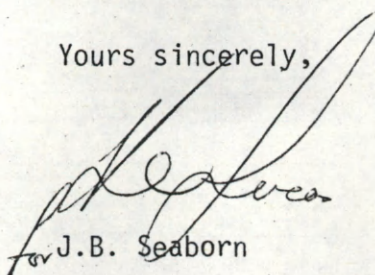
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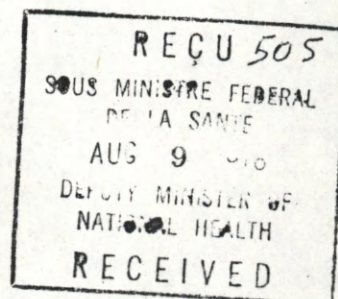
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Your consideration of this urgent matter is greatly appreciated.

Yours sincerely,

  
for J.B. Seaborn



Enclosure.





**Environment  
Canada**

**Environnement  
Canada**

**Brief presented to the  
Northwest Territories  
Water Board Public Hearing  
on the City of Yellowknife  
Application for  
Water Use License  
June 24 , 1976**

**PREPARED BY  
ENVIRONMENT CANADA  
JUNE , 1976**





Ottawa, Ontario

Mr. J. A. Bergasse,  
Chairman Northwest Territories  
Water Board,  
City of Yellowknife,  
P.O. Box 1500,  
Yellowknife, Northwest Territories

Dear Mr. Bergasse:

Environment Canada has prepared the attached brief for presentation to the Northwest Territories Water Board Public Hearing on Sewage Disposal for the City of Yellowknife. The brief presents environmental information which Environment Canada feels should be considered by the Water Board in their review of the City of Yellowknife's application for a license to dispose of their sewage.

The brief makes no recommendations and is intended only to provide the Water Board with information on the environmental concerns associated with the disposal of their sewage.

It is Environment Canada's hope that the brief will better enable the Water Board to determine which is the least environmentally damaging disposal scheme and for this purpose the brief is respectfully submitted.

Yours sincerely,

J. B. Seaborn



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1. Introduction

On December 15, 1972, the City of Yellowknife made application to the Northwest Territories Water Board for a permit to use Kam Lake for sewage disposal. After reviewing the impact of using Kam Lake as a sewage disposal site the Environmental Protection Service sent a letter to the Chairman of the Water Board on May 6, 1974 outlining some of the environmental concerns associated with using Kam Lake as a sewage lagoon. Subsequent to this letter and at the request of the City of Yellowknife, Environment Canada prepared a report entitled "Review of Proposed Sewage Disposal to Kam Lake, N.W.T." (EPS 8-NW-75-1) which concluded that Kam Lake had intrinsic value for fisheries and recreational use and that the use of the lake as a sewage lagoon would contravene the Fisheries Act. The report recommended that after treatment, sewage disposal to Great Slave Lake through a properly designed and located outfall, would probably be acceptable wastewater treatment for the City of Yellowknife.

In a letter dated May 6, 1975 to the Mayor of Yellowknife, the Chairman of the Northwest Territories Water Board asked the City of Yellowknife to undertake the following work:

- "1. Studies must be carried out to demonstrate that Kam Lake will operate efficiently to degrade sewage, and organic matter produced in the lake by the sewage nutrients, to a quality comparable to secondary treated effluent with an organic loading from 15,000 people.
2. The City must evaluate all true costs of utilizing Kam Lake as a sewage lagoon including devaluation of lands for potential development as well as recreational use.
3. The City must evaluate alternative sewage disposal schemes."

To provide this information the City hired a consulting firm, Reid, Crowther and Partners Limited, to study liquid waste disposal for the City of Yellowknife. Personnel from the Department of Indian Affairs and Northern Development, the Government of the Northwest Territories and Environment Canada assisted the city in preparing the terms of reference for the study and also provided technical information to the consultants.



Environment Canada, at the request of the City of Yellowknife sent a letter to Mr. Bob Simons, Secretary Manager, City of Yellowknife, dated November 7, 1975 (Appendix A), recommending certain minimum effluent criteria which would be necessary to protect the various receiving waters in the area. These recommended minimum effluent criteria were based on existing information regarding the impact of sewage effluents on receiving waters and it was indicated that site specific monitoring would be necessary to more accurately determine the minimum acceptable effluent criteria. The consultant considered these criteria in the development of sewage treatment alternatives for the City.

Due to lack of funds the original terms of reference could not be completely addressed. This resulted in the report being prepared using existing information only. An important section concerning the approximation of the effects of discharging primary and secondary effluents to Yellowknife Bay was deleted from the study.

Environment Canada reviewed the first and second drafts of the consultant's report and made suggestions for improvement.

As the consultant's report (Reid, Crowther & Partners Limited, 1976) represents part of the City of Yellowknife's submission to the Water Board for disposal of liquid wastes, Environment Canada is presenting in this brief their environmental concerns regarding sewage disposal for the City of Yellowknife. The intent of the brief is to provide information to the Water Board which will aid the Board in determining the least environmentally damaging sewage disposal scheme for the City of Yellowknife.

In the following discussion each of the sewage disposal alternatives, as outlined in the Reid, Crowther and Partners Limited report on Liquid Waste Disposal for the City of Yellowknife, are reviewed and environmental considerations are examined.

2. Treatment Alternatives

2.0 Location of Mechanical Treatment Plant

The proposed location of a mechanical treatment plant at the head of Kam Lake is undesirable in that:



1. it would reduce the recreational value of this part of the lake;
2. it could eliminate the excellent access to the northern part of the lake;
3. the plant would be within 1500' of the Frame Lake South Subdivision and Correctional Institute and within 2000' of the Northland Mobile Home park and;
4. there may be limited space for future plant expansion.

A treatment plant location between the head of Kam Lake and the ultimate discharge, which is relatively isolated from residential housing and will accommodate future treatment plant expansion is more desirable.

#### 2.1 Mechanical Treatment - Discharge to Yellowknife Bay

The Environmental Protection Service recommended to the City of Yellowknife that the minimum effluent criteria for sewage disposal to Great Slave Lake (i.e. Yellowknife Bay) be primary treatment with disinfection and preferably secondary treatment with disinfection plus provision of an acceptable diffused outfall (Appendix A). Reid, Crowther and Partners Ltd. concurred with these minimum effluent criteria and stated (page 44):

"... it is therefore concluded that lower Yellowknife Bay, at a point midway between Negus Point and Kam Lake, would be a suitable receiving body for disinfected primary effluent, but that if costs are not substantially greater, that disinfected secondary effluent would be preferable".

However, Reid, Crowther and Partners Limited also indicated that due to the dearth of information on the sub-surface currents in Yellowknife Bay further field measurements, would be necessary to determine the effects and optimum location of the outfall diffuser.



It is well recognized that Yellowknife Bay is:

1. of intrinsic value to the citizens of Yellowknife due to its size and proximity to the City;
2. used as a sports fishery;
3. used by the residents of Detah as a food fishery and a water supply;
4. used as an area for cottage development, and;
5. used for recreation during the summer and winter;

and it is therefore essential that the sewage effluent discharged to the Bay be of a quality such that the above uses are protected.

With a properly designed and located mechanical sewage treatment facility it should be possible to phase construction of the facility to meet the future sewage disposal requirements of the City for an indefinite period. The degree to which construction can be phased will be a function of the required effluent quality, the existing and projected sewage loadings, and the availability of funds.

The consultant has estimated the total capital cost of primary treatment and chlorination, with discharge to Yellowknife Bay, at \$2,610,000. Secondary treatment plus chlorination, with discharge to Yellowknife Bay, is estimated to have a total capital cost of \$3,650,000.

## 2.2 Mechanical Treatment - Discharge to Pud Lake

This treatment alternative involves the discharge of secondary effluent to Pud Lake. Pud Lake and the Lakes downstream of Pud, which are used as tailing ponds by the Cominco mine, would convey the treated sewage to Great Slave Lake. These lakes are not considered as part of the overall treatment system but merely as a discharge route to Great Slave Lake. The consultant estimates this treatment alternative has a total capital cost of \$2,550,000.

Environment Canada's principal concern respecting this treatment alternative is that the increased flow through the Pud Lake watershed, resulting from the sewage discharge, could increase the heavy metal contaminants deposited in Yellowknife Bay, and



if it can be shown that discharging the City's treated sewage to Pud Lake has no adverse effects on the treatment of the Cominco mine tailings then this treatment alternative would be attractive because it offers an economical discharge route to Great Slave Lake.

As discussed above the location of a mechanical treatment plant at the head of Kam Lake is undesirable from an environmental standpoint and a location between the head of Kam Lake and Pud Lake, which is relatively isolated from residential housing yet will accomodate future treatment plant expansion is more desirable.

2.3      Secondary Treatment with Nutrient Removal Followed by Chlorination - Discharge to Kam Lake

The "Review of Proposed Sewage Disposal to Kam Lake, N.W.T." (EPS 8 -NW-75-1) report stated that a very high level of sewage treatment would be required to protect Kam Lake if it was used as a receiving body for the City of Yellowknife's sewage. Although the above sewage treatment alternative, which the consultant estimates would cost \$3,300,000., would provide a high level of treatment, nutrient removal would not likely be sufficient to prevent eutrophication of Kam Lake.

The level of nutrient removal required to protect Kam Lake from eutrophying would seem to preclude from further consideration any treatment scheme which discharges to Kam Lake and is designed to protect the lake.

2.4      Conversion of the Southern Third of Kam Lake into a Sewage Lagoon - Discharge through Unnamed Lake and Mac Lake to Great Slave Lake

This treatment alternative, which the consultant estimates will have a total capital cost of \$1,470,000., involves converting a portion of Kam Lake and Unnamed Lake and Mac Lake into consecutive sewage lagoons. As the conversion of these lakes into sewage lagoons would represent a considerable change in the natural environment of the area, there are many engineering and resource considerations which must be examined when reviewing this alternative.

2.4.1      Engineering Considerations

Reid, Crowther and Partners (1976), page 79, state "The proposed lagoon," i.e. the southern third of Kam Lake", meets loading criteria satisfactorily but does not generally conform with



accepted physical criteria ...". The lagoons non-conformity to accepted physical design criteria may have adverse effects on overall lagoon operation as the following excerpts on physical design criteria for lagoons, taken from Waste Treatment Lagoons - State of the Art (EPS-17090-EHX 07/71) illustrate.

"A pond site should be as far as practicable from habitation or any area which may be built up within a reasonable future period".

"If practicable, ponds should be located so that local prevailing winds will be in the direction of uninhabited areas. Preference should be given sites which will permit an unobstructed sweep across the ponds, especially in the direction of the local prevailing winds."

"Location of ponds in watersheds receiving significant amounts of runoff water is discouraged unless adequate provisions are made to divert storm water around the ponds and otherwise protect pond embankments."

"Maximum normal liquid depth should be 5 feet." (Note: Dawson and Grainge (1969) recommended that ponds at Yellowknife be 6 feet deep because the maximum lagoon ice cover that can be expected is 3 feet).

The southern third of Kam Lake does not conform to the above criteria. The average depth of the lake is 18 feet and the prevailing winds blow toward the City. The rugged shoreline which shelters the lake will reduce mixing. Surface run-off, based on natural outflow measurements by Dr. Greg Brunskill (Figure 1) indicate that 41-71% of the annual outflow at Kam Lake occurs during the month of May. If the southern third of Kam Lake is used as a sewage lagoon the average retention time based on 1990 city sewage volumes would be 180 days. However during the month of May the retention time of sewage would be reduced to 46-72 days using 1990 sewage flows and to 50-83 days using 1975 sewage flows. This means that during May much of the sewage deposited during the winter, which has only received the equivalent of primary treatment, will be flushed out of the lagoon without receiving biological treatment. Dawson and Grainge (1969) recommended a retention time of 240-365 days for single cell long-retention lagoon in arctic and sub-arctic regions.



#### 2.4.2 Resource Considerations

One reason presented in favor of using Kam Lake as a sewage lagoon is that there are a large number of lakes in the Yellowknife area and that the removal of part of Kam Lake, Unnamed Lake and Mac Lake from the inventory of lakes will not represent a significant loss in the number of lakes. Figure 2, however, illustrates that while there are a relatively large number of lakes surrounding Yellowknife and within the developed and future development areas of Yellowknife many of these lakes have had their recreational value reduced or lost through alienation by man.

The existing and future recreational value of Kam Lake to the citizens of Yellowknife is difficult to determine because very little information is available regarding the recreational uses of the lakes surrounding the City. However, the following excerpt from the "City of Yellowknife, N.W.T. - General Plan Provision - 1976" by Makale, Holloway & Associates Ltd. discusses recreational patterns that might be expected in the vicinity of Yellowknife:

"The bulk of recreationalists are dependent initially on car access, especially in day use situations, which may be combined with foot or boat or may terminate with facilities provided at the car access terminus. The access pattern tends to cluster recreationalists in areas and on water bodies that have good/adequate car access. So even though approximately one-third of the total surface area is covered by water bodies, human use of this resource tend to be concentrated on a relatively small number of lakes within the Yellowknife area. These are areas where access combines with desirable natural features such as fish abundance, shoreline scenery and extensive safe navigable water surface. The pattern of outdoor recreation in winter tends to centre closer to Yellowknife and to car access points, but is then more dispersed from these main centres. This is a function of winter all terrain vehicles that are not limited to navigable waterways."



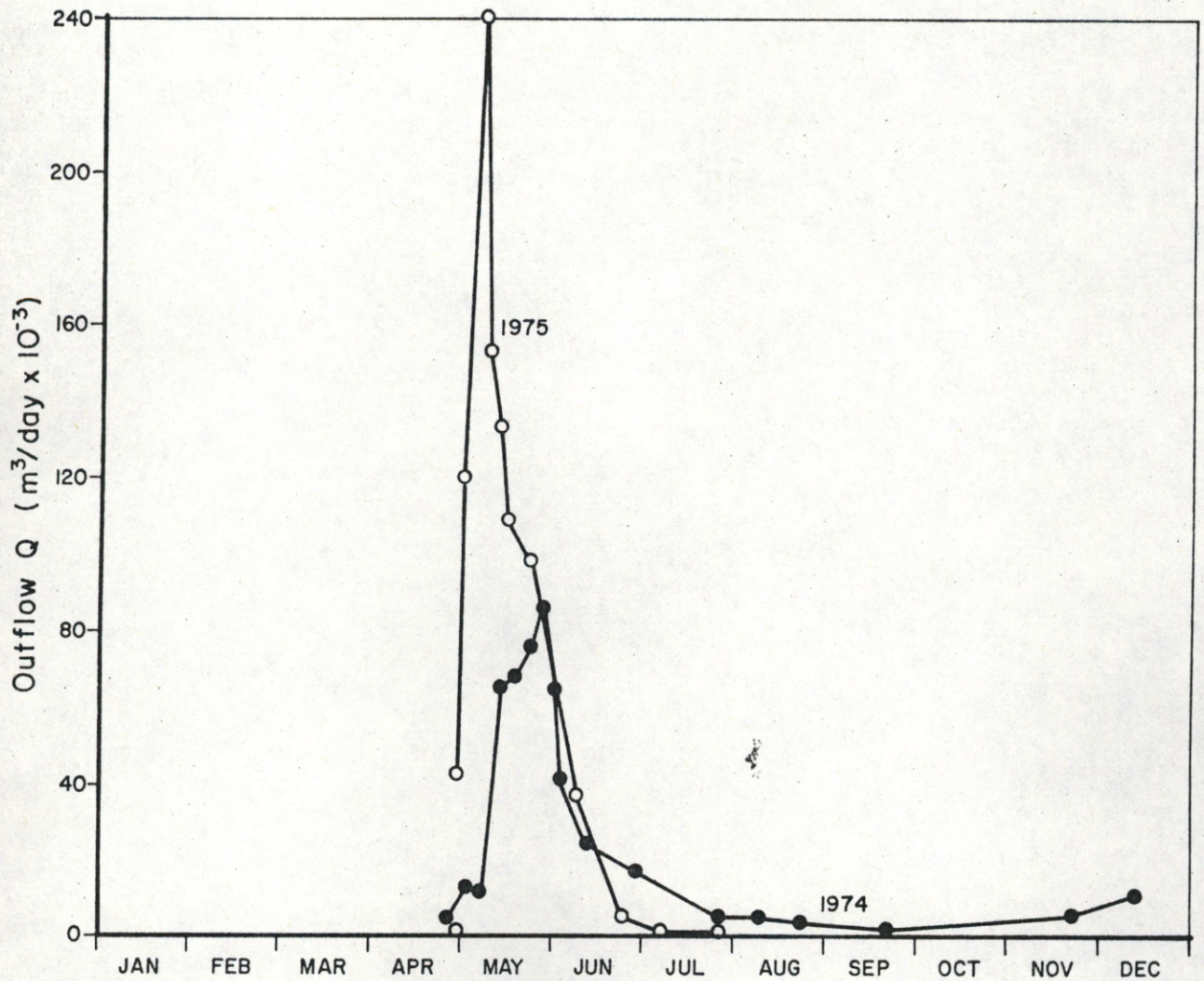


FIGURE 1. HYDRAULIC OUTFLOW MEASUREMENTS FOR KAM LAKE 1974 and 1975



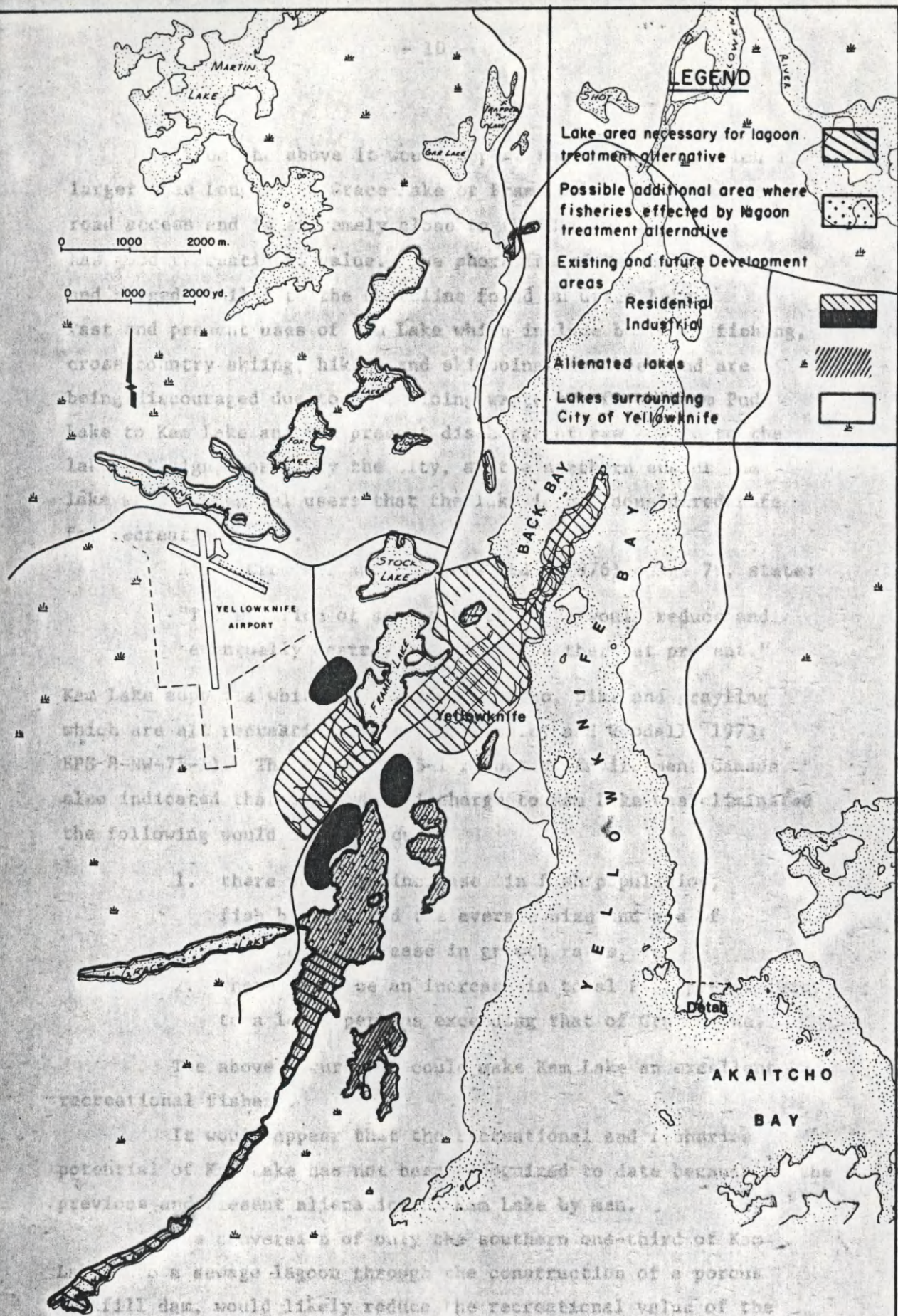


FIGURE 2 CITY OF YELLOWKNIFE AND SURROUNDING LAKES



From the above it would appear that Kam Lake, which is larger than Long Lake, Grace Lake or Frame Lake, has excellent road access and is extremely close to the City of Yellowknife, has good recreational value. The shoreline of Kam Lake is steep and rugged similar to the shoreline found on Grace Lake.

Past and present uses of Kam Lake which include boating, fishing, cross-country skiing, hiking and skidooing have been and are being discouraged due to past mining waste overflows from Pud Lake to Kam Lake and the present discharge of raw sewage to the lake. A sign, posted by the City, at the northern end of the lake warns potential users that the lake is not considered safe for recreational use.

Reid, Crowther and Partners Ltd. (1976), page 79, state:

"The addition of sewage to the lake would reduce and eventually destroy the fish life there at present."

Kam Lake supports whitefish, walleye, cisco, pike and grayling which are all recreational gamefish (Healey and Woodall, 1973; EPS 8-NW-75-1). The EPS 8-NW-75-1 report by Environment Canada also indicated that if sewage discharge to Kam Lake was eliminated the following would likely occur:

1. there would be increase in fish population, fish biomass and the average size and age of fish but a decrease in growth rates, and
2. there could be an increase in total fish productivity to a level perhaps exceeding that of Grace Lake.

The above occurrences could make Kam Lake an excellent recreational fishery.

It would appear that the recreational and fisheries potential of Kam Lake has not been recognized to date because of the previous and present alienation of Kam Lake by man.

The conversion of only the southern one-third of Kam Lake into a sewage lagoon through the construction of a porous rockfill dam, would likely reduce the recreational value of the northern part of the lake. The proximity of the lagoon to the northern part of the lake and the possibility of sewage contamination of the lake would probably deter people from using the lake.



The prevailing winds which during the period May to November, are from the south and east 55% of the time, would carry any odours from the lagoon to the northern part of Kam Lake and to Grace Lake. These odours would reduce the recreational value of the northern part of the lake.

The fisheries potential of the northern part of Kam Lake may also be affected by the construction of a control structure at the south end of Kam Lake if a migratory path of fish from Great Slave Lake to Kam Lake and Grace Lake exists. Although no information on fish migration into Kam Lake has been documented, Healey and Woodall (1973) suggested that one possible explanation for the occurrence of grayling in Kam Lake is migration from Great Slave Lake.

The use of a part of Kam Lake as a sewage lagoon would result in the eutrophication of Unnamed and Mac Lakes and the loss of any present and future recreational or fisheries value these lakes may have.

Based on the projected sewage loadings from the City of Yellowknife the southern one-third of Kam Lake can operate as a sewage lagoon until the year 1990. At this time upgrading will be required and the consultant has suggested that anaerobic lagoons be added. With the unfavourable prevailing winds anaerobic lagoons could create severe odour problems in the area.

3. Summary

In summary, Environment Canada strongly suggests to the Northwest Territories Water Board that the use of Kam Lake, Unnamed Lake and Mac Lake as sewage lagoons is the least desirable of the sewage disposal alternatives considered.

Such use would destroy the fishery and recreational value of these lakes, and seriously reduce the potential of the surrounding area for recreational and residential use.



Regardless of which treatment alternative is chosen, continuous monitoring of the sewage influent and effluent should be undertaken to ensure the sewage disposal facility is providing the desired level of treatment. Continuous monitoring of the receiving water should also be undertaken to ensure that the level of sewage treatment being provided is adequate to protect the receiving water.



REFERENCES

1. Dawson, R. N. and Grainge, J.W., 1969, Proposed Design Criteria for Wastewater Lagoon in Arctic and Sub-Arctic Regions, JWPCF, v41, p. 239.
2. EPS 8-NW-75-1, Review of Proposed Sewage Disposal to Kam Lake, N.W.T., Environmental Protection Service, Environment Canada.
3. Healey, MC. and Woodall, W.L., 1973, Limnological Surveys of Seven Lakes Near Yellowknife, Northwest Territories, Fisheries Research Board of Canada, Technical Report No. 407.
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5. Missouri Basin Engineering Health Council, 1971, Waste Treatment Lagoons- State of the Art, Water Pollution Control Research Series 17909 EHX07/71, U.S. Environmental Protection Agency, Washington, D.C. 20460.
6. Reid, Crowther & Partners Limited, 1976, City of Yellowknife Report on Liquid Waste Disposal Study, Address of Firm: 7410 Blackfoot Trail, S.E., Calgary, Alberta.



APPENDIX A

LETTER TO CITY OF YELLOWKNIFE FROM  
ENVIRONMENTAL PROTECTION SERVICE  
RECOMMENDING MINIMUM EFFLUENT  
CRITERIA TO VARIOUS RECEIVING  
BODIES OF WATER.



Environment  
Canada

Environnement  
Canada

Environmental  
Protection

Protection de  
l'Environnement

P.O. Box 2310  
Yellowknife, N.W.T.

TO *JE*

ENVIRONMENTAL PROTECTION

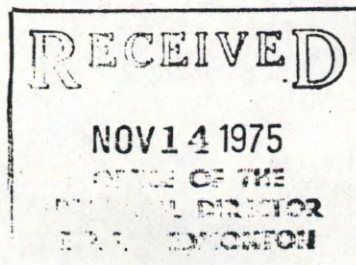
NOV 14 1975

EDMONTON, ALBERTA

FILE No. *4705-37/YK*

November 7, 1975

Mr. Bob Simons  
Secretary Manager  
City of Yellowknife  
Yellowknife, N.W.T.



*G.W. has copy*

Your file    Votre référence

Our file    Notre référence    4045-1/Ye

Dear Mr. Simons:

Re: City of Yellowknife Sewage Treatment Alternatives  
- Recommended Minimum Effluent Criteria

In response to a request by the City for guidance regarding the minimum effluent criteria that DOE would recommend to the N.W.T. Water Board for the disposal of sewage to the various receiving bodies of water being considered in the study of sewage treatment alternatives for the City of Yellowknife, I present the following:

- (a) Great Slave Lake (i.e., Yellowknife Bay) - minimum of primary treatment with disinfection and preferably secondary treatment with disinfection plus provision of acceptable diffuser outfall.
- (b) Back Bay - as an interim measure primary treatment with chlorination. Discharge on a permanent basis would require secondary treatment with disinfection.
- (c) Kam Lake - minimum of secondary treatment followed by nutrient removal, then disinfection.
- (d) Unnamed, Mac and Octopus Lakes - minimum of secondary treatment with disinfection.
- (e) Pud Lake - high arsenic content of lake precludes its use as receiving water based on present information.

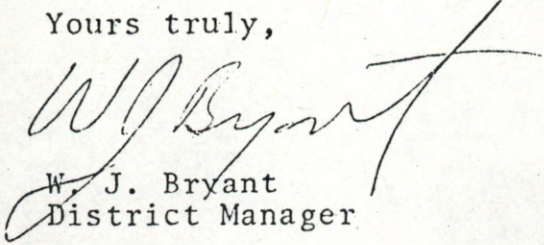
It should be noted that the minimum effluent criteria are based on the existing knowledge of the various water bodies



and may be subject to change as a result of further study and monitoring that will undoubtedly take place after the ultimate receiving body is decided upon.

By a copy of this letter, I am also informing the N.W.T. Water Board of the above-recommended DOE minimum effluent criteria.

Yours truly,



W. J. Bryant  
District Manager

WJB/jp

cc: N.W.T. Water Board Members  
A.E. Ganske  
N.A. Jacobsen  
I. Kraft  
J.J. Eatock  
G. Webster  
D. Hay  
V. Christensen



PA

Ottawa, Ontario  
K1A 0H3

AUG  
AOU - 6 1976

Mr. J. Lupien  
Deputy Minister  
Department of National Health and Welfare  
General Purpose Building  
Ottawa, Ontario

NHW - RECORDS SERVICES DIV. ADMIN. BR. RECORDS OFFICE	
Referred to.....	9 AUG 1976
File No.....	1000-5-16
Chg'd. to.....	

Dear Mr. Lupien:

SEWAGE DISPOSAL FOR THE CITY OF YELLOWKNIFE

Enclosed for your information is a copy of the DOE brief presented to the Northwest Territories Water Board public hearing held on June 24, 1976, at Yellowknife.

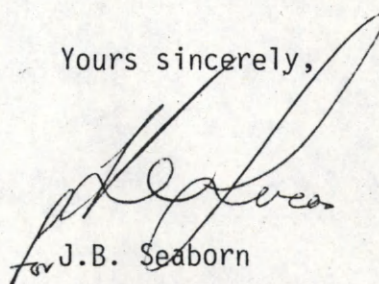
As you are probably aware, the City of Yellowknife has applied to the Water Board to convert part of Kam Lake, Unnamed Lake and Mac Lake to sewage lagoons. From the viewpoint of long term environmental management, Environment Canada considers that the conversion of all or part of these recreationally useful, fish inhabited lakes to sewage lagoons is the least desirable sewage disposal alternative.

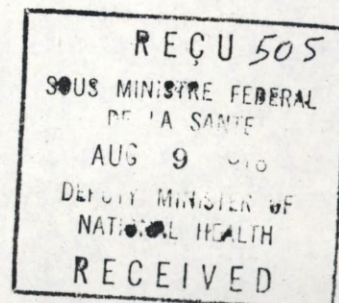
The City of Yellowknife, aside from being the capital of the Northwest Territories, represents the headquarters of activity for the Federal government in the Territories. We are therefore very concerned about the potential negative precedent that may be set should the least cost sewage lagoon alternative proposed by the City be endorsed. Furthermore, we fear that the establishment of such a precedent would seriously jeopardize our on-going activities to promote the adoption of sound environmental management practices by other municipalities, particularly those in the North.

Environment Canada would therefore appreciate any support and/or endorsement that your Department can provide for our recommendation that the City of Yellowknife install a properly designed and located sewage treatment plant.

Your consideration of this urgent matter is greatly appreciated.

Yours sincerely,

  
for J.B. Seaborn



Enclosure.





Environment  
Canada

Environnement  
Canada

---

**Brief presented to the  
Northwest Territories  
Water Board Public Hearing  
on the City of Yellowknife  
Application for  
Water Use License  
June 24 , 1976**

---

**PREPARED BY  
ENVIRONMENT CANADA  
JUNE , 1976**





Ottawa, Ontario

Mr. J. A. Bergasse,  
Chairman Northwest Territories  
Water Board,  
City of Yellowknife,  
P.O. Box 1500,  
Yellowknife, Northwest Territories

Dear Mr. Bergasse:

Environment Canada has prepared the attached brief for presentation to the Northwest Territories Water Board Public Hearing on Sewage Disposal for the City of Yellowknife. The brief presents environmental information which Environment Canada feels should be considered by the Water Board in their review of the City of Yellowknife's application for a license to dispose of their sewage.

The brief makes no recommendations and is intended only to provide the Water Board with information on the environmental concerns associated with the disposal of their sewage.

It is Environment Canada's hope that the brief will better enable the Water Board to determine which is the least environmentally damaging disposal scheme and for this purpose the brief is respectfully submitted.

Yours sincerely,

J. B. Seaborn



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1.        Introduction

On December 15, 1972, the City of Yellowknife made application to the Northwest Territories Water Board for a permit to use Kam Lake for sewage disposal. After reviewing the impact of using Kam Lake as a sewage disposal site the Environmental Protection Service sent a letter to the Chairman of the Water Board on May 6, 1974 outlining some of the environmental concerns associated with using Kam Lake as a sewage lagoon. Subsequent to this letter and at the request of the City of Yellowknife, Environment Canada prepared a report entitled "Review of Proposed Sewage Disposal to Kam Lake, N.W.T." (EPS 8-NW-75-1) which concluded that Kam Lake had intrinsic value for fisheries and recreational use and that the use of the lake as a sewage lagoon would contravene the Fisheries Act. The report recommended that after treatment, sewage disposal to Great Slave Lake through a properly designed and located outfall, would probably be acceptable wastewater treatment for the City of Yellowknife.

In a letter dated May 6, 1975 to the Mayor of Yellowknife, the Chairman of the Northwest Territories Water Board asked the City of Yellowknife to undertake the following work:

- "1. Studies must be carried out to demonstrate that Kam Lake will operate efficiently to degrade sewage, and organic matter produced in the lake by the sewage nutrients, to a quality comparable to secondary treated effluent with an organic loading from 15,000 people.
2. The City must evaluate all true costs of utilizing Kam Lake as a sewage lagoon including devaluation of lands for potential development as well as recreational use.
3. The City must evaluate alternative sewage disposal schemes."

To provide this information the City hired a consulting firm, Reid, Crowther and Partners Limited, to study liquid waste disposal for the City of Yellowknife. Personnel from the Department of Indian Affairs and Northern Development, the Government of the Northwest Territories and Environment Canada assisted the city in preparing the terms of reference for the study and also provided technical information to the consultants.



Environment Canada, at the request of the City of Yellowknife sent a letter to Mr. Bob Simons, Secretary Manager, City of Yellowknife, dated November 7, 1975 (Appendix A), recommending certain minimum effluent criteria which would be necessary to protect the various receiving waters in the area. These recommended minimum effluent criteria were based on existing information regarding the impact of sewage effluents on receiving waters and it was indicated that site specific monitoring would be necessary to more accurately determine the minimum acceptable effluent criteria. The consultant considered these criteria in the development of sewage treatment alternatives for the City.

Due to lack of funds the original terms of reference could not be completely addressed. This resulted in the report being prepared using existing information only. An important section concerning the approximation of the effects of discharging primary and secondary effluents to Yellowknife Bay was deleted from the study.

Environment Canada reviewed the first and second drafts of the consultant's report and made suggestions for improvement.

As the consultant's report (Reid, Crowther & Partners Limited, 1976) represents part of the City of Yellowknife's submission to the Water Board for disposal of liquid wastes, Environment Canada is presenting in this brief their environmental concerns regarding sewage disposal for the City of Yellowknife. The intent of the brief is to provide information to the Water Board which will aid the Board in determining the least environmentally damaging sewage disposal scheme for the City of Yellowknife.

In the following discussion each of the sewage disposal alternatives, as outlined in the Reid, Crowther and Partners Limited report on Liquid Waste Disposal for the City of Yellowknife, are reviewed and environmental considerations are examined.

2. Treatment Alternatives

2.0 Location of Mechanical Treatment Plant

The proposed location of a mechanical treatment plant at the head of Kam Lake is undesirable in that:



1. it would reduce the recreational value of this part of the lake;
2. it could eliminate the excellent access to the northern part of the lake;
3. the plant would be within 1500' of the Frame Lake South Subdivision and Correctional Institute and within 2000' of the Northland Mobile Home park and;
4. there may be limited space for future plant expansion.

A treatment plant location between the head of Kam Lake and the ultimate discharge, which is relatively isolated from residential housing and will accommodate future treatment plant expansion is more desirable.

#### 2.1 Mechanical Treatment - Discharge to Yellowknife Bay

The Environmental Protection Service recommended to the City of Yellowknife that the minimum effluent criteria for sewage disposal to Great Slave Lake (i.e. Yellowknife Bay) be primary treatment with disinfection and preferably secondary treatment with disinfection plus provision of an acceptable diffused outfall (Appendix A). Reid, Crowther and Partners Ltd. concurred with these minimum effluent criteria and stated (page 44):

"... it is therefore concluded that lower Yellowknife Bay, at a point midway between Negus Point and Kam Lake, would be a suitable receiving body for disinfected primary effluent, but that if costs are not substantially greater, that disinfected secondary effluent would be preferable".

However, Reid, Crowther and Partners Limited also indicated that due to the dearth of information on the sub-surface currents in Yellowknife Bay further field measurements, would be necessary to determine the effects and optimum location of the outfall diffuser.



It is well recognized that Yellowknife Bay is:

1. of intrinsic value to the citizens of Yellowknife due to its size and proximity to the City;
2. used as a sports fishery;
3. used by the residents of Detah as a food fishery and a water supply;
4. used as an area for cottage development, and;
5. used for recreation during the summer and winter;

and it is therefore essential that the sewage effluent discharged to the Bay be of a quality such that the above uses are protected.

With a properly designed and located mechanical sewage treatment facility it should be possible to phase construction of the facility to meet the future sewage disposal requirements of the City for an indefinite period. The degree to which construction can be phased will be a function of the required effluent quality, the existing and projected sewage loadings, and the availability of funds.

The consultant has estimated the total capital cost of primary treatment and chlorination, with discharge to Yellowknife Bay, at \$2,610,000. Secondary treatment plus chlorination, with discharge to Yellowknife Bay, is estimated to have a total capital cost of \$3,650,000.

## 2.2 Mechanical Treatment - Discharge to Pud Lake

This treatment alternative involves the discharge of secondary effluent to Pud Lake. Pud Lake and the Lakes downstream of Pud, which are used as tailing ponds by the Cominco mine, would convey the treated sewage to Great Slave Lake. These lakes are not considered as part of the overall treatment system but merely as a discharge route to Great Slave Lake. The consultant estimates this treatment alternative has a total capital cost of \$2,550,000.

Environment Canada's principal concern respecting this treatment alternative is that the increased flow through the Pud Lake watershed, resulting from the sewage discharge, could increase the heavy metal contaminants deposited in Yellowknife Bay, and



if it can be shown that discharging the City's treated sewage to Pud Lake has no adverse effects on the treatment of the Cominco mine tailings then this treatment alternative would be attractive because it offers an economical discharge route to Great Slave Lake.

As discussed above the location of a mechanical treatment plant at the head of Kam Lake is undesirable from an environmental standpoint and a location between the head of Kam Lake and Pud Lake, which is relatively isolated from residential housing yet will accomodate future treatment plant expansion is more desirable.

2.3      Secondary Treatment with Nutrient Removal Followed by Chlorination - Discharge to Kam Lake

The "Review of Proposed Sewage Disposal to Kam Lake, N.W.T." (EPS 8 -NW-75-1) report stated that a very high level of sewage treatment would be required to protect Kam Lake if it was used as a receiving body for the City of Yellowknife's sewage. Although the above sewage treatment alternative, which the consultant estimates would cost \$3,300,000., would provide a high level of treatment, nutrient removal would not likely be sufficient to prevent eutrophication of Kam Lake.

The level of nutrient removal required to protect Kam Lake from eutrophying would seem to preclude from further consideration any treatment scheme which discharges to Kam Lake and is designed to protect the lake.

2.4      Conversion of the Southern Third of Kam Lake into a Sewage Lagoon - Discharge through Unnamed Lake and Mac Lake to Great Slave Lake

This treatment alternative, which the consultant estimates will have a total capital cost of \$1,470,000., involves converting a portion of Kam Lake and Unnamed Lake and Mac Lake into consecutive sewage lagoons. As the conversion of these lakes into sewage lagoons would represent a considerable change in the natural environment of the area, there are many engineering and resource considerations which must be examined when reviewing this alternative.

2.4.1      Engineering Considerations

Reid, Crowther and Partners (1976), page 79, state "The proposed lagoon," i.e. the southern third of Kam Lake", meets loading criteria satisfactorily but does not generally conform with



accepted physical criteria ...". The lagoons non-conformity to accepted physical design criteria may have adverse effects on overall lagoon operation as the following excerpts on physical design criteria for lagoons, taken from Waste Treatment Lagoons - State of the Art (EPS-17090-EHX 07/71) illustrate.

"A pond site should be as far as practicable from habitation or any area which may be built up within a reasonable future period".

"If practicable, ponds should be located so that local prevailing winds will be in the direction of uninhabited areas. Preference should be given sites which will permit an unobstructed sweep across the ponds, especially in the direction of the local prevailing winds."

"Location of ponds in watersheds receiving significant amounts of runoff water is discouraged unless adequate provisions are made to divert storm water around the ponds and otherwise protect pond embankments."

"Maximum normal liquid depth should be 5 feet." (Note: Dawson and Grainge (1969) recommended that ponds at Yellowknife be 6 feet deep because the maximum lagoon ice cover that can be expected is 3 feet).

The southern third of Kam Lake does not conform to the above criteria. The average depth of the lake is 18 feet and the prevailing winds blow toward the City. The rugged shoreline which shelters the lake will reduce mixing. Surface run-off, based on natural outflow measurements by Dr. Greg Brunskill (Figure 1) indicate that 41-71% of the annual outflow at Kam Lake occurs during the month of May. If the southern third of Kam Lake is used as a sewage lagoon the average retention time based on 1990 city sewage volumes would be 180 days. However during the month of May the retention time of sewage would be reduced to 46-72 days using 1990 sewage flows and to 50-83 days using 1975 sewage flows. This means that during May much of the sewage deposited during the winter, which has only received the equivalent of primary treatment, will be flushed out of the lagoon without receiving biological treatment. Dawson and Grainge (1969) recommended a retention time of 240-365 days for single cell long-retention lagoon in arctic and sub-arctic regions.



#### 2.4.2 Resource Considerations

One reason presented in favor of using Kam Lake as a sewage lagoon is that there are a large number of lakes in the Yellowknife area and that the removal of part of Kam Lake, Unnamed Lake and Mac Lake from the inventory of lakes will not represent a significant loss in the number of lakes. Figure 2, however, illustrates that while there are a relatively large number of lakes surrounding Yellowknife and within the developed and future development areas of Yellowknife many of these lakes have had their recreational value reduced or lost through alienation by man.

The existing and future recreational value of Kam Lake to the citizens of Yellowknife is difficult to determine because very little information is available regarding the recreational uses of the lakes surrounding the City. However, the following excerpt from the "City of Yellowknife, N.W.T. - General Plan Provision - 1976" by Makale, Holloway & Associates Ltd. discusses recreational patterns that might be expected in the vicinity of Yellowknife:

"The bulk of recreationalists are dependent initially on car access, especially in day use situations, which may be combined with foot or boat or may terminate with facilities provided at the car access terminus. The access pattern tends to cluster recreationalists in areas and on water bodies that have good/adequate car access. So even though approximately one-third of the total surface area is covered by water bodies, human use of this resource tend to be concentrated on a relatively small number of lakes within the Yellowknife area. These are areas where access combines with desirable natural features such as fish abundance, shoreline scenery and extensive safe navigable water surface. The pattern of outdoor recreation in winter tends to centre closer to Yellowknife and to car access points, but is then more dispersed from these main centres. This is a function of winter all terrain vehicles that are not limited to navigable waterways."



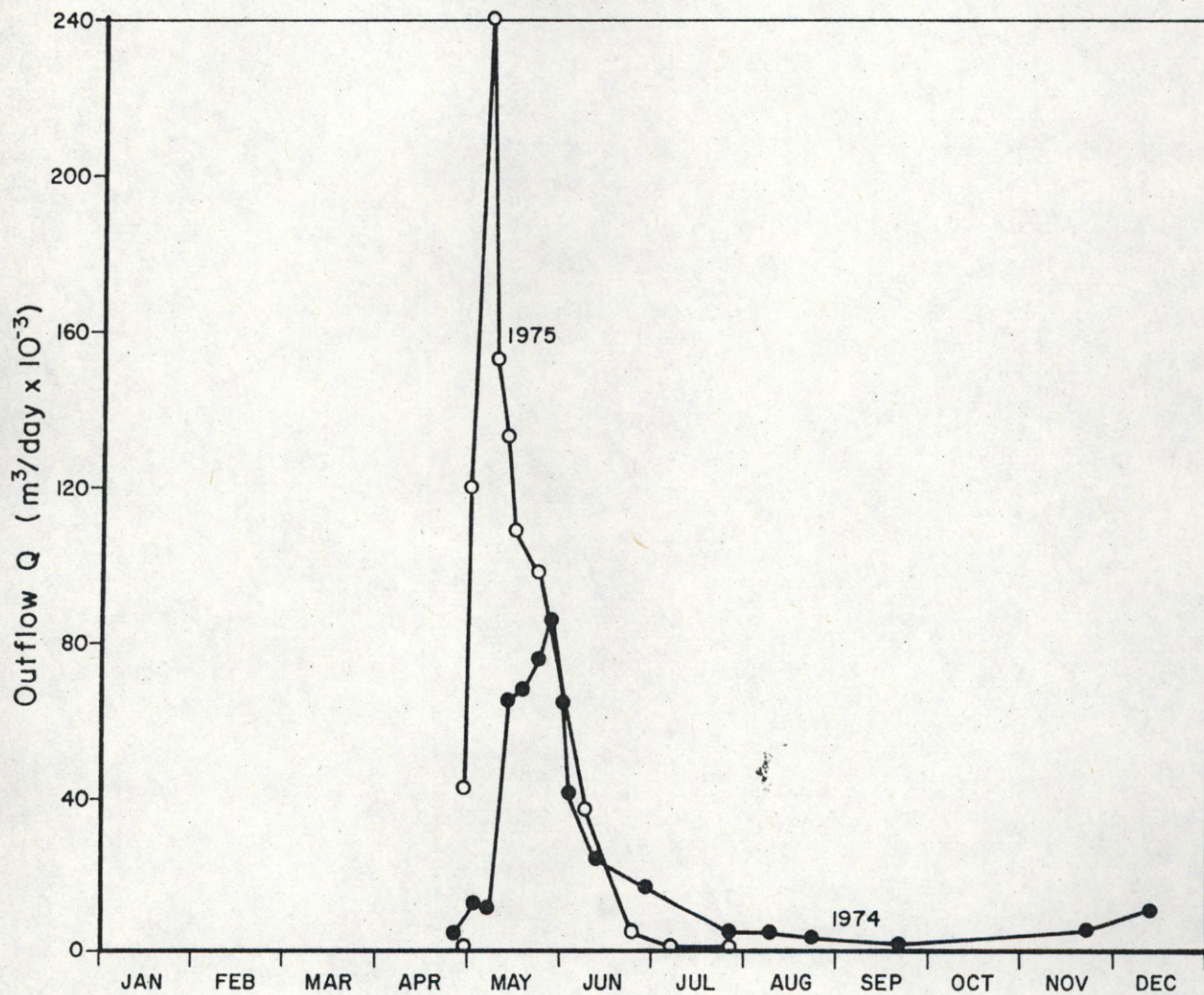


FIGURE 1. HYDRAULIC OUTFLOW MEASUREMENTS FOR KAM LAKE 1974 and 1975



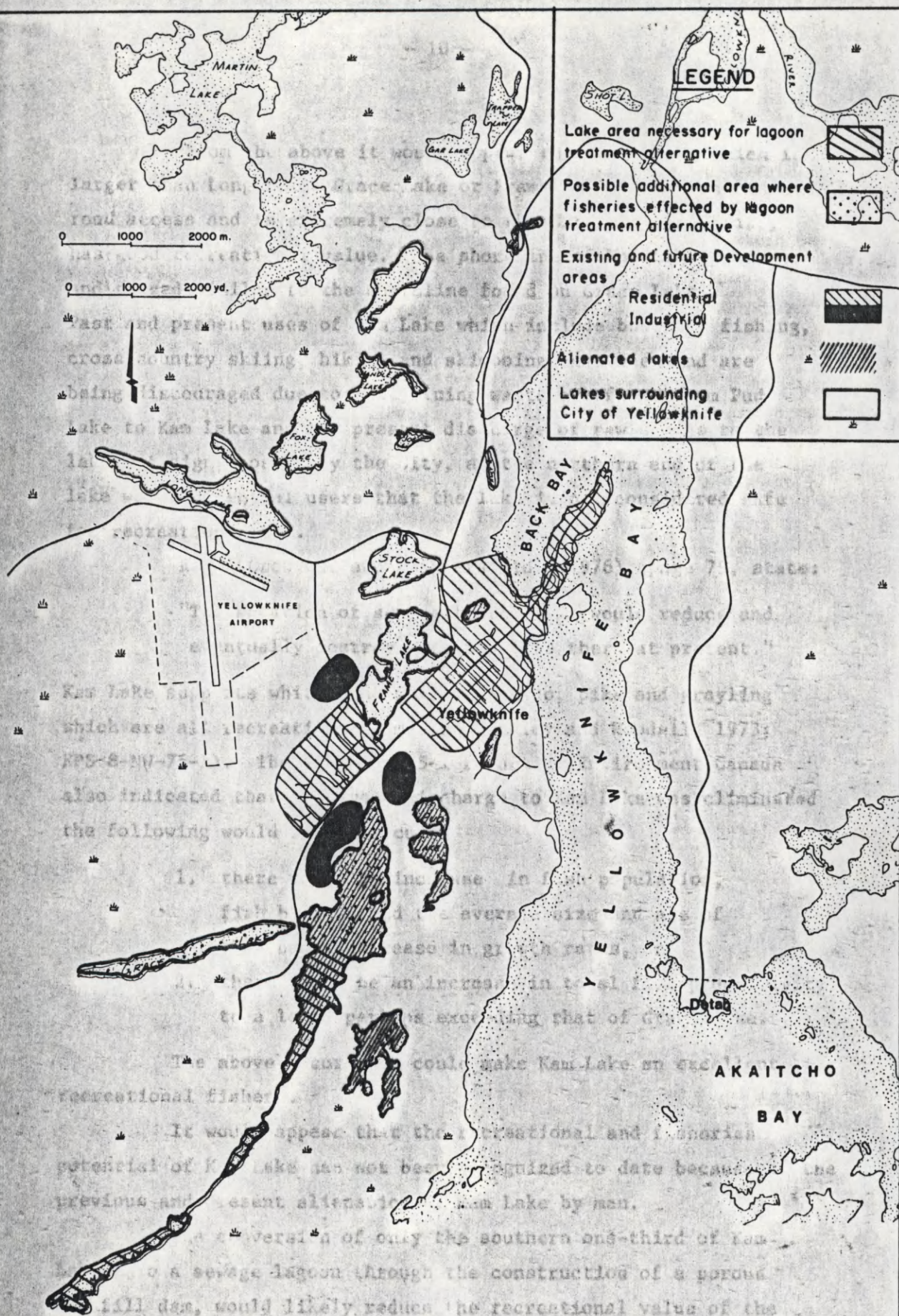


FIGURE 2 CITY OF YELLOWKNIFE AND SURROUNDING LAKES



From the above it would appear that Kam Lake, which is larger than Long Lake, Grace Lake or Frame Lake, has excellent road access and is extremely close to the City of Yellowknife, has good recreational value. The shoreline of Kam Lake is steep and rugged similar to the shoreline found on Grace Lake. Past and present uses of Kam Lake which include boating, fishing, cross-country skiing, hiking and skidooing have been and are being discouraged due to past mining waste overflows from Pud Lake to Kam Lake and the present discharge of raw sewage to the lake. A sign, posted by the City, at the northern end of the lake warns potential users that the lake is not considered safe for recreational use.

Reid, Crowther and Partners Ltd. (1976), page 79, state:

"The addition of sewage to the lake would reduce and eventually destroy the fish life there at present."

Kam Lake supports whitefish, walleye, cisco, pike and grayling which are all recreational gamefish (Healey and Woodall, 1973; EPS 8-NW-75-1). The EPS 8-NW-75-1 report by Environment Canada also indicated that if sewage discharge to Kam Lake was eliminated the following would likely occur:

1. there would be increase in fish population, fish biomass and the average size and age of fish but a decrease in growth rates, and
2. there could be an increase in total fish productivity to a level perhaps exceeding that of Grace Lake.

The above occurrences could make Kam Lake an excellent recreational fishery.

It would appear that the recreational and fisheries potential of Kam Lake has not been recognized to date because of the previous and present alienation of Kam Lake by man.

The conversion of only the southern one-third of Kam Lake into a sewage lagoon through the construction of a porous rockfill dam, would likely reduce the recreational value of the northern part of the lake. The proximity of the lagoon to the northern part of the lake and the possibility of sewage contamination of the lake would probably deter people from using the lake.



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The fisheries potential of the northern part of Kam Lake may also be affected by the construction of a control structure at the south end of Kam Lake if a migratory path of fish from Great Slave Lake to Kam Lake and Grace Lake exists. Although no information on fish migration into Kam Lake has been documented, Healey and Woodall (1973) suggested that one possible explanation for the occurrence of grayling in Kam Lake is migration from Great Slave Lake.

The use of a part of Kam Lake as a sewage lagoon would result in the eutrophication of Unnamed and Mac Lakes and the loss of any present and future recreational or fisheries value these lakes may have.

Based on the projected sewage loadings from the City of Yellowknife the southern one-third of Kam Lake can operate as a sewage lagoon until the year 1990. At this time upgrading will be required and the consultant has suggested that anaerobic lagoons be added. With the unfavourable prevailing winds anaerobic lagoons could create severe odour problems in the area.

### 3. Summary

In summary, Environment Canada strongly suggests to the Northwest Territories Water Board that the use of Kam Lake, Unnamed Lake and Mac Lake as sewage lagoons is the least desirable of the sewage disposal alternatives considered.

Such use would destroy the fishery and recreational value of these lakes, and seriously reduce the potential of the surrounding area for recreational and residential use.



Regardless of which treatment alternative is chosen, continuous monitoring of the sewage influent and effluent should be undertaken to ensure the sewage disposal facility is providing the desired level of treatment. Continuous monitoring of the receiving water should also be undertaken to ensure that the level of sewage treatment being provided is adequate to protect the receiving water.



REFERENCES

1. Dawson, R. N. and Grainge, J.W., 1969, Proposed Design Criteria for Wastewater Lagoon in Arctic and Sub-Arctic Regions, JWPCF, v41, p. 239.
2. EPS 8-NW-75-1, Review of Proposed Sewage Disposal to Kam Lake, N.W.T., Environmental Protection Service, Environment Canada.
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APPENDIX A

LETTER TO CITY OF YELLOWKNIFE FROM  
ENVIRONMENTAL PROTECTION SERVICE  
RECOMMENDING MINIMUM EFFLUENT  
CRITERIA TO VARIOUS RECEIVING  
BODIES OF WATER.



Environment Canada      Environnement Canada  
Environmental Protection      Protection de l'Environnement  
P.O. Box 2310  
Yellowknife, N.W.T.

November 7, 1975

Mr. Bob Simons  
Secretary Manager  
City of Yellowknife  
Yellowknife, N.W.T.

Dear Mr. Simons:

Re: City of Yellowknife Sewage Treatment Alternatives  
- Recommended Minimum Effluent Criteria

In response to a request by the City for guidance regarding the minimum effluent criteria that DOE would recommend to the N.W.T. Water Board for the disposal of sewage to the various receiving bodies of water being considered in the study of sewage treatment alternatives for the City of Yellowknife, I present the following:

- (a) Great Slave Lake (i.e., Yellowknife Bay) - minimum of primary treatment with disinfection and preferably secondary treatment with disinfection plus provision of acceptable diffuser outfall.
- (b) Back Bay - as an interim measure primary treatment with chlorination. Discharge on a permanent basis would require secondary treatment with disinfection.
- (c) Kam Lake - minimum of secondary treatment followed by nutrient removal, then disinfection.
- (d) Unnamed, Mac and Octopus Lakes - minimum of secondary treatment with disinfection.
- (e) Pud Lake - high arsenic content of lake precludes its use as receiving water based on present information.

It should be noted that the minimum effluent criteria are based on the existing knowledge of the various water bodies

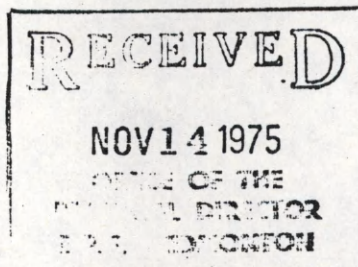
*JJ Catok*

TO	<i>JE</i>
ENVIRONMENTAL PROTECTION	
NOV 14 1975	
EDMONTON, ALBERTA	
FILE No.	<i>4705-37/YK</i>

*G.W. has copy*

Your file      Votre référence

Our file      Notre référence      4045-1/Ye

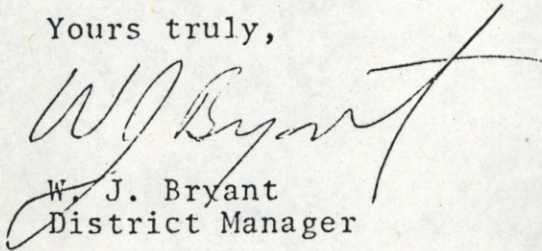




and may be subject to change as a result of further study and monitoring that will undoubtedly take place after the ultimate receiving body is decided upon.

By a copy of this letter, I am also informing the N.W.T. Water Board of the above-recommended DOE minimum effluent criteria.

Yours truly,



W. J. Bryant  
District Manager

WJB/jp

cc: N.W.T. Water Board Members  
A.E. Ganske  
N.A. Jacobsen  
I. Kraft  
J.J. Eatock  
G. Webster  
D. Hay  
V. Christensen



MEDICAL SERVICES BRANCH

RECORDING & TRANSMITTAL FORM

DEPUTY MINISTER'S CORRESPONDENCE

SUBJECT: Sewage Disposal for the City of  
Yellowknife

FILE NO: 850-5-X751

FROM: Mr. J.B. Seaborn,  
Deputy Minister,  
Department of Environment Canada,  
Fontaine Building,  
200 Sacré Coeur Street,  
HULL, Quebec.  
K1A 0H3

DATE: August 6 '76

TO: DEPUTY MINISTER

INITIATED  
IN BRANCH

RECEIVED IN  
ADM'S OFFICE: August 11 '76  
(Date)

PASSED August 11 '76  
(Date)

ACTION: Please prepare a reply for Mr. Jean Lupien's signature  
as soon as possible.

TO	DATE	REPLY			B.F.	DATE SENT OUT	SIGNED
		INTERIM	FINAL	DATE			
Dr. <sup>Frost</sup> <del>Hicks</del>	August 11 '76		X	23 août		23 août	

REMARKS:

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Ottawa, Ontario  
K1A 0H3

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Mr. J. Lupien  
Deputy Minister  
Department of National Health and Welfare  
General Purpose Building  
Ottawa, Ontario

850-5-X151

NHW - RECORDS SERVICES DIV. ADMIN. BR. RECORDS OFFICE	
Referred to.....	<i>0.01.11</i>
File No.....	3 AUG 1976 <i>1000-5-11</i>
Chg'd. to.....	

Dear Mr. Lupien:

SEWAGE DISPOSAL FOR THE CITY OF YELLOWKNIFE

Enclosed for your information is a copy of the DOE brief presented to the Northwest Territories Water Board public hearing held on June 24, 1976, at Yellowknife.

As you are probably aware, the City of Yellowknife has applied to the Water Board to convert part of Kam Lake, Unnamed Lake and Mac Lake to sewage lagoons. From the viewpoint of long term environmental management, Environment Canada considers that the conversion of all or part of these recreationally useful, fish inhabited lakes to sewage lagoons is the least desirable sewage disposal alternative.

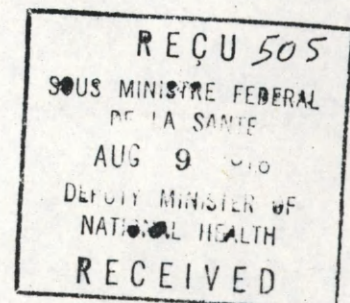
The City of Yellowknife, aside from being the capital of the Northwest Territories, represents the headquarters of activity for the Federal government in the Territories. We are therefore very concerned about the potential negative precedent that may be set should the least cost sewage lagoon alternative proposed by the City be endorsed. Furthermore, we fear that the establishment of such a precedent would seriously jeopardize our on-going activities to promote the adoption of sound environmental management practices by other municipalities, particularly those in the North.

Environment Canada would therefore appreciate any support and/or endorsement that your Department can provide for our recommendation that the City of Yellowknife install a properly designed and located sewage treatment plant.

Your consideration of this urgent matter is greatly appreciated.

Yours sincerely,

*J.B. Seaborn*  
for J.B. Seaborn



Enclosure.