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REPORT

**on a Proposal Concerning
Surface Water Quality
Objectives and Stream
Classification for the
Province of Manitoba**

The Clean Environment Commission

Revised Edition May 1979

Mr. W. M. Ward, announced that the Division would study the comments and views expressed and would provide the Commission with an amended proposal at a later date. The Commission, therefore, decided to withhold its report and recommendations pending the receipt of such an amended proposal. Another reason for delaying the report was that the Commission kept receiving additional submissions subsequent to the hearing, the last one as late as December 1977. A list of submissions received is attached as Appendix C.

A modified proposal was received in October 1977 and was subsequently discussed with Mr. Ward. The Commission has based its comments and recommendations in this report on the modified proposal. Reference to the original proposal is made only when discussing comments that were received at the hearing and which specifically pertained to the earlier version. The recent proposal is attached as Appendix D.

The Commission discussed the matter at its meetings at various times. The present report and recommendations were adopted in substance at the meeting on January 23, 1978.

Chapter 2

Summary

Terminology

There are two separate issues in the proposal of the Environmental Management Division. One is the establishment of use-related water quality objectives. The other is the adoption of stream standards as a step in water quality management.

Water quality objectives are based on scientific data, the so-called water quality criteria, which relate the quality or health of the aquatic environment to properties, conditions and chemical constituents of the water. The objectives differ from the criteria in that they incorporate the notion of a desirable goal. Thus, they normally take risk and uncertainty into account by including a margin of safety. Nevertheless, water quality objectives are basically of a scientific nature. Their establishment should be the task of the scientific community within, as well as outside, the regulatory agencies.

When water quality objectives are applied to a given stream, the practical decision must be made what uses are to be protected. This is basically what stream classification does. Stream classification is, therefore, a policy decision, a commitment towards maintaining certain minimum standards of environmental quality that will ensure that valued uses may continue in the future or that they may be restored.

In this report, the term stream standard will be used to designate the quality objectives for a given stream in terms of specific limits to contaminants and conditions related to quality. The stream standard is not a law that is being enforced; it remains an objective. However, it is an objective that relates to a specific situation; it is based on specified uses and observed qualities of the stream.

Water Quality Objectives

The proposal of the Environmental Management Division contains a set of water quality objectives for each of six use categories. Although there was some criticism and disagreement about specific points, the Commission foresees no problems in the adoption of the objectives as such as long as it is

recognized that they are the result of an on-going process of scientific investigation. This means that the objectives must be continually reviewed and updated in the light of new evidence.

Concerning the use that will be made of the objectives, the following points may be made.

1. While the objectives would be an essential step in the establishment of stream classifications, they are also useful if stream classification is not proceeded with. An up-to-date use-related set of water quality objectives would be of considerable value to the Commission as a standard for comparison when judging present water quality or as an indicator of the possible consequences of waste discharges to a stream.

2. The categories of use defined in the proposal are of necessity quite broad. Finer distinctions may be needed in specific instances to protect a locally important quality component. In addition, the usefulness of a stream for a given purpose is seldom a black and white issue. Flexibility is therefore needed when the objectives are translated into stream standards or into effluent limits.

3. The environmental quality of a stream or lake is determined by more than the physical quality and chemical composition of its water. Bank and shore line degradation or over-crowding may effect the quality as much. Water quality objectives should, therefore, be regarded as part of an overall environmental management program that focuses on the stream or lake as a whole and our use and enjoyment of it.

Stream Classification

With regard to stream classification, the Commission investigated the proposal from two aspects. First, it evaluated the merits of the proposal by comparing it to other methods used in water quality management. Secondly, it investigated how stream classification could best be implemented.

There are two reference points in any environmental management decision. The first is the effect of any proposed action or emission of contaminants on the quality and the use made of the natural and human environment. The second is the ability of the industry or operator to comply with any restrictions imposed on the emission of contaminants. Any attempt at formulating consistent

policies for environmental decisions tends to focus on one of these two reference points.

Stream classification focuses on the use made of streams and lakes. It recognizes the disposal of waste as a useful function of a stream which can be harmonized with other uses and which, depending on the circumstances, may have to take priority over other uses. It is an essential part of a so-called best resource for which there are competing uses.

There is another approach to environmental policy, which focuses on the second reference point, the ability of the operation or industry to limit discharges to the environment to a practical minimum. This approach requires that limits be set in accordance with the best pollution control technology that is available for the industry or operation. The approach will be referred to as the best practicable technology approach.

The Commission has compared the two approaches and has concluded that the stream classification method has considerable merit. In particular, it was noted that:

- (a) it avoids environmental confrontation in recognizing that the deposition of wastes into the environment is not necessarily incompatible with high quality use and enjoyment of our natural resources;
- (b) the approach aims at making the benefits as well as the cost of environmental control explicit;
- (c) the approach ties in with regional development planning and thus provides a rational basis for the degree of environmental control specified.

Two reservations may be mentioned. In the first place, there is substantial uncertainty involved in estimating the assimilative capacity of the environment and the long-term effects of contaminant releases. This uncertainty should be clearly recognized when deciding on stream standards.

In the second place, there is also much uncertainty about the future use of rivers and lakes and the danger of undue rigidity in comprehensive resource planning is not imaginary. However, the fact that the planning function can be abused should not be reason to omit planning.

Having investigated the merits of the classification proposal, the Commission then considered how stream standards could best be implemented. Obviously, the practicability of the proposal would depend very much on any problems encountered at the implementation stage.

The Commission noted a general agreement about the total impracticability of direct enforcement of stream standards. Several other means, such as negotiable permits, effluent charges and positive incentives, were considered because they have either been implemented in other jurisdictions or have been strongly recommended in the literature by leading environmental economists. However, the Commission reached the conclusion that in the Manitoba situation the proposal could best be implemented through orders of The Clean Environment Commission setting effluent limits on industries and operations. This means that the stream standard would function as a guide for The Clean Environment Commission in formulating its orders.

There is another aspect to the implementation of the proposal of the Environmental Management Division, namely, the procedure whereby stream classifications would be established. Several speakers at the hearing stressed the importance of this point. The Commission has outlined in the report a step-by-step procedure based on the following principles:

- (a) early participation is needed in the studies leading to a classification proposal of all departments of government involved in the consequences and effects of such a proposal;
- (b) public participation must be ensured through public hearings before The Clean Environment Commission;
- (c) present quality and use patterns should be the point of departure of any classification proposal and changes to be effected by the classification decision should be justified by demonstrating not only the desirability but also the cost, the feasibility and the practicability of the proposal;
- (d) target dates are to be considered an essential part of the classification proposal;
- (e) the decision as to the appropriate effluent limits needed to achieve the stream standard should be the task and responsibility of The Clean Environment Commission.

Chapter 3

Recommendations

The Commission recommends:

1. That the water quality objectives for various types of use, as proposed by the Environmental Management Division and as subsequently amended, be formally adopted for use in Manitoba.
2. That the Environmental Management Division be instructed to review the water quality objectives at least every three years and that it formulate proposals for revision when new evidence warrants this.
3. That prior to any revision all interested parties be given an adequate opportunity to publicly present their views on the matter.
4. That a program be undertaken aimed at classifying all streams in Manitoba in accordance with the schedule of designated uses proposed by the Environmental Management Division.
5. That, where this appears desirable, specific surface waters be classified as not to be degraded in quality.
6. That on the basis of the classification and possibly other considerations of present quality and use, stream standards be formulated for the classified streams or parts thereof, which list the specific target limits to be applied to designated contaminants or conditions germane to water quality.
7. That the stream standards be used as targets to be aimed for by all government agencies involved in water quality and use; in particular by The Clean Environment Commission in setting appropriate effluent limits.
8. That specific proposals for stream classification be prepared by the

Environmental Management Division in close co-operation with other departments of government.

9. That all classification and reclassification proposals be made the subject of public hearings before The Clean Environment Commission which is to present the Minister with its recommendations.
10. That any classification decision be clearly identified as government policy, for example, by incorporation in an Order-in-Council.
11. That the proposed nutrient policy as formulated by the Environmental Management Division be adopted as a general goal but that the practical implications of the proposal be examined in more detail, in particular, the requirement of "limiting phosphorus inputs to lakes and impoundments from all point and non-point sources to the maximum extent possible".

PART II

WATER QUALITY OBJECTIVES FOR DESIGNATED USES

Chapter 1

The Proposed Water Quality Objectives and Their Use

The Environmental Management Division of the Department of Mines, Resources and Environmental Management has proposed the adoption of a set of Water Quality Objectives related to designated uses of surface waters within the Province of Manitoba. These objectives are intended to serve as basic targets in water quality management programs.

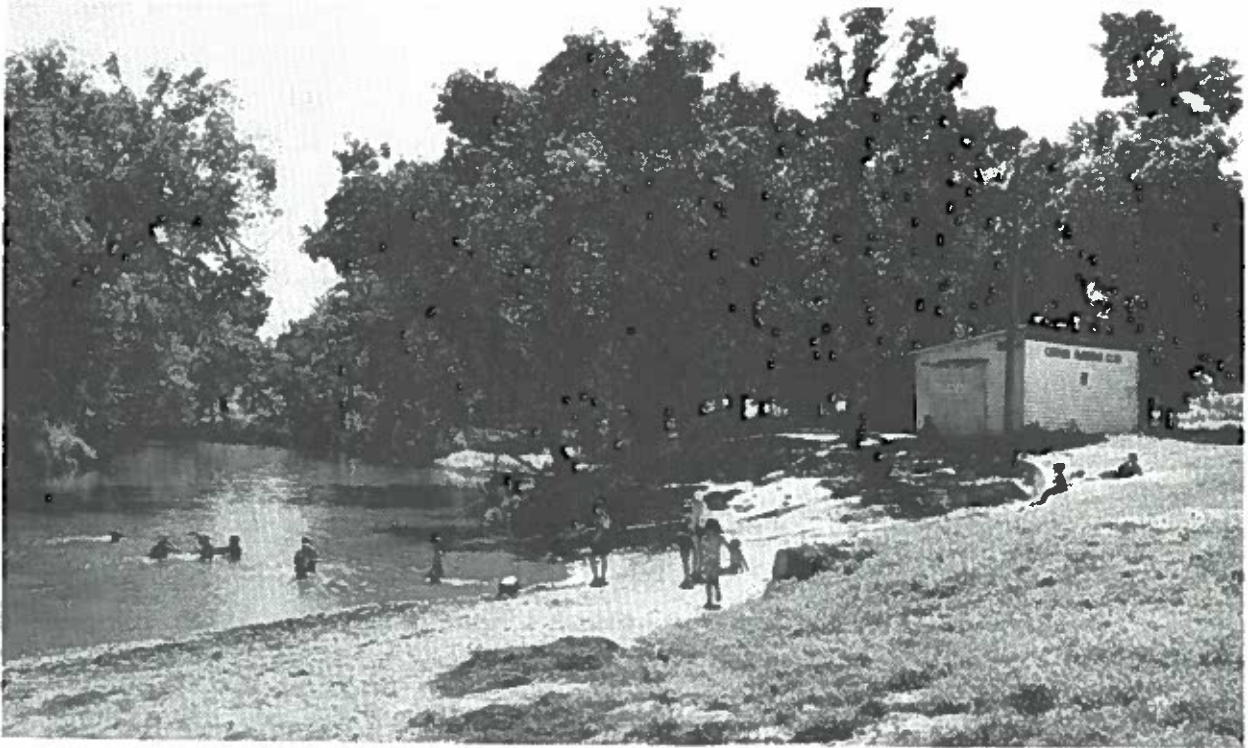
To this end, the Division identified six use categories that will constitute the principal classes. These are:

1. Domestic Consumption.
2. Fisheries and Recreation.
3. Industrial Consumption.
4. Agriculture and Wildlife.
5. Navigation and Waste Disposal.
6. Other Uses. (For the present not defined).

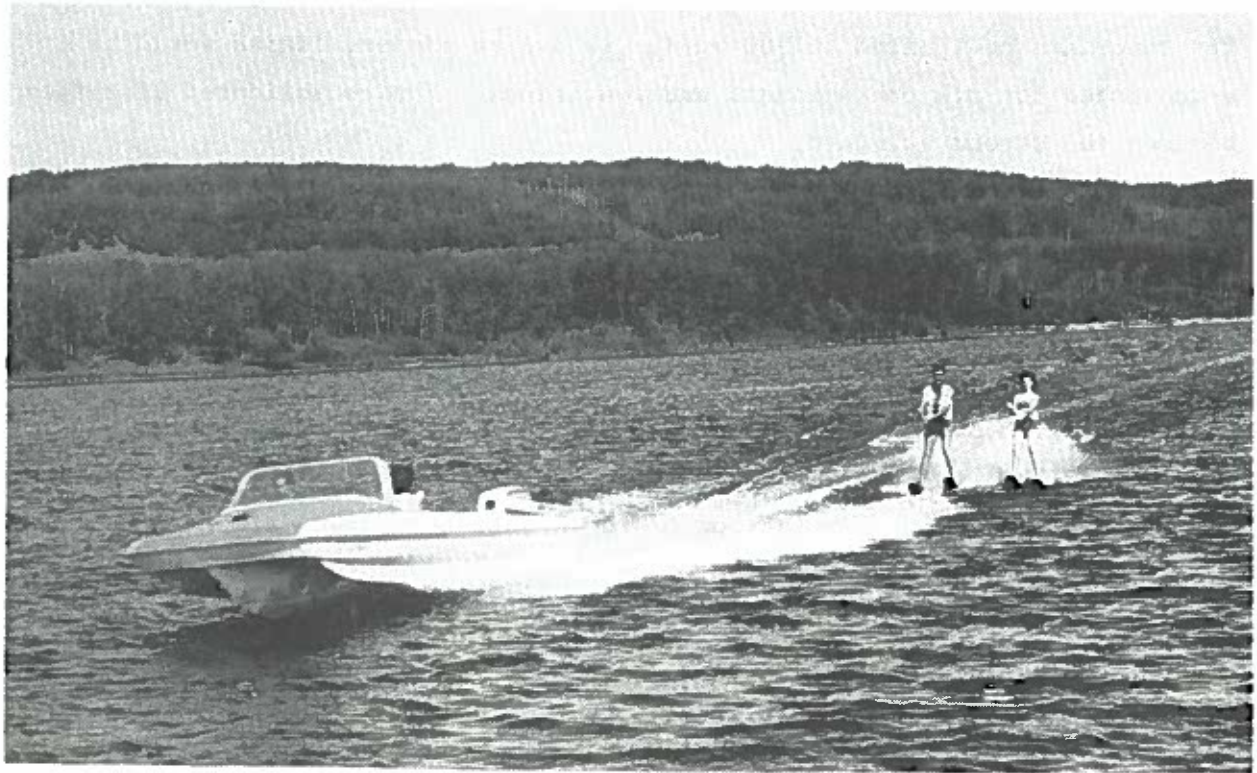
A number of subclasses are distinguished in each of the first four classes. These relate to the relative suitability of the water for the designated uses. For example, the subclass 3A, in the principal class 3, Industrial Consumption, designates a quality that is high enough to permit the water to be used without chemical treatment in most industrial processes, except food processing. In the same principal class, the subclass 3C designates water with a lower quality for industrial consumption; it is generally suitable for industrial cooling and materials transport only.

For each class or subclass, except for the undefined class 6, the Division has prepared a list of contaminants or conditions (such as turbidity, pH, temperature, etc.) that are relevant to the suitability of the water for the designated use. For each item on these lists, the acceptable limits or ranges have been established. Together the limits constitute the water quality objectives for the class or subclass.

The water quality objectives are intended to be used in conjunction with water management programs for each of the 19 riverbasins in Manitoba. Each of these basins is to be classified in accordance with desirable present or future uses. The uses implied in the classification each require a set of water



Boyne River, Carman, Manitoba



Minnedosa River, Minnedosa, Manitoba

quality objectives which together form a stream standard. The following example may clarify this.

Suppose that, on the basis of environmental, social and economic considerations, a river is classified as 1C, 2C, 3B 4A and 5. This classification expresses a designated use as well as a designated quality for the river.

With respect to the use, the classification means that the water would need considerable treatment if it were to be used for domestic consumption. It would be suitable for boating but not for swimming and it would support a stand of rough fish. Industry could use the water with only a moderate degree of treatment. It would be good water for irrigation and it would be suitable for navigation.

With respect to water quality, the classification would impose on the responsible authorities the obligation to protect the water in accordance with each of the limits listed for the subclasses mentioned. The lists for each use could be consolidated to a single list containing, for each substance or condition, the limit that would protect the most sensitive use. For example: chlorides would be limited by the classification 1C to 250 mg/l, by 2C to 200 mg/l, by 3B to 100 mg/l, by 4A to 150 mg/l, while class 5 does not impose a limit on chlorides. Protection of the most sensitive use thus requires that the chlorides be limited to 100 mg/l. In a like manner, limits would be established for all contaminants and conditions. The consolidated list then becomes the stream standard.

Three important modifications of the general concept outlined above are incorporated in the proposal.

As a first modification, a non-degradation objective has been proposed as a possible alternative to a classification based on specified uses. There are several reasons for this. For example, many of Manitoba's waters have a high natural quality and yet there is at the present time little or no demand for their utilization. Protection of these waters may thus aim at preserving them for future undesignated uses. Other waters are being used for wildlife management or form an ecological reserve. Again others have value as wild rivers. In each case, protection would aim at preserving rivers as much as possible in their present state. To make this possible, the non-degradation

objective was included in the proposal.

The second modification was necessary because effluent from waste treatment plants or industrial operations normally enter a river in a far more concentrated form than would be permissible for the river as a whole. The stream standard is not intended as an effluent standard, but applies to the water after the effluent has been mixed with the stream. In the immediate vicinity of the waste outlets, the mixing is yet incomplete; therefore, monitoring of the stream to check on compliance with the stream standard must be undertaken away from the so-called mixing zone. The Division has proposed mixing zone limits which define areas within which monitoring of the stream will not take place. The mixing zone limits do not presume to define the actual physical boundaries of the zone within which mixing does take place. They serve the dual purpose of giving the waste producer some leeway with regard to stream quality and protecting aquatic life against local pollution that might otherwise extend over the entire stream cross-section.

The third modification relates to nutrient levels in lakes and impoundments. The quality of such waters may be seriously impaired by the nutrients that enter them and that may cause eutrophication. Placing a limit on the nutrient level is not a practical way of preserving the water quality, firstly, since the relationship between nutrient levels and eutrophication is very complex and secondly, because the nutrient level is dependent on many factors beyond the control of man. Nutrients from domestic sewage, and in particular phosphates, are but one factor in the eutrophication process; it is the only one, however, that can be controlled. Therefore, the only practical way of slowing down the process of eutrophication in lakes or impoundments is to limit the phosphorus input. This can be achieved at point sources by means of effluent limits and at all non-point sources, such as agricultural operations, by better management.

The proposal finally deals with the management problem caused by stream flow variability. The effect of a discharge of contaminants in a stream varies with the amount of flow in the river. It must be the object of stream protection to preserve the stream quality even when the flows are low. Nevertheless, for the purpose of determining appropriate effluent limits that would result in the desired quality, one must define a minimum flow to which

the standard is applied. The Division has proposed a designated flow, below which the stream standard shall not apply. Roughly speaking, this flow has been defined so that each year there is a 10% probability that the stream flow drops below the critical level for a week or more.

Chapter 2

Reactions to the Proposal

The Commission received many comments on the proposal as originally presented by the Environmental Management Division both at the public hearing and afterwards. Some comments led the Environmental Management Division to reconsider and modify its proposal, which in its present form is as described in Chapter 1 of this report. A brief summary of the main comments and objections received by the Commission follows.

1. Many participants objected to the inclusion of a section entitled "General Objectives for Waste Discharges" which was included in the original proposal. The objections were in part directed towards specific clauses in the section; for example, there was opposition to a clause requiring disinfection of all waste water that might cause a violation of stream coliform criteria. Specific objections were also directed towards the implied requirement for tertiary treatment of many municipal waste discharges. A more general objection was voiced in several submissions which concerned the inclusion of requirements about waste discharges in a document ostensibly dealing with ambient water quality standards. This was considered to be illogical. The Environmental Management Division subsequently removed the section in its entirety.

2. Objections were also raised against a general clause in the original proposal requiring the use of the highest and best practicable technology for all new waste producers in high quality waters; that is, in waters where the existing quality is higher than required by the established objectives. This requirement was subsequently dropped and replaced by the non-degradation option which may or may not be imposed on any water.

3. Considerable concern was expressed about the requirement of phosphate removal from municipal waste water by means of best available technology for the sake of slowing down eutrophication in lakes and impoundments. In the subsequent version of the proposal, the Division reworded this objective to read "limiting phosphorus inputs to lakes and impoundments from all point and non-point sources to the maximum extent possible". This could mean the same thing, namely, that tertiary treatment becomes a requirement for all sewage treatment facilities whose waste eventually winds up in a lake or in an

impoundment. If this is indeed implied by the words "to the maximum degree possible", then there would be a serious discrepancy between this requirement and the rest of the proposal which avoids such non-negotiables by making specific requirements dependent on the local situation. At any rate, a proposal implying mandatory tertiary treatment of sewage in municipal plants would require more consideration than it can be given in the context of the present discussion.

4. Several persons commented on specific limits included in the specifications for the various subclasses. Some changes were proposed and were accepted by the Division. Others noted the uncertainty in the stated limits and commented that, since the purpose of the limits was to protect a given use, they would tend to err on the side of safety. Consequently, water would not necessarily be unfit for a given use simply because a particular limit, established for that use, was exceeded. The opinion was also expressed that some limits seemed to represent little more than detection levels with the available analysis techniques. Warnings were voiced against the danger of entrenchment of poorly substantiated requirements. With regard to all these comments and objections, it was generally agreed that the lists of limits represents the current state of scientific knowledge and that the limits must be continually updated.

5. Many persons commented on the use that might be made of the water quality objectives and expressed fear that they might be used as standards that would be enforced. It was generally felt that water quality objectives for a given stream should remain a planning tool, to be used as a guide for the setting of appropriate effluent limits. Of particular interest were the comments made by the representative of the Ontario Ministry of the Environment who said that Ontario has a system of water quality criteria and, associated with this, guidelines for surface water quality management. The Ontario Ministry is currently revising the criteria and the guidelines. However, it would appear that Ontario may well opt for a more flexible approach than stream classification.

6. Implementation procedures were considered to be extremely important and several persons commented on the need for broad public support, for adequate consultation with all parties at interest, for public participation

and for adequate review procedures. Several persons expressed a strong preference for public hearings by The Clean Environment Commission as a means of setting appropriate stream classifications. It is of interest that the Ontario Guidelines and Criteria Review Committee identified the lack of a clear and detailed set of implementation procedures as a basic weakness of the Ontario approach. As a result, several matters referred to in the Ontario Guidelines have not been sought out in depth or fully pursued and implemented. On the other hand, the Review Committee has leaned away from proposing a classification system for the Ontario waters partly because of a perceived danger of "getting locked into difficulties". The Ontario Review Committee presently considers the possibility of recommending a continuation of the system of guidelines with an overall long-term goal of making all surface waters safe for body contact water recreation. The Ontario representative said that this might be an unrealistic goal for some waters, even on the long term. He expressed the opinion that proper implementation procedures would be essential for any water quality management system. These procedures should ensure both public support and the necessary commitment on the part of government, municipalities and industries.

Chapter 3

Discussion of the Proposed Water Quality Objectives

The Commission wishes to state the following points concerning the proposal for the establishment of Water Quality Objectives.

1. It is of great value for any system of water quality management to have a set of use-related water quality objectives that reflect the latest scientific information and that will be updated as needed. If for no other reason, the Commission welcomes the proposal produced by the Division and appreciates the important work done to date in this connection.

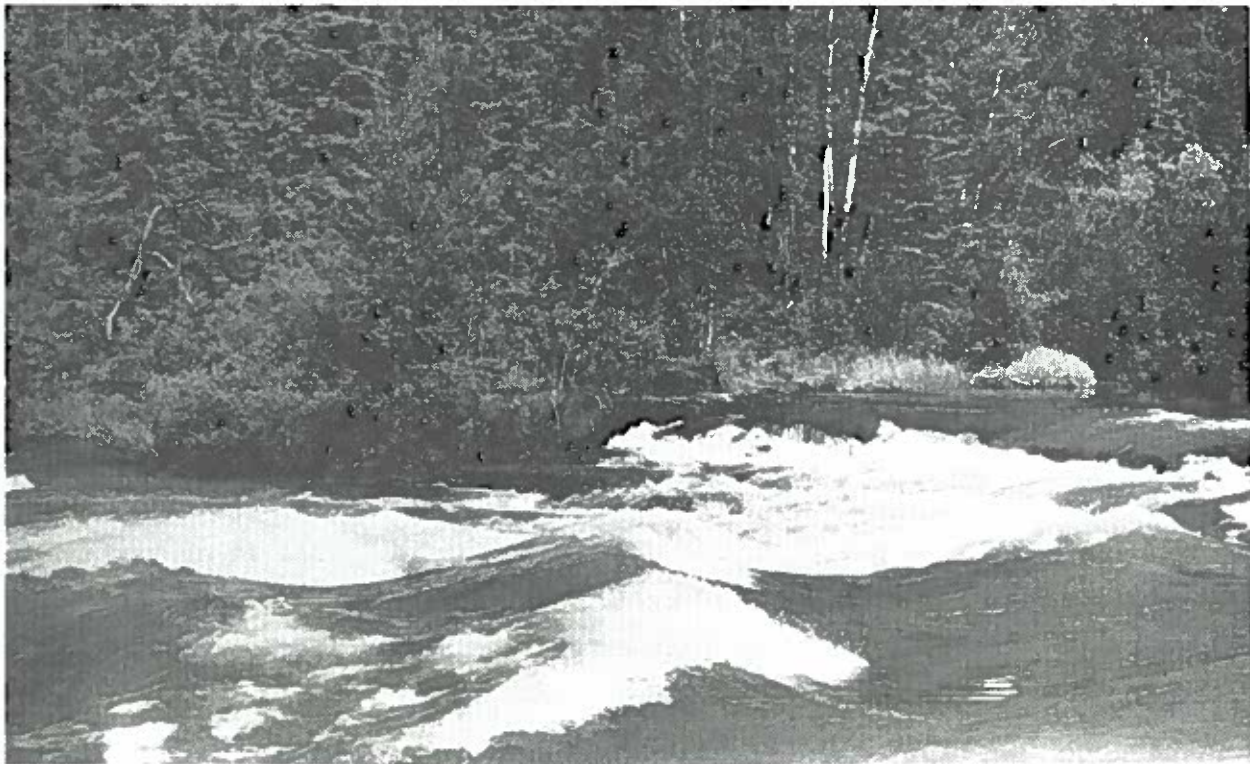
2. It is up to the scientific community to decide on the limits that will adequately protect specific uses of surface waters. Although based on the best information available, the data may be expected to have a considerable margin of uncertainty and there is undoubtedly room for substantial differences of opinion. It must be the responsibility of the Environmental Management Division to resolve these differences one way or another and to produce an agreed upon set of objectives that can be accepted for use until revised in the light of new information.

3. Environmental quality is a subtle and not easily definable attribute. The parameters and their limits listed in the proposed water quality objectives constitute a first line defense against specific forms of degradation. To obtain their full benefit, they should be used in conjunction with an overall environmental management policy aimed at preserving the natural quality and diversity of waters and shorelands as much as is consistent with their necessary and desirable use. Stream classification is only part of the necessary water quality management program for any basin. Without a firm commitment to such programs, the value of stream classification is rather limited. For example, a classification aimed at a high quality use of a stream for fishing and recreation is of limited value if the shorelands are allowed to deteriorate or if overcrowding spoils the recreational quality.

4. The actual relationship between water quality and use is not completely defined by the criteria set forth for the designated uses. This is partly so because the broad use categories on which the classification is based encompass uses with different sensitivities. For example, some crops are far



Bird River, Manitoba



Sasaqui Rapids, Grass River, Manitoba

more sensitive to chloride concentrations in irrigation water than others. There is no clear line separating sport and commercial fish from rough fish as far as sensitivity to pollutants is concerned. Similarly, there is a spectrum of water-based recreation in which the sensitivity to pollutants and turbidity varies greatly. Classification on the basis of these broad use categories, therefore, entails the danger of oversimplification. It could well be that on the basis of a few parameters a stream receives a relatively low grade in one or more of the designated uses. This should not, in itself, be reason to open the door to further deterioration of all other concentrations and conditions to the limits corresponding to the designated uses.

5. To avoid the danger of oversimplification, it is desirable that actual use patterns and their relation to water quality are included in the on-going studies and surveys necessary to manage basin water quality. This does not require complete inventories of use which would be costly and time-consuming to produce and to maintain. The studies should rather concentrate on problem areas and may demand mainly data that would be collected in any event by diverse government agencies.

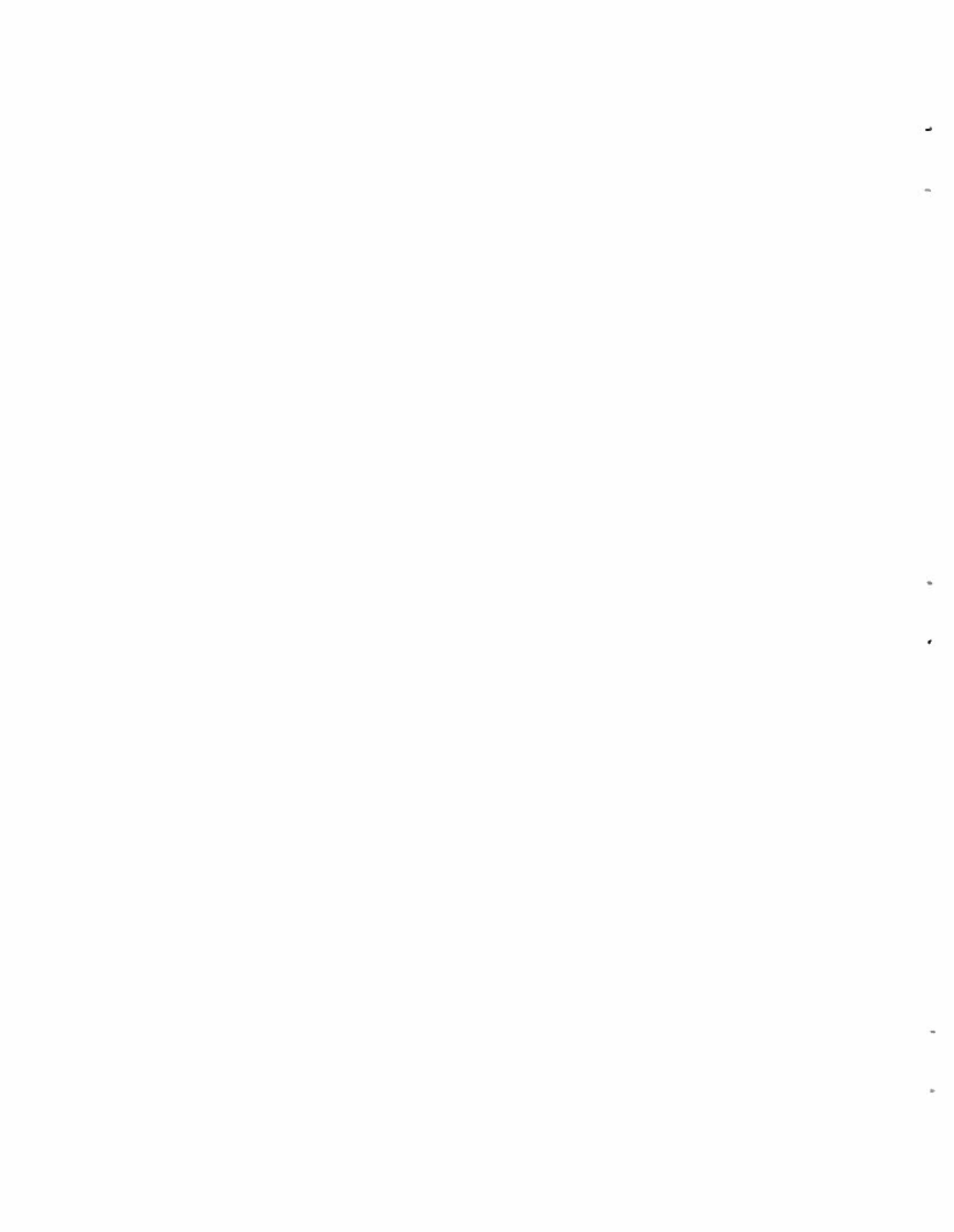
6. Care should be taken to preserve the integrity of the limits as scientific information; they should not be modified to accommodate specific uses. This may seem self-evident; however, the matter is not without practical significance because of the unavoidable uncertainty in the limits. A simple way of separating the scientific data from the enforcement process is to allow the stream standard to differ somewhat from the consolidated list of limits. This may be desirable, for instance, when the natural background levels of one or more parameters seem to warrant a somewhat less strict limit for the stream standard. This device could also be used to preserve a somewhat higher quality with respect to some parameters when other parameters force the classification down.

7. It is noted that considerable uncertainty is suggested by the prevailing use of the digits 1, 2 and 5 in the limits. This is at variance with expressions like 5.0 mg/l and 0.20 mg/l, which denote a far greater precision. The accuracy of the limits should either be properly implied or explicitly stated.

8. A minor point is the complicated and obscure mathematical

expression in the low flow criterion. From an explanatory note added in paranthesis, it would appear that the low flow criterion is to be defined as the flow below which the stream did not drop for 7 consecutive days or longer in more than ten percent of the total number of years on record. The proposed criterion, however, states something quite different. It says that the critical flow is exceeded by 90% of the 7 consecutive daily average flows on record for the critical month(s). There are in each year 359 different sequences of 7 days. Without the words "in the critical month(s)" there would in one year be, on the average, 35.9 such sequences, adding up to a period of about 30 days, in which the flow would be below the critical flow. With an unspecified number of critical months, the criterion becomes indeterminate. The attempt at mathematical precision is further frustrated by the fact that statistical estimates change each year when data become available. The definition of the critical flow is to a large degree arbitrary, but the intent is obviously that its magnitude must be fairly definite in each case. It would perhaps be better to remove all formal uncertainty by stating that the stream standard will not be applied to flows below a critical level to be determined by the Department as its estimate of the flow below which the stream flow will not remain for a week or more in 10% of the years.

9. The water quality criteria for designated uses should be officially accepted by the government so as to obtain a document that is more than a compilation of scientific opinion. The Environmental Management Division should be charged with the responsibility for periodic review and proper procedures should be worked out for making changes when these appear to be desirable. The procedures should entail (a) publication of the proposed revision, (b) availability of all pertinent data to all interested persons, (c) an opportunity for all interested persons to be heard prior to any decision, and (d) publication of all decisions made.



PART III

THE PROPOSED STREAM CLASSIFICATION

Chapter 1

The Function of Stream Classification in Pollution Control

Introduction

Stream classification is an administrative tool in water quality management. Although widely recognized as being rational and effective, it has by no means found universal acceptance. An investigation into the proposal, as requested by the Minister, must therefore include a brief appraisal of the function of stream classification in pollution control. Specifically, the appraisal must critically examine why stream classification should be preferred over other methods of maintaining water quality.

Stream classification aims at placing environmental control over surface waters on a more systematic basis. Much environmental control, including the control exercised by The Clean Environment Commission is ad hoc. This does not mean that decisions are arbitrary. Each decision involves not only the applicant but also the enforcement agency. Any interested party and even the public at large can have an input into the decision-making process and, if a decision is appealed, the Minister also becomes involved. Each decision thus sets a precedent so that over the years a standard of practice is developed which must stand up in actual experience with numerous operations. Nevertheless, in the absence of general policies, objectives and guidelines, it is difficult to do more than to curb local excesses.

As long as the environmental control requires nothing more than that, the ad hoc approach may be quite adequate. This is the case when, on the whole, the quality of the surface waters is satisfactory and sources of contamination are few and far between.

The situation changes when the contamination gets to the point where the combined effect of the pollutants interferes with the use or enjoyment of the waters even though each contaminant discharge by itself may not be unreasonable. Then there is a need for a more systematic approach to the question of what are acceptable limits.

There are two principal considerations in any decision on effluent limits. The first is the effect of the contamination on the quality of the water course and the use thereof. The second is the ability of the contaminator

to reduce the discharge of contaminants to the water course. The question of what are reasonable limits obviously hinges on these two considerations.

Two broad methodologies present themselves in the setting of limits. The first regards any discharge of contaminants into the environment as undesirable. The practice can not always be avoided but should be curbed to the fullest extent the operator is capable of. This methodology is, therefore, called the *best practicable technology approach*.

The second methodology regards the transport and ultimate disposal or deposition of waste products as a useful function of the natural environment which can co-exist with other uses. The function of environmental management is not to curb the discharge of waste as much as possible, but to see to it that the effect of the contamination is compatible with other uses the stream is put to. The emphasis is on the stream as a resource, the use of which is to be optimized. This methodology is, therefore, called the *best resource allocation approach*.

Stream classification is based on the latter methodology. As an administrative tool, it stands or falls with the merits of the best resource allocation approach as compared to those of the best practicable technology approach. The discussion of stream classification in this chapter is, therefore, put in the light of this comparison.

To avoid misunderstanding, two preliminary remarks must be made. In the first place, the best practicable technology approach does not require that discharges be reduced regardless of cost. But if it can be demonstrated that a reduction is within the practical means of an industry or operation, then the reduction must be achieved.

Secondly, with the best resource allocation approach, it is conceivable that the use of a river or lake for waste disposal receives a higher priority than its use for, say recreation and sport fishing. The question of what can practically be achieved in the way of reducing contamination is pertinent in the issue but only as part of the overall picture.

The two approaches will be compared from different points of view as indicated by the subtitles of the chapter. Conclusions regarding the overall suitability follow the comparison.

1. Degree of Environmental Protection Afforded

The best practicable technology approach is often defended because it seems to afford the highest degree of environmental protection that can practically be achieved. This is an important consideration since there is always uncertainty about the long term effects of releasing contaminants into the environment. This uncertainty may not be reflected in the balance of costs and benefits on which the best resource allocation approach is based. Consequently, it is possible that with the latter approach a degree of pollution is tolerated that could have been prevented and that is regretted at a later time.

In practice, this advantage of the best practicable technology approach is rather illusory for two main reasons.

In the first place, it should be realized that the best practicable technology approach actually gives priority to the requirements of the industry or operation for the use of the environment for waste disposal. There is no limitation on the development or on the expansion of any industrial operation in any location; all that is required is that the discharge of waste be kept to a practical minimum. Waste producers may thus gradually encroach on the quality of a stream and cause serious degradation. With the best resource allocation approach, it is possible to prevent an undesirable concentration of waste producers on a given stream. Sensitive streams or high quality streams can thus be given a degree of protection that is more stringent than with the best practicable technology approach. This protection may well take into account any uncertainty as to long term effects of the contaminants.

In the second place, the protection afforded by the best practicable technology approach is entirely dependent on the interpretation of the term "practicable".

Economic considerations play a large role in deciding what is practicable in pollution control. It is usually held that the highest degree of control actually achieved by the industry in any location represents best practicable technology for a given process. By requiring the entire industry to match this degree of control, a uniformly high standard would be obtained across the country. However, adopting this standard presumes a roughly equal position of the industry across the country with respect to the burden imposed

by the control. Generally, this presumption is only valid when the pollution control measures do not really hurt the industry. Otherwise, the impact of the pollution control requirements will usually hit the industry at one location harder than at another location. Thus, what is practicable in one area may be impracticable somewhere else. Moreover, in an international context, the required pollution control could conceivably affect the competitive position of an industry to the point that the question of what is practicable may have to be reviewed in that light. In that situation, it would certainly be desirable to take into account what the effect of relaxing the standards would be on the environment; and that would bring one back to the question of best resource allocation.

The best resource allocation approach may also fail to protect the environment for example, when pollution havens are allowed to develop for the sake of attracting industry or when streams are sacrificed for the sake of cheap waste disposal. Even then the best resource allocation approach has the advantage that all the cards are put on the table and that costs and benefits are made explicit. This allows at least a critical evaluation of what is meant by "best allocation".

2. Integration in Planning and Development

New methods of containing and recycling waste must continually be developed if progressive deterioration of the surface waters is to be prevented in the face of mounting pressures by population expansion and economic growth. It is, therefore, important that a method of pollution control is adopted which stimulates developments that reduce the conflict between growth and environmental quality. There are two aspects to this problem. In the first place, the industry or operation must be motivated towards reducing the pollution load. In the second place, the use of the surface waters must be regulated so as to minimize conflict.

Concerning the first aspect, the best practicable technology approach places the discharge standards under constant review and advantage is taken of all technological development as it becomes available for practical purposes. It is true that the industry will have little incentive for the development of new techniques for reducing the pollution load if the new control methods would

be more costly. Nevertheless, new processes are continually being developed and, when faced with the prospect of having to meet more stringent standards because of new developments, an industry will usually try hard to find economical ways of doing this. The constant review process inherent in the best practicable technology approach thus appears to be a definite advantage.

With the best resource allocation approach, there is little incentive towards developing better techniques as long as the constraints are not tight. This situation changes when (a) the stream classification requires industries and operation to clean up in order to meet the objectives, or (b) when the growth of industries and operations begins to encroach on the limits set in accordance with the water quality objectives.

With either approach, discharge limits will have to be changed periodically to meet changing conditions. Tightening up discharge limits because of possible overloading of a stream by additional polluters is bound to be unpopular with those who were there first. The same difficulties are encountered when more stringent standards are adopted because of technological development elsewhere.

Concerning the second aspect, regulating the use of the water resources so as to minimize the conflict between growth and environmental quality, the best resource allocation approach fits right in with regional planning. It also shares in all the difficulties of regional planning; the difficulty of setting rational and realistic planning objectives, the difficulty of weighing costs and benefits and arriving at proper priorities, the difficulty of trying to foresee future development. The way to resolve these difficulties is not to give up on planning, but to adopt a flexible approach which emphasizes the direction of the development rather than its final results.

3. Reasonableness and Equitability

A serious disadvantage of the best practicable technology approach is that a substantial cost may be involved in achieving the prescribed reduction without it being made clear that the benefits to the environment justify the cost. The waste producer thus feels that he is unreasonably made to pay for an abstract principle rather than for a worthwhile purpose.

The other side of the coin is that the imposition of uniform emission

and effluent standards prevents the occurrence of pollution havens where local industries receive a competitive advantage at the expense of the environment. For this reason, the best practicable technology approach is sometimes considered to be the more equitable. However, the argument is not very substantial. A great many factors determine the competitive position of an industry. There is no reason why a firm should be allowed to take advantage of, say its proximity to the markets and not of its proximity to streams with a low use classification or a high assimilative capacity.

The best resource allocation approach may in fact impose different standards on industries on the basis of their location. This is in itself neither unreasonable nor inequitable. However, it is easy to see how this principle can be abused.

4. Conclusions

It would appear from the foregoing comparison that both approaches can be made to work if there is a determination to make them work. The best resource allocation approach, however, has several basic advantages over the best practicable technology approach. They may be summarized as follows.

In the first place, the best resource allocation approach recognizes that the deposition of waste products in the environment is not necessarily incompatible with a high quality use and enjoyment of the natural resources.

In the second place, the approach aims at making the benefits as well as the costs of the waste disposal explicit.

In the third place, the approach ties in with regional development planning and thus provides a rational basis for decisions concerning discharge standards.

Two disadvantages were noted. Firstly, the uncertainty about the assimilative capacity of a stream or lake may be reason for reducing waste discharges to a practical minimum even if the adverse effects of less stringent limits cannot be demonstrated conclusively. In the second place, there is a danger of undue rigidity in any attempt at formulating a comprehensive plan for resource use.

These disadvantages can largely be overcome by adopting a flexible

approach which takes the uncertainty of the assimilative capacity of the environment and the uncertainty concerning future development into account. This may mean that in specific instances the discharge limits may be determined by best practicable technology, for example, where allowances for uncertainty must be made and the more stringent limits would not impose an undue hardship on the industry or operation. It also means that proper procedures must be worked out for changes in classification where this is desirable.

The Commission was very interested in the comments by the representative of the Ontario Ministry of the Environment in view of their tentative rejection of stream classification. The Commission notes that the present system of guidelines based on general water quality objectives is being reviewed precisely because it lacks specific implementation procedures. It remains to be seen if any other system that does not get down to classifying individual streams will prove to be more satisfactory.

Concerning the current Ontario proposals, tentatively outlined by the Ontario representative, the Commission notes that the overall objective is making all surface waters suitable for fishing and body contact water recreation. This is a very high objective; but the admission that it is a long term objective, which may not be reached for some streams in the foreseeable future, could well take the bite out of it and render it little more than a bland resolution to aim at high environmental quality. If that is the case, then the commitment towards specific improvements or towards maintaining quality in actual situations must be evident at a different level of decision making if it is there at all.

The Commission recognizes the problems inherent in stream classification and appreciates the danger of "getting locked into difficulties". However, limits set on actual operations on an ad hoc basis also affect the future use of a stream. It seems preferable to face the question of "best use" in the wider context of stream classification rather than case-by-case whenever an effluent limit must be set. It should be recognized that a classification can be changed if necessary and that target dates can be incorporated to achieve greater flexibility and to avoid unnecessary rigidity.

Chapter 2

The Implementation of Stream Standards

Introduction

The level of water quality corresponding to a given stream classification must be expressed in a stream standard which summarizes all the limits that must be met. The effectiveness of stream classification as a tool in water quality management therefore depends on how well such a stream standard can be implemented.

A number of administrative devices are available for this purpose. Some are in use in other jurisdictions, others have been strongly recommended in the pertinent literature by environmental economists.

In this chapter, the various implementation methods will be discussed briefly under successive subheadings. Following this, the method that appears best suited for the Manitoba situation will be recommended.

Direct Enforcement

To comply with the stream standard imposed by the classification of any stretch of river, waste producers must be required to keep the total waste load below the designated limits. It would be quite desirable if the enforcement could be related directly to this requirement so that a waste producer would be charged with a violation if, and only if, the stream standard was found to be exceeded. The waste producer could then plan his operations to take full advantage of the varying capacity of the stream as a recipient of the various waste products. This would enable him to minimize his cost and to concentrate on keeping the impact of waste production during the critical flow periods below the specified limits. Furthermore, the enforcing agency would not need to be involved in the technical aspects of the waste production; neither would there be occasion for concern about mixing zones or about the assimilative capacity of the stream. The only concern would be with the actual level of pollutants in the stream at designated locations.

Unfortunately, this ideal can seldom, if ever be attained. There are usually many waste producers on a stream. In the absence of effluent limits, the upstream polluters would be able to use the total carrying capacity of the

stream leaving the downstream dischargers with the choice of withholding all of their pollution load or violating the stream standard. Moreover, a program that would monitor the concentrations of a long list of contaminants in a variable stream would be extremely costly and cumbersome if it had to be adequate for the purpose of legal enforcement.

The implementation of stream standards can be achieved only by means of effluent limits. The proper role of a stream standard is to serve as a guide by which appropriate effluent limits can be set.

Orders

Effluent limits can be set on a case-by-case basis by order of The Clean Environment Commission, as is the current practice. Little needs to be said about this procedure since it is at the present time the normal way in which environmental control is exercised over many different categories of operations in this Province. The adoption of stream standards would make a difference since the adopted standard would presumably represent declared government policy. The Commission would thus be obliged to set the effluent limits in the order with a view to meeting the stream standard.

It will be evident that a considerable amount of judgement is needed to translate a stream standard into effluent limits. There may be a variety of waste producers with different patterns of waste discharge during the year. There is a continual change in flow, in background levels of contaminants and in assimilative capacity of the stream. Future developments must also be provided for. It would, therefore, be a source of confusion if the stream standard were regarded as more than a guide for the Commission if it were given an independent status that would allow a number of competing interpretations to gain recognition in court and appeal procedures. There is also no need for this, since only experience will tell whether the stream standards are being met with the effluent limits imposed in the orders.

The order system has the advantage of flexibility. Each case is considered on its merits in proceedings which involve the waste producer, the enforcing agency, the parties at interest and the public at large. Stream standards would be a desirable complement to the present system since the Commission has no jurisdiction in deciding on the best use of surface waters or

any other natural resource. Yet, its decisions may influence this use to a marked degree either by fixing the status quo or by changing it.

A disadvantage of the order system is that each case requires a separate investigation which may be time consuming and cumbersome. Experience has shown this drawback to be far less serious than may appear at first glance. It has been found that patterns develop which allow similar cases to be handled quite expeditiously. When dissimilarities require more time, experience shows that the extra time is usually well spent on achieving a solution that matches the situation.

Permits

A permit system differs from the order system in that it is concerned only with the waste load each producer is allowed to discharge in any given time period, and not with any other condition aimed at controlling the waste discharge.

An interesting feature of the permit system is that, once established, it conceivably could become self-regulating by making permits transferable through purchase and sale on the market. Firms wishing to establish themselves or wishing to expand their operations would have to purchase portions of permits from other waste producers. The demand for waste permits would thus encourage waste producers to try reducing their discharge so as to be able to sell part of their permit. Economic expansion would thus be accompanied by a voluntary effort to adopt improved waste treatment practices. In addition, any industry or operation would have the assurance that it would not have to meet more stringent pollution control requirements in the future unless it chose to do so by selling part of its permits. Implementation of the stream standard would thus be an almost automatic process that would require only periodic checks to ensure that permits would not be violated.

The permit system has been mentioned favourably in publications by economists, but the Commission is not aware of it having been tried anywhere for pollution control. Its success would depend entirely on how well the market in permits would function. This could well leave much to be desired. Moreover, the initial distribution of the permits would very much favour existing operations and industries unless the government would sell the permits from the

onset. This would raise a host of problems. With additional development, there would be pressure for additional permits. All in all, there is room for considerable doubt as to the desirability of this system in Manitoba.

Effluent Charges

Effluent charges are frequently being advocated by economists and others as a means of promoting responsible and efficient action by waste producers to keep waste discharges to a minimum.

It is not uncommon to levy effluent charges when waste producers make use of common waste treatment and water supply facilities. The charges are then based on the cost of treating a particular waste discharge to the required standard. Effluent charges have been an outstanding success in the pollution control of the industrial Ruhr area in West Germany.

When wastes are discharged directly into a river, and no further treatment occurs, then effluent charges can be used either to compensate for damage and deterioration or for the purpose of deterring avoidable waste discharges.

Compensation is obviously very difficult, if not impossible, to achieve since it requires expressing the damage or deterioration in monetary terms. In addition, it is also practically impossible to single out the persons who actually suffer the damage so that inequities and distortions inevitably arise.

Deterring avoidable waste discharges by means of effluent charges requires stream standards so that one can determine the level of waste reduction one should aim for. In theory, it should be possible to set the effluent charges at a level which makes it more profitable for the waste producer to comply with the standard than to violate it. The principal advantages of the system would be the following.

In the first place, there would be a continuing incentive motivating the waste producer to search for economical means of reducing the discharge of waste since the cost of downstream pollution would be internalized.

In the second place, the system would allow waste producers more freedom in planning their own operations. Operations that would require costly installations to reduce their waste discharge would opt for paying the charges

while operations that could more economically achieve a reduction would do so. Economically speaking, the system would, therefore, be more efficient than a direct regulatory system. The waste producers would, together, strive towards a least cost-solution while the regulatory agency could determine the overall pollution load by setting the effluent charges high enough.

There are also serious disadvantages to this system, apart from its obvious unpopularity with the waste producers.

Firstly, it is extremely difficult to set the charges at the right level for all different forms of pollution. Charges that are set too high cause unnecessary hardship and will perhaps impede necessary development. Charges that are set too low become ineffective and will amount to the cost of a licence to pollute.

Secondly, the desirability of having an industry in a given location is not merely measured by its waste production. Effluent charges, set high enough to deter one firm from unnecessary waste discharge, could well drive another firm with a lower margin of profitability out of business. This may not matter from the single viewpoint of maintaining the stream standard, but within a wider context the result could be wholly unacceptable.

Thirdly, the revenue that would become available to the government is bound to distort the picture. It is difficult to see how the government could avoid the accusation of collecting money at the expense of the environment.

Fourthly, different effluent charges would have to be set for different rivers to obtain a deterrent against an undesirable concentration of polluters in one area. This would make an already complicated matter even more difficult.

In the balance, it seems quite doubtful that effluent charges would be a desirable means of implementing the stream standard in Manitoba.

Positive Incentives

Large expenditures may be required to improve the quality of a stream or a lake to the level deemed to be in the public interest. This is true regardless of the approach taken to the control of environmental quality. However, the establishment and implementation of a stream standard may run into more forceful opposition than the case by case approach simply because it

affects more polluters at the same time. Political considerations may then force a modification of the proposed stream classification. Moreover, a high standard could well mean undue hardship to some municipalities or drive some industries out of business. In such a situation, it may be in the public interest to reduce the opposition by instituting incentive or assistance programs that are aimed at facilitating the implementation of a high stream standard. Positive incentives may be in the form of tax breaks, loans or grants. Many examples of positive incentive programs can be found here and in other jurisdictions.

Across the board incentives, such as tax breaks, are relatively blunt tools that may produce the wrong results if they are effective at all. For example, tax reductions on pollution control equipment could conceivably make waste production with subsequent treatment more advantageous to a firm than process changes aimed at reducing the production of waste.

Loans and grants for specific undertakings would likely be more effective and more efficient as well.

Little can be said in general about the desirability of positive incentives except to note that the question of financial implications of a stream classification, for the waste producers as well as for the community at large, must be faced at the time when the classification is decided.

Conclusions

On the basis of the foregoing discussion, there seems to be little doubt that the implementation of stream standards can best be achieved in Manitoba through orders from The Clean Environment Commission, supplemented by regulations that cover operations that do not require individual attention. The environmental legislation is geared towards this approach and no new legislation would be required. Any of the other methods of implementation would be far more difficult to fit into the existing system. Moreover, they do not seem to offer any substantial advantages over the system of orders.

Stream classification would in fact provide a valuable complement to the regulatory task of The Clean Environment Commission, which is simply to set limits for existing and proposed operations. The Commission has no authority to regulate the use made of surface waters, either directly or indirectly and it is

not up to the Commission to decide that waters should, or should not, be made fit for sport fishing and body contact water recreation. Under the present circumstances, the Commission must let itself be guided to a large extent by existing uses and it would probably exceed its jurisdiction if it were to use its limit-setting authority for the purpose of achieving new use-related water quality objectives. That situation would no longer exist if such objectives were incorporated in stream classifications that could be regarded as declared government policy.

Chapter 3

Procedures for the Classification of Streams

At the hearings, several persons stressed the importance of proper procedures in arriving at stream classifications. They pointed out that the desired improvement in water quality or the effort needed to prevent further deterioration would require the co-operation of many people with diverse interests. The classification would therefore need broad public support to be successful.

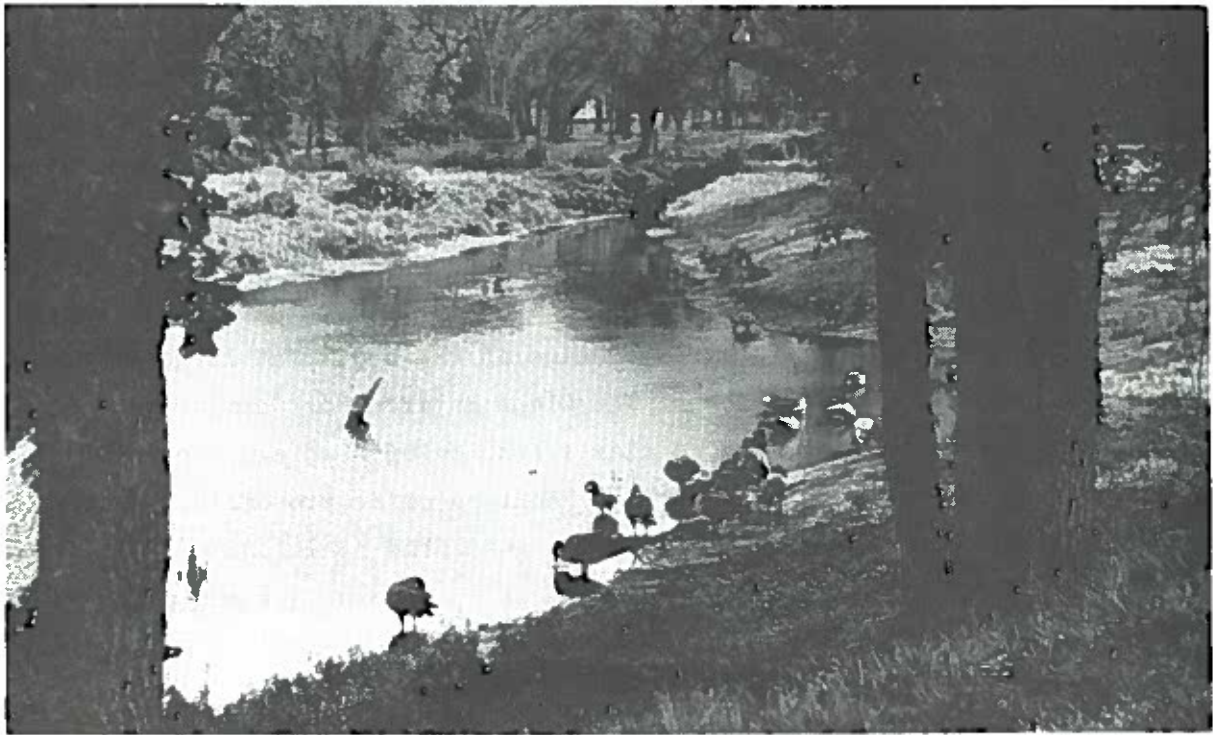
An essential part of the classification procedures is consultation with all interested parties since deciding on the best use of a stream is a matter of judgement for which few objective criteria are available. Moreover, costs as well as benefits that are associated with the classification decision can be both substantial and very unequally distributed. An equitable decision must, therefore, be based on as broad a picture as can be obtained.

The classification of any stream represents government policy for that stream. The classification decision is, therefore, one for which the elected government must assume final responsibility. Thus, the classification should be officially adopted by formal adoption procedures. In other jurisdictions, for example in North Dakota and Minnesota, stream standards have been made into binding regulations which have the force and effect of law. This route could conceivably be followed in Manitoba since The Clean Environment Act provides for the Lieutenant-Governor-in-Council to make regulations respecting the limits of contaminants in the environment [Section 18(k) Clean Environment Act].

It should be kept in mind that the legal systems in Canada and the United States are somewhat different so that the legal effect of such a regulation may be different. In fact, it is difficult to determine precisely what the effect of such a regulation in Manitoba would be. It could not be enforced directly since it would not impose on anyone the obligation to do or not to do something that could be clearly spelled out. Presumably, it would bind the Commission in that it would be a violation to issue an order that would cause the limits set out in the stream classification to be exceeded. If the appeal would be made to a court, then this would be a very laborious way of challenging a Clean Environment Commission order. It is difficult enough to



Commercial Fishing, Lake Winnipeg, Manitoba



Waterfowl, Souris, Manitoba

prove that a waste producer has actually caused an ambient limit to be exceeded. To prove that an effluent limit has this effect is much more difficult and requires data that are generally not available except perhaps to the enforcing and monitoring agency.

If the appeal was to be made to the Minister, then there is no need to have the stream standard incorporated in a regulation. In that case, it would be quite sufficient to produce a plausible argument that the stated government policy for the stream was likely to be violated by the contested order.

Stream classification should reflect more than departmental policy for several departments of government have a close interest in the terms of the classification and are involved in its implementation. Perhaps stream classification could be best identified as government policy if it were established by Order-in-Council.

The emphasis on resource use demands that classification proposals reflect the views of all departments involved in the implementation and its possible consequences. This does not mean that the departments must first reach agreement before a proposal is made public. On the contrary, a unified approach would convey the impression that the real decision has already been made and that the input of interested parties and the general public is pro forma only. Initial consultation between the departments and public agencies is necessary to present a complete picture and to clarify the real issues. But, if consultation with parties at interest is to be meaningful, then the conflicts evoked by the classification must be articulated and not suppressed.

The public input in the classification decision is of vital importance. The Clean Environment Act is unique in Canada's environmental legislation in that it gives all interested parties, including the public at large, the right to be heard prior to any decision of The Clean Environment Commission. It is in keeping with this principle that no classification of a stream should be undertaken without prior public hearings about specific proposals. Once established, the stream classification will guide the decisions of The Clean Environment Commission. The classification is therefore part and parcel of the environmental decisions about which the Act says that the public has a right to be heard.

Several persons at the hearings emphasized the need for public

hearings in connection with the classification procedure and expressed strong preference that these hearings be held by The Clean Environment Commission under The Clean Environment Act.

The classification of all streams in Manitoba is a big task. There are 19 natural water basins in the Province, each requiring a separate, detailed study. Fortunately, there is not the same degree of urgency for all 19 basins. Many are not to any degree stressed by use at the present time. These could easily wait till the time and resources for classification become available. The Environmental Management Division has quite sensibly suggested that a beginning be made by classification of the Red River basin, followed by that of the Assiniboine River and perhaps the Saskatchewan River. This would encompass the greater part of the present problem areas as well as many of the foreseeable future.

The proper point of departure in any classification effort is undoubtedly the present quality and pattern of use of the stream. It has been suggested that this point be recognized by insisting that the stream under consideration be classified in accordance with present quality and that the questions and proposals at the hearings be directed towards the need and the cost of a departure from the present classification. This would make the formal procedures for the establishment of a stream classification the same as those for changing it, should this be desired because of new developments. There is some merit in this suggestion, for any classification proposal should include a careful and realistic appraisal of how the necessary changes in water quality limits can be implemented. There is no point in establishing an objective if there is no agreed upon plan of achieving it. The suggestion thus means that, unless there is a firm commitment to change, the present use will set the stream classification.

Any changes in the pattern of use, imposed by a stream classification, require time. There are two possibilities of dealing with the time question. The first is to include time limits in the classification decision. The other is to leave it to The Clean Environment Commission to determine in each individual case the time constraints to be imposed on the waste producers. Each option has its problems. Leaving the classification decision entirely without a time frame entails the danger that the objective becomes a mere wish rather

than a realistic target. On the other hand, it is difficult to set a definite date for the implementation without a detailed analysis of schedules and how they are to be met. It is significant that the most frequent reason for variations of Commission orders has been requests for changes in implementation dates. This shows the difficulty of setting realistic implementation dates for pollution control programs. A possible compromise is to include in the classification decision a target date which then becomes a goal towards which the Commission works when setting binding orders.

On the basis of the foregoing considerations, the Commission would envision the following steps in the implementation procedure.

1. A fact-finding study is headed by the Environmental Management Division and carried out in co-operation with other departments and branches of government including authorities in neighbouring Provinces and States when the study concerns international or interprovincial streams. Its purpose is to determine the present state of the river. The study should reveal:

- (a) the water regime of the river;
- (b) natural background levels of any contaminant and any condition relating to the water quality;
- (c) sources of pollution and deterioration;
- (d) pollution levels and loads;
- (e) present classification.

2. A fact-finding study is jointly undertaken by departments and authorities involved in the use of the water resource. Its purpose is to establish present and possible future uses of the river. The study should reveal:

- (a) the present use made of the river together with data demonstrating importance, limiting conditions, and any problems relating to water quality;
- (b) the potential use of the river, together with an analysis of demand, time constraints, limiting conditions and relationships to water quality;
- (c) benefits to be gained from better water quality.

3. A tentative classification proposal or proposals, supported by one or more departments of government, is submitted to The Clean Environment

Commission. In the event that the proposal or proposals require or permit a change from the present water quality, or in the event that a reclassification is proposed, the proposal or proposals must include:

- (a) an outline of the quality changes required;
- (b) a discussion of the uses that will be made possible by the proposed changes and the benefits thereof;
- (c) a list of the measures that would be needed to bring the quality changes about and a discussion of their feasibility;
- (d) a discussion of the cost of the necessary reduction in the level of contamination and of the means of financing this;
- (e) an indication of the time needed to accomplish the required quality changes.

4. The Clean Environment Commission then sets a date for a public hearing and makes the reports on the studies, referred to above, available to all interested parties. The announcement would carry an invitation to submit reasoned counter proposals if desired.

5. The public hearing is held and all interested parties are heard.

6. The Clean Environment Commission prepares a report on the hearing for the Minister.

7. The Environmental Management Division, in co-operation with other departments of government, then submits a firm proposal for the stream classification taking into account all information received by the Commission at the public hearing or in connection with it.

8. If necessary, a second public hearing is held by The Clean Environment Commission, this time on the firm proposal received from the Environmental Management Division. The need for the hearing would depend on the changes made in the original proposal and on the question whether all interested parties had the opportunity to voice their comments on the substance of the latest proposal.

9. The Clean Environment Commission then submits its recommendations to the Minister.

10. The government then decides on the stream classification and the accompanying stream standard with the necessary target dates and any measures or programs it deems necessary to ensure or facilitate the implementation. The

classification and stream standard are set by Order-in-Council.

11. The Environmental Management Division institutes a review of existing orders to determine any changes necessary because of the classification decision.

12. Existing orders are revised and new orders issued in accordance with established procedures in The Clean Environment Act.

13. The Environmental Management Division institutes a program for monitoring stream quality aimed at verifying whether or not the water quality specified in the stream standard is achieved.

14. The Environmental Management Division also instigates, in co-operation with other departments of government, a program for the assembly of available data on the use of the stream as related to the quality of the water, with a view establishing a closer relationship between the quality of the water and its usefulness for whatever purposes it is used.

15. The Environmental Management Division may at any time propose a change in stream classification or in stream standard. Such proposals are to be dealt with in accordance with all the steps outlined above.

16. The Clean Environment Commission shall take cognizance of the established stream classifications and stream standards as representing government policy with regard to the environmental management of the waters. The Commission shall use its own judgement in the implementation of the stream standard by means of orders issued under The Clean Environment Act.

**LETTER FROM THE
MINISTER OF
MINES, RESOURCES AND ENVIRONMENTAL MANAGEMENT**



MANITOBA

MINISTER
MINES, RESOURCES AND ENVIRONMENTAL MANAGEMENT
WINNIPEG
R3C 0V8

77 01 21.

Mr. G. E. Moore,
Chairman,
Clean Environment Commission,
Box 4, 139 Tuxedo Avenue,
Winnipeg, Manitoba.
R3C 0V8

Dear Mr. Moore:

Environmental Management has developed a set of proposed stream classifications and water quality criteria to serve as basic targets for a water quality management program for Manitoba's nineteen watershed basins. I believe it to be important that we have a set of water quality targets (objectives) which, to the best practicable degree, would reflect a commitment to and point the way towards restoration, maintenance and enhancement of the chemical, physical and biological quality of the Province's waters. These proposals are being circulated to all Government Departments, Municipal Corporations and other interested parties.

It is now necessary to apply such criteria to the individual watershed basins and classify the watercourses involved. This will require close scrutiny of each river and possibly individual sections of each river.

Towards this end, I am requesting the Clean Environment Commission to investigate the proposal, to hold public hearings on the proposal and to provide me with reports and recommendations on both the proposed water quality criteria and stream classifications. A copy is attached.

I suggest that the Commission place emphasis upon:

1. ensuring that public hearings provide all interested parties an opportunity to present, in public, their comments and suggestions, and

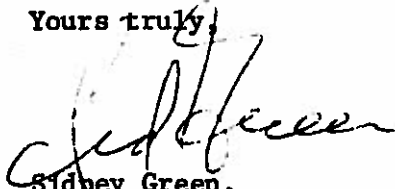
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Mr. G. E. Moore.

2. ensuring that the proposed water quality criteria and stream classifications are critically discussed and that the concerns and interests of users and the public are considered.

You may be assured of the co-operation of my Department.

Yours truly,



Sidney Green,
Minister.



ADVERTISEMENT
OF
COMMISSION HEARING

May 28, 1977

MANIT^BBA
THE CLEAN ENVIRONMENT COMMISSION
NOTICE OF PUBLIC HEARING
SURFACE WATER QUALITY OBJECTIVES

Notice is hereby given that pursuant to the provisions of The Clean Environment Act, a public hearing concerning objectives of surface water quality in the Province of Manitoba will be held on Monday and Tuesday June 27 and 28, 1977, at 10:00 a.m. in the Large Board Room of Building No. 2 in the Fort Osborne Complex at 139 Tuxedo Avenue, Winnipeg.

Representations are invited from the public and from municipalities, organizations, associations, companies and institutions on the proposed objectives for water quality. Representations should relate to the Province as a whole. Later hearings will deal with the application of water quality objectives to individual water basins and watersheds in various parts of Manitoba.

Copies of the Proposed Interim Objectives of Surface Water Quality under consideration by the Commission are available on request. These objectives may be officially adopted in future as the basic means of prescribing standards for the quality of surface water intended for drinking, recreation, agriculture, fisheries and industry throughout the Province.

Any person wishing to make a representation before the Commission or proposing to submit a written representation to the Commission is requested to so advise the Commission at Box 4, 139 Tuxedo Avenue, Winnipeg, R3N 0H6 in writing or by telephoning 489-4511 Local 192.

**LIST
OF
SUBMISSIONS**

MANITOBA WATER QUALITY OBJECTIVES

LIST OF SUBMISSIONS

1. Proposed Interim Objectives of Surface Water Quality.
Appendix A - Data sheet - Manitoba Interim Water Quality Objectives.
Appendix B - Mr. W. M. Ward statement covering introduction of surface water quality and attachment - Stream Classification List.
2. Petroleum Association for Conservation of the Canadian Environment representation.
3. Department of Agriculture representation.
Appendix A - Redrafted proposed water quality objectives.
Appendix B - Additional points from the Department of Agriculture.
4. City of Winnipeg brief.
Appendix A - Effluent chlorination in the City of Winnipeg, March, 1976.
5. Town of Selkirk representation.
6. The Manitoba Water Services Board representation.
7. Province of Ontario, Ministry of the Environment, comments on the Proposed Objectives of Surface Water Quality.
8. INCO brief with Appendices, letter dated June 14, 1977.
9. Submission to Surface Water Quality Objectives Hearing, Mr. C. D. Hughes, City Engineer, City of Brandon.
10. Manitoba Hydro brief by James F. MacLaren Ltd.
11. Brief by W. L. Wardrop & Associates Ltd., Mr. G. E. Thompson, P. Eng.,
Appendix A - Supporting document.
12. Province of Saskatchewan, Department of the Environment, letter.

13. Department of Health, North Dakota, letter of June 21, 1977.
Appendix A - Standards of Water Quality for State of North Dakota.
14. Representation of J. T. Moenig of the Environmental Control Branch of the Manitoba Department of Mines, Resources and Environmental Management on Eutrophication.
15. Manitoba Environmental Council, Forum, Manitoba Water Quality Objectives, May 5, 1977, Transcript of Proceedings.
16. "Pollution Control in Manitoba" by L. A. Kay, Pollution Control Policy of the Provincial Sanitary Control Commission, Manitoba, November, 1953.
17. Alberta Surface Water Quality Objectives, January, 1977.
18. Prairie Provinces Water Board Water Quality Objectives, March, 1973.
19. Saskatchewan Water Quality Objectives, January, 1975.
20. Map of Drainage Basins (Watersheds) in Manitoba.
21. Submission of Dr. Dennis B. Schulte, P. Eng., University of Manitoba, Department of Agricultural Engineering, June 24, 1977.
22. Submission by The Winnipeg Chamber of Commerce, July 12, 1977.
23. Submission of Parkland Water Utilization Study, Parkland Regional Development Inc., July 5, 1977.
24. Submission of the Minnesota Pollution Control Agency, August 16, 1977.
25. Department of the Environment, Province of Saskatchewan, letters dated August 23 and September 9, 1977.
26. Letter from N. H. James, Acting Director General, Inland Waters Directorate, Environment Canada to Dr. W. George Bowen, Assistant Deputy Minister, Environmental Management Division, September 1, 1977.

27. "Comments and Suggested Amendments . . .", G. H. Lawler, Chairman,
Western and Northern Regional Board, Fisheries and Environment Canada,
October 12, 1977.

PROVISIONAL

OBJECTIVES OF SURFACE WATER QUALITY

Province of Manitoba

CONTENTS

	Page
I. Introduction	iii
II. Water Quality for Designated Uses for Intra-Provincial Waters	vii
III. Methodologies	xxiv
IV. Definitions	xxv
V. Bibliography	xxvi

Annex 1 General Water Quality Objectives

Annex 2 Summary Table - Manitoba Water Quality Objectives

Annex 3 Stream Classification List

Annex 4 Classification Table - Manitoba Water Quality Objectives

OBJECTIVES OF SURFACE WATER QUALITY

Province of Manitoba

I. INTRODUCTION

- (a) This document sets forth water quality objectives for designated water uses, and outlines a format for the development of water quality objectives for specific intra-provincial surface waters of Manitoba.

The objectives described in this report are proposed to protect the interests of the people of Manitoba. These interests include ensuring continued public health and public enjoyment of Provincial waters; the propagation and protection of fish and wildlife; and the economic, industrial and social development of the Province.

Water quality objectives are goals to be achieved, not standards or requirements to be enforced. Water quality objectives provide a tool, to be used in conjunction with pollution control mechanisms, in comprehensive water management.

This document therefore:

1. establishes water quality objectives for designated water uses;
2. outlines a format for establishing water quality objectives for specific water management areas.

(b) Water Quality Objectives for Designated Water Uses

For each use of water there are certain scientific requirements related to water quality which are essential to support the designated water use. These water quality characteristics constitute the water quality objectives for the designated use.

Water quality objectives are defined quantitatively, where possible, and descriptively, on the basis of best scientific information available. It is emphasized that water quality objectives should be under continual review. Many elements/materials not currently included in the objectives may be included at a later date on the basis of new scientific knowledge. Similarly, existing objectives will be amended if a change is warranted by additional information.

In this report, water quality objectives will be defined for the following designated water uses:

1. Domestic Consumption
2. Fisheries and Recreation
3. Industrial Consumption
4. Agriculture and Wildlife

- I. (b) 5. Navigation and Waste Disposal
6. Other Uses

(c) General Water Quality Objectives

Towards achieving the greatest social and economic benefit, certain water quality objectives applying to all Manitoba surface waters have been set forth. These general objectives are outlined in Annex 1 of this document.

(d) Application of Water Quality 'Use' Objectives

The Province of Manitoba is committed to the establishment of water quality objectives for all Manitoba surface waters. Water quality objectives for specific water management areas are derived via the following steps:

1. Identification of desired water uses, present and future, for the water management area. The choice of water uses incorporates environmental, social and economic considerations. Past, prevailing and potential water quality should be considered in determining desired uses. On the basis of inferior water quality due to natural causes, certain water uses may not be feasible.
2. By integrating the water quality objectives for all the chosen water uses, identify the water quality (by parameter) that will ensure protection of all the water uses. This water quality is the specific water quality objective for the water management area under consideration.
3. Non-Degradation
If in the identification of desired water uses a watercourse has an existing quality superior to any specific use and it is proposed to designate it as a "wild river" or "ecological reserve" or an outstanding natural resource, or for some special purpose, those waters will be subject to a non-degradation objective. The objective for such waters will be to maintain the existing high quality.
4. Mixing Zone Policy
Means for expediting mixing and dispersion of sewage, industrial waste, or other waste effluents in the receiving waters, are to be provided, as far as practicable, by the agency having jurisdiction to maintain the quality of the receiving waters in accordance with applicable objectives. A mixing Zone is an area around a point source which is exempted from the water quality objectives. Mixing zones shall be established on an individual basis with primary consideration being given to the following guidelines:

I. (d) 4. (i) Point Source into Lakes and/or Marine Waters

The mixing zone shall extend up to 300 feet horizontally in all directions and from the bed of the receiving waters to the surface, but shall not exceed 25% of the width of the body of water at the point source.

(ii) Point Source into Water Courses -

The mixing zone shall extend from the bed of the receiving waters to the surface and up to 300 feet downstream of the receiving waters, but shall not exceed 25% of the width of the water course at the point source.

(iii) Multiple Point Sources -

In this case, each point source is considered by itself and for each point source, a mixing zone shall be defined as above.

5. Nutrients Policy

As a parameter, nutrients relate only indirectly to water quality. The relationship of these parameters (Phosphorus and Nitrogen) to water quality is primarily in terms of aquatic plant growth, particularly algae, that is produced or promoted by the nutrients. As a result of this indirect relationship, the complex biological processes involved in the conversion of nutrients to plant material and the many other conditions affecting these processes, it is impossible to establish a specific water quality standard for nutrients which will directly relate to preventing undesirable plant growth.

Since certain species of algae are able to fix atmospheric nitrogen, the control of nitrogen inputs to lakes is not practical, and phosphorus becomes the nutrient of greatest concern. It has been well-documented that the phosphorus content of a lake is generally closely related to the amount of algal growth and the transparency. Although phosphorus is not always the limiting nutrient, especially in lakes receiving sewage effluent, it is the only controllable one.

The acceptable state of lakes or reservoirs for phosphorus, aquatic plant growth or transparency is difficult to define, even for individual waters. In general, it is not feasible or practical to set this type of water quality standard for lakes and reservoirs or even groups of lakes. The need, therefore, with respect to phosphorus is in effluent limitations and non-point source controls to prevent material increases in phosphorus and algal growth.

The water quality goal shall be to limit aquatic plant growth and phosphorus levels in lakes and impoundments to the amount present under natural conditions. Since natural conditions are very difficult, if not impossible to define, the practical goal shall

- I. (d) 5. be that all lakes and impoundments and, where applicable, portions of rivers shall be protected from becoming more eutrophic. The present trophic status of all lakes and impoundments shall be improved to the maximum extent possible. These objectives shall be accomplished by limiting phosphorus inputs to lakes and impoundments from all point and non-point sources to the maximum extent possible.

6. Minimum Flows

For practical purposes in the application of these objectives, they should be maintained at all stream flows which are equal to or exceeded by 90% of the seven consecutive daily average flows of record (the lowest weekly flow with a once-in-ten-year recurrence interval) for the critical month(s). The period of record for determining the specific flow for the stated recurrence interval, where records are available, shall include at least the most recent ten years of record, including flow records obtained after establishment of flow regulation devices, if any. Such calculations shall not be applied to lakes and their embayments which have no comparable flow recurrence interval. Where stream flow records are not available, the flow may be estimated on the basis of available information on the watershed characteristics, precipitation, runoff and other relevant data.

II. WATER QUALITY OBJECTIVES FOR DESIGNATED USES OF INTRA-PROVINCIAL WATERS

Water quality objectives for specific uses represent attempts to quantify water quality in terms of the limits required to support the various beneficial uses of water.

The following objectives shall prescribe the qualities or properties of the intra-provincial waters of the province which are necessary for the designated public use or benefit and which, if the limiting conditions given are exceeded, shall be considered indicative of a polluted condition which is actually or potentially deleterious, harmful, detrimental or injurious with respect to such designated areas or established uses of the intra-provincial waters.

These water quality objectives for specific uses are meant as guidelines to be used in conjunction with a thorough knowledge of local conditions. There is a continuing need to refine these objectives and to establish new ones as additional field information and research results become available.

1. DOMESTIC CONSUMPTION

In respect to all classes in this use category, in addition to the objectives listed below, no sewage, industrial waste or other wastes, treated or untreated, shall be discharged into or permitted by any person to gain access to any waters classified for domestic consumption so as to cause any material undesirable increase in the taste, hardness, temperature, toxicity, corrosiveness or nutrient content, or in any other manner to impair the natural quality or value of the waters for use as a source of drinking water.

For all classes of Domestic Consumption, pesticides shall not be detectable by an acceptable method of analysis approved by the Environmental Control Branch except as listed in Table "1".

Class 1A

The quality of this class of the waters of the province shall be such that without treatment of any kind, except as may be required under the Public Health Act, the raw waters will meet in all respects the acceptable limits of the Canadian Drinking Water Standards and Objectives 1968, and any revisions, amendments or supplements thereto. This objective will ordinarily be restricted to waters with a high degree of natural protection. The basic requirements are given below.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Arsenic (As)	0.01 milligram per litre
Barium (Ba)	1 milligram per liter
Boron (B)	5.0 milligrams per liter

II. 1. <u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Cadmium (Cd)	0.01 milligrams per liter
Chlorides (Cl)	250 milligrams per litre
Chromium (as Cr + 6)	0.05 milligrams per liter
Color value	15
Copper (Cu)	1 milligram per liter
Cyanides (CN)	0.01 milligram per liter
Faecal Coliform Organisms	Absent
Fluorides (F)	1.2 milligrams per liter
Iron (Fe)	0.3 milligrams per liter
Lead (Pb)	0.05 milligrams per liter
Manganese (Mn)	0.05 milligrams per liter
Mercury (Hg)	0.002 milligrams per liter
Methylene blue active substance (MBAS)	0.5 milligrams per liter
Nitrate + Nitrite (N)	10 milligrams per liter
pH	5.0 - 9.0
Phenol	0.001 milligram per liter
Radioactive material	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Selenium (Se)	0.01 milligram per liter
Silver (Ag)	0.05 milligrams per liter
Sulfates (SO ₄)	250 milligrams per liter
Threshold odour number	4
Total Coliform Organisms	At least 90% of the samples in any consecutive 30 day period should be "negative". None of the samples "positive" should have an MPN index greater than 10 per 100 ml. or an MF count greater than 6 per 200 ml. or 15 per 500 ml. portions.

II.	1.	<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
		Total dissolved solids (filterable residue)	500 milligrams per liter
		Turbidity value	5
		Zinc (Zn)	5 milligrams per liter

TABLE "1"
Water Quality Objectives for Pesticides in
Public Water Supply, Livestock Watering and Water Contact Recreation
[Concentration in Whole (Unfiltered) Water]

Pesticide	Type	Not to Exceed Limit - µg/l
Aldrin	D	1.0
Chlordane	D	3.0
2,4-D	A	100.
Diazinon	B	I.I.*
Dichlorvos	B	I.I.
Dieldrin	D	1.0
Dimethoate	B	I.I.
DDT	D	42.
Endrin	D	0.2
Ethion	B	I.I.
Heptachlor	D	0.1
Heptachlor Epoxide	D	0.1
Lindane	D	4.0
Methoxychlor	D	100.
Methyl Parathion	B	I.I.
Monocrotophos	B	I.I.
Parathion	B	I.I.
Toxaphene	D	5.0
2, 4, 5-TP	A	10.0
All organophosphates and carbamates, total	B,C	100.

Type - A - Herbicides
B - Organophosphates
C - Carbamates
D - Organochlorines

* Note: Insufficient Information (I.I.)
Due to a general lack of data, scientifically
defensible objectives cannot be set at the time.

II. 1. Class 1B

The quality of this class of the waters of the province shall be such that with approved disinfection, such as simple chlorination or its equivalent, the treated water will meet in all respects the acceptable limits of the Canadian Drinking Water Standards and Objectives 1968, for drinking water, and any revisions, amendments or supplements thereto. This objective will ordinarily be restricted to waters with a moderately high degree of natural protection. The physical and chemical objectives quoted above for Class 1A intra-provincial waters shall also apply to these waters in the untreated state, except as listed below.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Faecal Coliform Organisms	At least 95% of the samples in any consecutive 30 day period should have a faecal coliform density of less than 10 MPN per 100 ml.
Total Coliform Organisms	At least 95% of the samples in any consecutive 30 day period should have a total coliform density of less than 100 MPN per 100 ml.

Class 1C

The quality of this class of the waters of the province shall be such that with treatment consisting of coagulation, sedimentation, filtration, softening, storage and chlorination, or other equivalent treatment processes, the treated water will meet in all respects the acceptable limits of the Canadian Drinking Water Standards and Objectives 1968 for drinking water, and any revisions, amendments or supplements thereto. This objective will ordinarily be restricted to waters not considered to afford adequate protection against contamination from surface or other sources of pollution. The physical and chemical objectives quoted above for Class 1A waters shall also apply to these waters in the untreated state, except as listed below.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Faecal Coliform Organisms	At least 90% of the samples in any consecutive 30 day period should have a faecal coliform density of less than 100 MPN per 100 ml.
Total Coliform Organisms	At least 90% of the samples in any consecutive 30 day period should have a total coliform density of less than 1000 MPN per 100 ml.

II. 1. <u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Total dissolved solids	1000 milligrams per liter
Turbidity value	25

Class 1D

The quality of this class of the waters of the province shall be such that after treatment consisting of coagulation, sedimentation, filtration, storage and chlorination, plus additional pre, post, or intermediate stages of treatment, or other equivalent treatment processes, the treated water will meet in all respects the acceptable limits of the Canadian Drinking Water Standards and Objectives 1968 for drinking water, and any revisions, amendments or supplements thereto. The concentrations or ranges given below shall not be exceeded in the raw waters before treatment.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Arsenic (As)	0.05 milligrams per liter
Barium (Ba)	1 milligram per liter
Cadmium (Cd)	0.01 milligram per liter
Chromium (Cr + 6)	0.05 milligrams per liter
Cyanide (CN)	0.2 milligrams per liter
Faecal Coliform Organisms	At least 90% of the samples in any consecutive 30 day period should have a faecal coliform density of less than 1000 MPN per 100 ml.
Fluoride (F)	1.5 milligrams per liter
Lead (Pb)	0.05 milligrams per liter
Radioactive material	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Selenium (Se)	0.01 milligram per liter
Silver (Ag)	0.05 milligrams per liter
Total Coliform Organisms	At least 90% of the samples in any consecutive 30 day period should have a total coliform density of less than 5000 MPN per 100 ml.

II. (2) FISHERIES AND RECREATION

For all classes of fisheries and recreation waters, the aquatic habitat, which includes the waters and stream bed, shall not be degraded in any material manner, there shall be no material increase in undesirable slime growths or aquatic plants, including algae. Pesticides shall not exceed the limits indicated in Table "2" nor shall there be any significant increase in other residues in the waters, sediments and aquatic flora and fauna; the normal fishery and lower aquatic biota upon which it is dependent and the use thereof shall not be seriously impaired or endangered, the species composition shall not be altered materially, and the propagation or migration of the fish and other biota normally present shall not be prevented or hindered by the discharge of any sewage, industrial waste or other waste effluents to the waters.

No sewage, industrial or other wastes shall be discharged into any of the waters of this category so as to cause any material change in any other substances or characteristics which may impair the quality of the waters or the aquatic biota of any of the above-listed classes or in any manner render them unsuitable or objectionable for fishing, fish culture or recreational uses. Additional selective limits or changes in the discharge bases may be imposed on the basis of local needs.

For all classes of fisheries and recreation waters, the phenol content shall not exceed 0.01 milligram per liter and any value that could impart odour or taste to fish flesh or other freshwater edible products such as crayfish, clams, prawns and like creatures. Where it seems probable that a discharge may result in tainting of edible aquatic products, bioassays and taste panels will be required to determine whether tainting is likely or present.

TABLE "2"

Water Quality Objectives for Pesticides,
Freshwater Aquatic Life and Wildlife
[Concentration in Whole (Unfiltered) Water]

PESTICIDE (by common name)	CODE (Note 1)	TYPE (Note 2)	NOT TO EXCEED LIMIT (micrograms per liter)
Aldrin plus Dieldrin	-	D	0.003 (Note 3)
Allethrin	-	-	0.002
Amitrole	3	A	300.
Azinphos-methyl	1,2	B	0.001
Carbaryl	1,2	C	0.02
Chlordane	-	D	0.04
Chlorpyrifos	-	B	0.001
Coumaphos	-	B	0.001
Crotoxyphos	-	B	0.10
2,4-D (BEE)	2,3	A	4.0
Dalapon	2,3	A	110.
DDT	-	D	0.002
DDVP	-	B	0.001
Demeton	-	B	1.0
Diazinon	2	B	0.009
Dicamba	2,3	A	200.
Dichlobenil	-	A	37.
Dichlone	-	A	0.2
Dieldrin			(See Aldrin)
Dioxathion	-	B	0.09
Diquat	3	A	0.5
Disulfoton	2	B	0.05
Diuron	3	A	1.6
Endosulfan	1,2	D	0.003
Endrin	-	D	0.002
EPN	-	B	0.06
Ethion	-	B	0.02
Fenac	-	A	45.
Fenitrothion	-	B	10.0
Heptachlor	-	D	0.005
Heptachlor Epoxide	-	D	0.005
Lindane	1	D	0.02
Malathion	1	B	0.008
Methoxychlor	-	D	0.005
Mevinphos	-	B	0.002
Mexacarbate	-	C	0.10
Mirex	-	D	0.001
Naled	-	B	0.004

TABLE "2" (cont'd)

PESTICIDE (by common name)	CODE (Note 1)	TYPE (Note 2)	NOT TO EXCEED LIMIT (micrograms per liter)
Oxydemeton-methyl	-	B	0.4
Parathion -	-	B	0.0004
Phosphamidon	-	B	0.03
Picloram	2,3	A	9.0
Pyrethrum	-	-	0.01
Rotenone	-	-	10.
Silvex (phenoxypropionic)	3	A	30.
Silvex (BEE)	-	A	2.5
Silvex (PGBE)	-	A	2.0
Simazine	3	A	10.
TDE	-	D	0.006
Temophos	-	B	100.
TEPP	-	B	0.4
Toxaphene	2	D	0.01
Trichlorfon	1,2	B	0.002

Note 1

- Codes - 1 - Insecticides used in vegetable and field production in Southern Manitoba.
2 - Pesticides expected to be used in North Dakota irrigation.
3 - Herbicides in use in Manitoba.

Note 2

- Types - A - Herbicides, Fungicides & Defoliants
B - Organophosphate insecticide
C - Carbamate insecticide
D - Organochlorine insecticide

Note 3

Pesticide limits to protect freshwater aquatic life are generally based on multiplying the acute toxicity values for the most sensitive important fish species by an application factor of 0.01. With respect to a number of pesticides in use in Manitoba and adjoining States or Provinces, due to a general lack of data, scientifically defensible objectives cannot be set at this time. The limits for these, to protect aquatic life, should be based on 0.01 of the 96-hour LC50 value determined using the receiving water in question and the most sensitive important fish species in the area as test organism.

II. 2. Class 2A

The quality of this class of the waters of the province shall be such as to permit the propagation and maintenance of warm and cold water sport or commercial fishes and be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. Limiting concentrations or ranges of substances or characteristics which should not be exceeded in the waters are given below.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Ammonia (N), unionized	0.02 milligrams per liter
Cadmium	0.01 milligram per liter for waters with hardness greater than 100 milligrams per liter (CaCO ₃)
	0.004 milligrams per liter for waters with hardness lower than 100 milligrams per liter (CaCO ₃)
Chlorides (Cl)	200 milligrams per liter
Chlorine (Cl ₂)	0.01 milligram per liter
Chromium (as Cr + 6)	0.1 milligram per liter
Colour value	30
Copper (Cu)	0.02 milligrams per liter or not greater than 1/10 the 96-hour LC50 value
Cyanides (CN)	0.005 milligrams per liter
Dissolved oxygen	60% or more saturation at the ambient temperature
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 20 MPN per 100 milliliters.
Fluorides (F)	1.5 milligram per liter
Lead (Pb)	0.03 milligrams per liter
Mercury (Hg)	0.0002 milligrams per liter
Nickel (Ni)	0.025 milligrams per liter
pH value	6.5 - 8.5
Polychlorinated biphenyls (PCB)	0.000002 milligrams per liter

<u>II. 2. Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Radioactive materials	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Selenium (Se)	0.01 of the 96-hour LC50 value
Silver (Ag)	0.01 of the 96-hour LC50 value
Sulfides (H ₂ S)	0.002 milligrams per liter
Temperature	No change greater than 0.5° Celsius beyond natural minimum and maximum temperatures
Thallium (Tl)	0.05 milligrams per liter
Total Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 100 MPN per 100 milliliters.
Turbidity value	10
Uranium (U)	0.01 milligram per liter or .01 of the 96-hour LC50 value
Zinc (Zn)	.01 of the 96-hour LC50 value

Class 2B

The quality of this class of the waters of the province shall be such as to permit the propagation and maintenance of cool or warm water sport or commercial fishes and be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. The physical and chemical objectives quoted above for Class 2A shall also apply to these waters except as listed below.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Dissolved Oxygen	47% or more saturation at the ambient temperature
Faecal Coliform Organisms	The median (50 Percentile) based on not less than 5 samples per month should be not greater than 200 MPN per 100 milliliters
pH value	6.5 - 9.0
Temperature	No change greater than 1.0° Celsius beyond natural minimum and maximum temperatures.

II. 2. <u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Total Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 500 MPN per 100 milliliters.
Turbidity value	25

Class 2C

The quality of this class of the waters of the province shall be such as to permit the propagation and maintenance of rough fish or species commonly inhabiting waters of the vicinity under natural conditions, and be suitable for boating and other forms of aquatic recreation for which the waters may be usable. The physical and chemical objectives quoted above for Class 2A shall also apply to these waters except as listed below.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Colour value	100
Dissolved Oxygen	35% or more saturation at the ambient temperature
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 400 MPN per 100 milliliters.
pH value	5.0 - 9.3
Temperature	No change greater than 2.0° Celsius beyond natural minimum and maximum temperatures.
Total Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 1000 MPN per 100 milliliters.
Turbidity value	25

3. INDUSTRIAL CONSUMPTION

Class 3A

The quality of this class of the waters of the province shall be such as to permit their use without chemical treatment, for most industrial purposes, except food processing and related uses, for which a high

- II 3. quality of water is required. The quality shall be generally comparable to Class 1B waters for domestic consumption, except for the following.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Chlorides (Cl)	50 milligrams per liter
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 200 MPN per 100 milliliters.
Hardness (CaCO ₃)	50 milligrams per liter
pH value	6.5 - 8.5

Class 3B

The quality of this class of the waters of the province shall be such as to permit their use for general industrial purposes, except for food processing, with only a moderate degree of treatment. The quality shall be generally comparable to Class 1D waters used for domestic consumption, except the following.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Chlorides (Cl)	100 milligrams per liter
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 200 MPN per 100 milliliters.
Hardness (CaCO ₃)	250 milligrams per liter
pH value	6.0 - 9.0

Class 3C

The quality of this class of the waters of the province shall be such as to permit their use for industrial cooling and materials transport without a high degree of treatment being necessary to avoid severe fouling, corrosion, scaling, or other unsatisfactory conditions. The following shall not be exceeded in the waters.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Chlorides (Cl)	250 milligrams per liter
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should not be greater than 200 MPN per 100 milliliters.

II. 3.	<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
	Hardness (CaCO ₃)	500 milligrams per liter

Additional selective limits may be imposed for any specific waters as needed.

In addition to the above listed standards, no sewage, industrial waste or other wastes, treated or untreated, shall be discharged into or permitted by any person to gain access to any provincial waters classified for industrial purposes so as to cause any material impairment of their use as a source of industrial water.

4. AGRICULTURE AND WILDLIFE

Class 4A

The quality of this class of the waters of the province shall be such as to permit their use for irrigation without significant damage or adverse affects upon crops, vegetation or soil, and represents good quality irrigation water. The following concentrations or limits shall be used as a guide in determining the suitability of the waters for such uses.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Aluminum (Al)	0.5 milligrams per liter
Arsenic (As)	0.1 milligrams per liter
Beryllium (Be)	0.1 milligrams per liter
Boron (B)	0.2 milligrams per liter
Cadmium (Cd)	0.01 milligrams per liter
Chloride (Cl)	150 milligrams per liter
Chlorine (Cl ₂)	<.05 milligrams per liter
Chromium, Total (Cr)	0.05 milligrams per liter
Cobalt (Co)	0.05 milligrams per liter
Copper (Cu)	0.20 milligrams per liter
Detergents and Saponates	5.0 milligrams per liter
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 1000 MPN per 100 milliliters.
Fluoride (F)	1.0 milligram per liter
Iron (Fe)	5.0 milligrams per liter
Lead (Pb)	5.0 milligrams per liter

II. 4. <u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Lithium (Li)	2.5 milligrams per liter
Manganese (Mn)	0.2 milligram per liter
Mercury (Hg)	<.00002 milligram per liter
Molybdenum (Mo)	0.01 milligram per liter
Nickel (Ni)	0.20 milligrams per liter
Nitrate + Nitrite (N)	20. milligrams per liter
pH value	5.0 - 9.0
Radioactive materials	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Selenium (Se)	0.02 milligrams per liter
Sodium (Na)	60% of total cations as milli-equivalents per liter
Specific conductance	1000 micromhos per centimeter
Sulfates (SO ₄)	250 milligrams per liter
Sulfides (H ₂ S)	3 milligrams per liter
Total dissolved solids (filterable residue)	700 milligrams per liter
Vanadium (V)	0.10 milligram per liter
Zinc (Zn)	2.0 milligrams per liter

Class 4B

The quality of this class of the waters of the province shall be such as to permit their use for irrigation without significant damage or adverse effects upon crops, vegetation or soil, and represents irrigation water of acceptable quality. The objectives quoted above for Class 4A waters shall also apply to these waters in the untreated state, except as listed below.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Aluminum (Al)	1.0 milligram per liter
Boron (B)	0.3 milligrams per liter
Chlorides (Cl)	350 milligrams per liter
Chlorine (Cl ₂)	0.05 milligrams per liter
Detergents and Saponates	40 milligrams per liter

II. 4. <u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Mercury (Hg)	0.005 milligrams per liter
Nitrate + Nitrite (N)	30 milligrams per liter
Specific Conductance	2000 micromhos per centimeter
Sulfates (SO ₄)	400 milligrams per liter
Sulfides (H ₂ S)	5 milligrams per liter
Total Dissolved Solids (Filterable residue)	1500 milligrams per liter

Class 4C

The quality of this class of the waters of the province shall be such as to permit their use by livestock and wildlife without inhibitory or injurious effects. The limits or concentrations of substances or characteristics given below shall not be exceeded in the waters.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Aluminum (Al)	5.0 milligrams per liter
Arsenic (As)	0.05 milligrams per liter
Boron (B)	5.0 milligrams per liter
Cadmium (Cd)	0.05 milligrams per liter
Chromium, Total (Cr)	1.0 milligram per liter
Cobalt (Co)	1.0 milligram per liter
Copper (Cu)	0.5 milligram per liter
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 200 MPN per 100 milliliters
Fluoride (F)	2.0 milligrams per liter
Lead (Pb)	0.1 milligram per liter
Mercury (Hg)	0.01 milligrams per liter
Nitrate + Nitrite (N)	100 milligrams per liter
Nitrite (N)	10 milligrams per liter
Pesticides	Not to exceed the limits listed in Table "2"
pH value	5.5 - 9.0

II. 4. <u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Radioactive materials	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Selenium (Se)	0.05 milligrams per liter
Sulfates (SO ₄)	500 milligrams per liter
Total Dissolved Solids (total salinity)	3000 milligrams per liter
Toxic algae	Avoid use of water bearing heavy growth of blue-green algae.
Unspecified Toxic Substances	None at levels harmful either directly or indirectly
Vanadium (V)	0.1 milligram per liter
Zinc (Zn)	25 milligrams per liter

5. NAVIGATION AND WASTE DISPOSAL

The quality of this class of the waters of the province shall be such as to be suitable for aesthetic enjoyment of scenery and to avoid any interference with navigation or damaging effects on property. The following limits or concentrations shall not be exceeded in the waters.

<u>Substance or Characteristic</u>	<u>Acceptable Limit or Range</u>
Faecal Coliform Organisms	The median (50 percentile) based on not less than 5 samples per month should be not greater than 1000 MPN per 100 milliliters.
pH value	4.5 - 10.0
Sulfides (H ₂ S)	0.02 milligrams per liter

Additional selective limits may be imposed for any specific waters as needed.

6. OTHER USES

The uses to be protected in this class may be under other jurisdictions and in other areas to which the waters of the province are tributary, and may include any or all of the uses listed in the foregoing categories, plus any other possible beneficial uses. The Department, therefore, reserves the right to impose any standards necessary for the protection of this class, consistent with legal limitations.

III. METHODOLOGIES

The means of measuring water quality are changing rapidly. As more is learned of the cause-effect relationships of pollutants in the water environment, the greater becomes the demand for lower levels of detection of these pollutants, for better sampling and preservation techniques and for faster methods to produce reliable results.

Sampling and Preservation of Samples

Collection, preservation and handling of samples requires attention because the results of laboratory analyses are only as good as the samples received for analyses.

In considering the practice of sample collection for laboratory analyses, the areas of concern identified were as follows:

1. Sampling Site Selection

Sampling sites should be carefully selected to ensure that they fit the management plan for maintaining the quality of the water resource, they give information which can be correlated with periodic information at other sites or which will supplement periodic information, and they give the total water quality picture of the area. (29) and (30).

2. Sampling Frequency

The number of sampling locations and the frequency of sampling should be governed by the requirements for pollution control and the maintenance of the quality of the water resource. Contamination is often intermittent and may not be revealed by a single sample. A single sample provides information on the conditions prevailing at the time of sampling. One satisfactory result cannot guarantee that the condition will persist.

3. Sampling Methods

Samples should reach the laboratory with little or no change in their physical, chemical and microbiological in situ state. The sampling techniques described in the latest editions of references (27), (28) and (30) should be used.

4. Identification of Samples

Samples must be properly identified and field sheets completed, on site.

Analytical

There are a variety of methods currently in use in analyzing water. It is imperative, therefore, that methods selected be comparable with the methods used by water laboratories throughout Canada. This can be achieved by making use of the latest editions of recommended standard methodology (27) and (31). Participation in interlaboratory quality control programs, such as the National Laboratory Quality Control Program of the Water Quality Branch, Fisheries and Environment Canada, should be encouraged to obtain comparable analytical results.

IV. DEFINITIONS

Domestic Consumption

As a designated water use, this will include all waters which are or may be used as a source of supply for drinking, culinary or food processing use or other domestic purposes and for which quality control is or may be necessary to protect the public health, safety or welfare.

Fisheries and Recreation

As a designated water use, this will include all waters which are or may be used for fishing, fish culture, bathing or any other recreational purposes, and for which quality control is or may be necessary to protect aquatic or terrestrial life, or the public health, safety or welfare.

Industrial Consumption

As a designated water use, this will include all waters which are or may be used as a source of supply for industrial process or cooling water, or any other industrial or commercial purposes, and for which quality control is or may be necessary to protect the public health, safety or welfare.

Agriculture and Wildlife

As a designated water use, this will include all waters which are or may be used for any agriculture purposes, including stock watering and irrigation, or by waterfowl or other wildlife, and for which quality control is or may be necessary to protect terrestrial life or the public health, safety or welfare.

Navigation and Waste Disposal

As a designated water use, this will include all waters which are or may be used for any form of water transportation or navigation, disposal of sewage, industrial waste or other waste effluents, or fire prevention, and for which quality control is or may be necessary to protect the public health, safety or welfare.

Other Uses

As a designated water use, this will include waters which are or may serve any other beneficial uses not listed herein, including without limitation any such uses in this or any other Province, State, or Nation of any inter-jurisdictional waters flowing through or originating in this Province, and for which quality control is or may be necessary for the above declared purposes, or to conform with the requirements of the legally constituted Provincial, State or National agencies having jurisdiction over such waters.

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GENERAL WATER QUALITY OBJECTIVES

General Water Quality objectives give overall guidance to water managers for ensuring that, regardless of the utilization or development of the water resource, reasonable measures will be taken to protect water quality.

Every effort should be made to retain the natural quality of provincial waters. Should, however, it be deemed necessary to allow degradation to occur for socio-economic or other reasons, then all reasonable and practicable measures should be employed to ensure that the loss in quality does not exceed the minimum levels required to protect the most sensitive use.

Provincial waters deemed to have outstanding natural recreational and aesthetic value should be maintained in their natural state.

To ensure that the quality and overall value of provincial waters are protected and enhanced, water pollution control programs should ensure that:

1. The quality of any body of water and the life-system functioning within that body should not be allowed to deteriorate below minimum acceptable levels consistent with current knowledge and practicable technology, or if below, should be brought up to a minimum acceptable quality;
2. Certain "high quality" bodies of water whose existing quality is substantially above existing requirements, should be maintained at their existing high quality levels;
3. Where natural conditions are suitable, all bodies of water should be sufficiently high quality to permit safe direct body contact;
4. All waters should meet minimum national or international standards and objectives (statutory, recommended, or agreed) designed for the protection or enhancement of public health and well-being;
5. The quality of waters should be maintained so as not to impede optimum sustainable economic yield of Manitoba's fishery resources compatible with other desired uses of water;
6. All waters should be maintained free from, or within concentration limits designated under appropriate legislation respecting environmental contaminants or conditions, any substances which pose a threat to the aquatic or human environment. Such freedom or limitation should be corroborated by biological assessment;
7. All waters should be free from amounts of substances attributable to municipal, industrial and other discharges that will settle to form putrescent or otherwise objectionable deposits, that produce colour, odour and other conditions, in such a degree as to create a nuisance or in concentrations that are toxic or harmful to human, animal or aquatic life;

8. All waters should be free from floating debris, oil, scum and other floating materials attributable to municipal, industrial or other discharges (including those from ships and other waterborne vehicles) in amounts sufficient to cause unsightly or deleterious effects on water quality;
9. All waters should be free from nutrient substances derived from municipal, industrial, agricultural or other sources in concentrations or quantities that create nuisance growths of aquatic plants and alga.

SUMMARY TABLE
MANITOBA WATER QUALITY OBJECTIVES

PARAMETER	UNITS	1A	1B	1C	1D	2A	2B	2C	3A	3B	3C	4A	4B	4C	5
Aluminium (Al)	mg/l											0.5	1.0	5.0	
Ammonia (N)	mg/l					0.02	0.02	0.02							
Arsenic (As) Total	mg/l	0.01	0.01	0.01	0.05				0.01	0.05		0.1	0.1	0.05	
Barium (Ba)	mg/l	1.	1.	1.	1.				1.	1.					
Beryllium (Be)	mg/l											0.1	0.1		
Boron (B)	mg/l	5.0	5.0	5.0					5.0			0.2	0.3	5.0	
Cadmium (Cd)	mg/l	0.01	0.01	0.01	0.01	(K)*	(K)	(K)	0.01	0.01		0.01	0.01	0.05	
Chloride (Cl)	mg/l	250.	250.	250.		200.	200.	200.	50.	100.	250.	150.	350.		
Chlorine (Cl ₂)	mg/l					0.01	0.01	0.01				<0.05	0.05		
Chromium (Cr + 6)	mg/l	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.05	0.05					
Chromium, Total (Cr)	mg/l											0.05	0.05	1.0	
Cobalt (Co)	mg/l											0.05	0.05	1.0	
Colour True		15.	15.	15.		30.	30.	100.	15.						
Copper (Cu)	mg/l	1.	1.	1.		(L)0.02	(L)0.02	(L)0.02	1.			0.2	0.2	0.5	
Cyanide (CN)	mg/l	0.01	0.01	0.01	0.2	0.005	0.005	0.005	0.01	0.2					

SUMMARY TABLE

MANITOBA WATER QUALITY OBJECTIVES

PARAMETERS	UNITS	1A	1B	1C	1D	2A	2B	2C	3A	3B	3C	4A	4B	4C	5
Detergents & Saponates	mg/l											5.0			
Dissolved Oxygen	% sat'n mg/l					60 or over (M)	47 or over (M)	35 or over (M)					40.		
Faecal Coliform Organisms	Counts/ 100 ml	Absent	10 (A)	100 (C)	1000 (E)	20 (N)	200 (Q)	400 (S)	200 (Q)	200 (Q)	200 (Q)	1000 (U)	1000 (U)	200 (Q)	1000 (U)
Fluoride (F)	mg/l	1.2	1.2	1.2	1.5	1.5	1.5	1.5	1.2	1.5		1.0	1.0	2.0	
Hardness, Total (CaCO ₃)	mg/l								50.	250.	500.				
Iron, Total (Fe)	mg/l	0.3	0.3	0.3					0.3			5.0	5.0		
Lead (Pb)	mg/l	0.05	0.05	0.05	0.05	0.03	0.03	0.03	0.05	0.05		5.0	5.0	0.1	
Lithium (Li)	mg/l											2.5	2.5		
Manganese (Mn)	mg/l	0.05	0.05	0.05					0.05			0.2	0.2		
Mercury (Hg)	mg/l	0.002	0.002	0.002		0.0002	0.0002	0.0002	0.002	0.002		<.00002	0.005	0.01	
Methylene Blue Active Substances (Foaming Agents) (MBAS)	mg/l	0.5	0.5	0.5					0.5						
Molybdenum (Mo)	mg/l											0.01	0.01		

SUMMARY TABLE
MANITOBA WATER QUALITY OBJECTIVES

PARAMETERS	UNITS	1A	1B	1C	1D	2A	2B	2C	3A	3B	3C	4A	4B	4C	5
Nickel (Ni)	mg/l					0.025	0.025	0.025				0.2	0.2		
Nitrate+Nitrite (N)	mg/l	10.	10.	10.					10.			20.	30.	100.	
Nitrite (N)	mg/l													10.	
Pesticides (1)		Table 1	Table 1	Table 1	Table 1				Table 1	Table 1					
Pesticides (2)						Table 2	Table 2	Table 2						Table 2	
pH		5.0-9.0	5.0-9.0	5.0-9.0		6.5-8.5	6.5-9.0	5.0-9.3	6.5-8.5	6.0-9.0		5.0-9.0	5.0-9.0	5.5-9.0	4.5-10.0
Phenol (1c compounds)	mg/l	0.001	0.001	0.001					0.001						
Polychlorinated Biphenyls (PCB)	mg/l					0.000002	0.000002	0.000002							
Radioactive Materials	l	(X)*	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)		(X)	(X)	(X)	
Selenium (Se)	mg/l	0.01	0.01	0.01	0.01	(DD)	(DD)	(DD)	0.01	0.01		0.02	0.02	0.05	
Silver (Ag)	mg/l	0.05	0.05	0.05	0.05	(DD)	(DD)	(DD)	0.05	0.05					
Sodium (Na)												60% Total Cations	60% Total Cations		
Specific Conductance	umhos											1000.	2000.		

SUMMARY TABLE

MANITOBA WATER QUALITY OBJECTIVES

PARAMETER	1A	1B	1C	1D	2A	2B	2C	3A	3B	3C	4A	4B	4C	5
Sulfate (SO ₄)	250.	250.	250.					250.			250.	400.	500.	
Sulfide (H ₂ S)					0.002	0.002	0.002				3.	5.		0.02
Temperature					(O)0.5	(O)1.0	(O)2.0							
Thallium (Tl)					0.05	0.05	0.05							
Threshold Odour Number	4.	4.	4.					4.						
Total Coliform Organisms	NEG. (Y)	100. (Z)	1000. (B)	5000. (F)	100. (D)	500. (R)	1000. (U)	100. (Z)	5000. (F)					
Total Dissolved Solids	500.	500.	1000.					500.			700.	1500.	3000.	
Toxic Algae													(BB)	
Turbidity Value	5.	5.	25.		10.	25.	25.	5.						
Unspecified Toxic Substances													(CC)	
Uranium (U)					(DD)	(DD)	(DD)							
Vanadium (V)											0.1	0.1	0.1	
Zinc (Zn)	5.	5.	5.		(DD)	(DD)	(DD)	5.			2.0	2.0	25.	

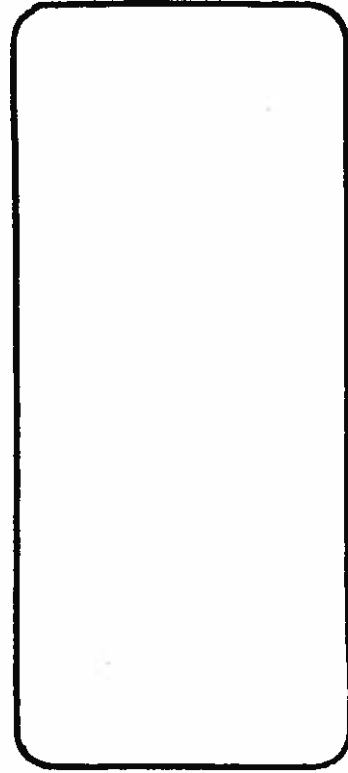
* See Notes Appendix D Annex 4 Pages v and vi

STREAM CLASSIFICATION LIST

<u>WATERS</u>	<u>REACH OR AREA INVOLVED OR LOCATION</u>	<u>CLASSIFICATION</u>	<u>SEE COLUMN</u>
Assiniboine River	Shellmouth Reservoir	1B, 2B, 3B, 4A, 4C, 5, 6	I
Assiniboine River	Shellmouth Reservoir to Brandon 1st Street Bridge	1B, 2C, 3B, 4A, 4C, 5, 6	II
Assiniboine River	Brandon 1st Street Bridge to end of recovery zone	2C, 3B, 4A, 4C, 5, 6	III
Assiniboine River	Brandon recovery zone to Portage la Prairie (Diversion pool)	1B, 2B, 3B, 4A, 4C, 5, 6	I
Assiniboine River	Portage la Prairie to end of recovery zone	2C, 3B, 4A, 4C, 5, 6	III
Assiniboine River	Portage recovery zone to Winnipeg west limits	1B, 2B, 3B, 4A, 4C, 5, 6	I
Assiniboine River	City of Winnipeg	2C, 3B, 4A, 4C, 5, 6	III
Burntwood River		1C, 2A, 3B, 4A, 4C, 5, 6	IV
Red River	U.S. Border to Winnipeg south limits	1B, 2C, 3B, 4A, 4C, 5, 6	II
Red River	City of Winnipeg	2C, 3B, 4A, 4C, 5, 6	III
Red River	Winnipeg north limits to end of recovery zone	2C, 3B, 4A, 4C, 5, 6	III
Red River	Recovery zone to Lake Winnipeg	1C, 2C, 3B, 4A, 4C, 5, 6	V
Roseau River		1C, 2B, 3B, 4A, 4C, 5, 6	VI
Souris River	U.S. Border to Assiniboine River	1C, 2C, 3B, 4A, 4C, 5, 6	V
Winnipeg River		1C, 2A, 3B, 4A, 4C, 5, 6	IV
Minnedosa River		1C, 2A, 3B, 4A, 4C, 5, 6	IV

MANITBA

CLEAN ENVIRONMENT COMMISSION
BOX 4, 139 TUXEDO AVENUE
WINNIPEG, CANADA R3N 0H6



MANITOBA INTERIM WATER QUALITY OBJECTIVES*

PARAMETER	UNITS	I	II	III	IV	V	VI
Thallium (Tl)	mg/l	0.05	0.05	0.05	0.05	0.05	0.05
Threshold Odour Number		4.	4.	---	4.	4.	4.
Total Coliform Organisms	Counts per 100 ml	100. (Z)	100. (Z)	1000. (U)	100. (D)	1000. (U)	500. (R)
Total Dissolved Solids	mg/l	500.	500.	700.	700.	700.	700.
Toxic Algae		(BB)	(BB)	(BB)	(BB)	(BB)	(BB)
Turbidity Value	JTU	5.	5.	25.	10.	25.	25.
Unspecified Toxic Substances		(CC)	(CC)	(CC)	(CC)	(CC)	(CC)
Uranium (U)	mg/l	0.01 or (DD)	0.01 or (DD)	0.01 or (DD)	0.01 or (DD)	0.01 or (DD)	0.01 or (DD)
Vanadium (V)	mg/l	0.1	0.1	0.1	0.1	0.1	0.1
Zinc (Zn)	mg/l	2.0 or (DD)	2.0 or (DD)	2.0 or (DD)	2.0 or (DD)	2.0 or (DD)	2.0 or (DD)

* For all letters see Notes (pages 5 & 6)

NOTES

- (A) At least 95% of the samples in any consecutive 30-day period should have a faecal coliform density of less than 10 MPN per 100 ml.
- (B) At least 90% of the samples in any consecutive 30-day period should have a total coliform density of less than 1000 MPN per 100 ml.
- (C) At least 90% of the samples in any consecutive 30-day period should have a faecal coliform density of less than 100 MPN per 100 ml.
- (D) The median (50 percentile) based on not less than 5 samples per month should be not greater than 100 MPN per 100 ml.
- (E) At least 90% of the samples in any consecutive 30-day period should have a faecal coliform density of less than 1000 MPN per 100 ml.
- (F) At least 90% of the samples in any consecutive 30-day period should have a total coliform density of less than 5000 MPN per 100 ml.
- (K) 0.01 milligrams per liter for waters with hardness greater than 100 mg/l (CaCO₃).
0.004 milligrams per liter for waters with hardness lower than 100 mg/l (CaCO₃).
- (L) or not greater than 1/10 the 96-hour LC50 value.
- (M) % saturation is at the ambient temperature.
- (N) The median (50 percentile) based on not less than 5 samples per month should be not greater than 20 MPN per 100 ml.
- (O) No change greater than stated degrees Celsius beyond the natural minimum and maximum temperatures.
- (Q) The median (50 percentile) based on not less than 5 samples per month should be not greater than 200 MPN per 100 ml.
- (R) The median (50 percentile) based on not less than 5 samples per month should be not greater than 500 MPN per 100 ml.
- (S) The median (50 percentile) based on not less than 5 samples per month should be not greater than 400 MPN per 100 ml.
- (U) The median (50 percentile) based on not less than 5 samples per month should be not greater than 1000 MPN per 100 ml.
- (X) Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.

- (Y) At least 90% of the samples in any consecutive 30-day period should be "negative". None of the samples "positive" should have an MPN index greater than 10 per 100 ml or an MF count greater than 6 per 200 ml or 15 per 500 ml portions.
- (Z) At least 95% of the samples in any consecutive 30-day period should have a total coliform density of less than 100 MPN per 100 ml.
- (BB) Avoid use of water bearing heavy growth of blue green algae.
- (CC) None at levels harmful either directly or indirectly.
- (DD) .01 of the 96-hour LC50 value.

