ST. LAWRENCE RIVER
CLEAN UP RURAL BEACHES (CURB) PLAN

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Raisin Region
Conservation
Authority

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EXECUTIVE SUMMARY

The St. Lawrence River Rural Beaches Program was initiated in 1990 by the Raisin Region Conservation Authority (R.R.C.A.) as part of the Ministry of the Environment's initiative to prevent the closure of rural beaches as a result of bacterial contamination. The primary goal of the program was to identify sources of bacterial pollution affecting local rural beaches, recommend remedial measures to control or eliminate the flow of bacteria from those sources, and to implement those remedial measures.

The two year program study phase was completed in 1991. This document is the next step in the Rural Beaches Program. Entitled the St. Lawrence River Clean Up Rural Beaches (CURB) Plan, it outlines the results of the two year study phase by addressing each identified actual/potential source of bacterial pollution affecting study area beaches, recommends remedial actions to be taken, and assigns an overall cost for each remedial action required.

Two primary sources of bacterial pollution were identified through testing and surveys: sources resulting from agricultural activities, and sources attributable to non-agricultural activities. Specific agricultural bacterial pollution sources identified include milkhouse wash water, livestock access to watercourses, and poor manure management and storage practices. Non-agricultural sources include inadequate home and cottage septic systems, discharges from sewage treatment plants and sewer outfalls, contaminated surface runoff, and droppings from geese and gulls.

The overall cost of effecting remedial actions to control the sources of bacterial pollution within the St. Lawrence Beaches Study area, is $2.84 Million. Of this total, $1.08 Million has been assigned towards dealing with non-agricultural bacterial sources, and $1.76 Million has been assigned to deal with agricultural bacterial sources. These costs do not include major items such as municipal sewage treatment plants.

The implementation strategy of the CURB Plan involves two basic components. The first component prioritizes Water Quality Improvement Plan projects according to an established set of principles. These principles are intended to give priority to those bacterial sources which have the greatest direct impact on beach pollution, with regard given to cost effectiveness. The second component is the process to approve Water Quality Improvement Plan projects at the area watershed level. A Local CURB Plan Review Committee will review each plan submitted to it by the applicant. Upon acceptance of the plan, it will then be submitted to the CURB Program Provincial Review Committee for final funding consideration.

RECOMMENDATIONS

Based on the conclusions from the 1990 and 1991 St. Lawrence Beaches Study, the following courses of action are recommended:

1. That the Raisin Region Conservation Authority seek approval and funding from the Ministry of the Environment for the implementation of the Clean Up Rural Beaches Plan, and the hiring of a CURB Facilitator at the Conservation Authority level;

2. That a CURB Program Local Review Committee be formed of members representing the Raisin Region Conservation Authority, Ministry of the Environment, Ministry of Agriculture and Food, Ministry of Natural Resources, Eastern Ontario Health Unit, and the local chapter of the Ontario Soil and Crop Association, in order to review Water Quality Improvement Plans submitted to it for specific project funding;

3. That CURB Implementation Program funding be provided to undertake educational programs in order to increase public awareness about water quality issues, particularly those which impact upon the quality of stream and beach waters;

4. That CURB Implementation Program funding be made available to assist area homeowners in repairing and/or replacing faulty septic systems within the St. Lawrence Beaches Study area;

5. That CURB Implementation Program funding be made available to area farmers identified in this CURB Plan to undertake projects or encourage practices to improve water quality as part of their own individual Water Quality Improvement Plan. Items requiring funding include milkhouse wash water disposal systems, manure storage structures, and fencing to control livestock access to watercourses;

6. That CURB Implementation Program funding be made available for cooperative agricultural programs involving the Raisin Region Conservation Authority, Ontario Ministry of Agriculture and Food, Ontario Soil and Crop Improvement Association, 4H, and other farm organizations, to encourage soil and water conservation practices in the study area, including proper manure management;

7. That CURB Implementation Program funds be made available for agricultural demonstration projects promoting soil and water conservation practices;

8. That the Ministry of Natural Resources recent experimental program to control geese populations be monitored to determine its effectiveness;

9. That CURB Implementation Program funds be made available for a demonstration project to evaluate the effectiveness of monofilament gull screens on one of the gull affected beaches identified in this CURB Plan;

10. That the Raisin Region Conservation Authority and the Ministry of Natural Resources establish a program to effectively control gull populations, and that CURB Implementation Program funding be made available for this program;

11. That the St. Lawrence Parks Commission consider undertaking a comprehensive program to redirect runoff waters away and downstream of beach swimming areas, by relocating runoff discharge culverts, and/or constructing earthen berm structures to deflect runoff flows;

12. That the St. Lawrence Parks Commission undertake a comprehensive study of all park sewage systems within its jurisdiction, and that recommendations from such a study be enacted upon in a timely manner;

13. That the St. Lawrence Parks Commission undertake a program to collect bird feces from beach and grass areas, cover food waste receptacles, and discourage bird feeding by park users;

14. That the Township of Osnabruck complete repairs to the Ingleside Sewage Treatment Plant outfall pipe as soon as is possible;

15. That the proposed upgrading of the Ingleside Sewage Treatment Plant by the Township of Osnabruck, and the Long Sault Sewage Treatment Plant by the Township of Cornwall, be undertaken as soon as is possible to reduce the potential of bacterial contamination from sewer overflows during rain events;

16. That the Township of Charlottenburgh and the Ministry of the Environment consider the recommendations of a feasibility report to construct a sewage treatment system for Martintown;

17. That the Township of Charlottenburgh request the conducting of a study to determine the need of providing a sewage treatment system for Williamstown;

18. That the Township of Lancaster consider the recommendations of a sewage disposal study of South Lancaster, should it be determined that a sewage disposal problem exists;

19. That the implementation of the CURB Program be coordinated with projects, plans, and programs of other agencies intended to pursue compatible goals.

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1. INTRODUCTION TO THE CLEAN UP RURAL BEACHES PLAN

1.1 The CURB Plan Concept

The need for action to reduce or eliminate the closure of Ontario's rural beaches prompted the creation of the Rural Beaches Program in Ontario, a Ministry of the Environment sponsored initiative. The program has been directed at those watersheds which have had rural beach closures as a result of bacterial pollution counts exceeding recreational water quality guidelines. The program involves the participation of affected local conservation authorities to conduct two years of study in order to locate bacterial pollution sources. Based on the study results, a plan of remedial action, referred to as a Clean Up Rural Beaches (CURB) Plan would be formulated.

1.2 The CURB Implementation Program

The emphasis of the program is on improving land management practices, particularly those which adversely affect water quality.

The program implementation period for each participating conservation authority is five years in length, commencing with the approval of a locally produced CURB Plan by the Ontario Ministry of the Environment.

The funding aspect of the program uses a percentage grant and/or cost ceiling to provide landowners with an incentive to reduce their contribution to beach bacterial pollution (see Table 1).

Table 1. CURB Program Grant Rates

Eligible Item	Grant Rate	Grant Ceiling
manure storages	50%	$12,000
milkhouse waste disposal systems	50%	$ 5,000
restricting livestock from watercourses	75%	$10,000
private septic systems	50%	$ 2,000

note: funding rates as of January 1, 1992

The largest percentage of monies available under this program are to farming operations within the study area boundary. Agriculture has been found to be a significant contributor of fecal material in rural area watercourses, particularly those upstream of swimming areas.

Farmers who qualify under this program may receive grants to construct structures and/or adopt practices as part of their Water Quality Improvement Plan. Rural farm and non-farm residents may also receive grants to repair or otherwise rebuild private sewage septic systems as part of their own Water Quality Improvement Plan.

Participating Conservation Authorities will also receive funding for program delivery, conservation promotion and education, on-farm demonstrations, evaluation, and on-going water quality monitoring.

Local area CURB committees, with members representing the agricultural community, relevant Ministries, and the participating Conservation Authority, will review and accept Water Quality Improvement Plans for funding.

1.3 The St. Lawrence River Clean Up Rural Beaches Plan

The St. Lawrence River CURB Plan is based on two years of study, particularly the summers of 1990 and 1991. It identifies the major suspected sources of bacterial pollution affecting those rural beaches within the Raisin Region Conservation Authority's watershed (see Figure 1). The specific areas of concern covered in this document have been identified in the 1991 St. Lawrence Beaches Final Report.

Two sources of bacterial pollution affecting rural beaches were discovered, agricultural and non-agricultural. The major portion of this CURB Plan deals with the identification and remediation of agricultural source bacterial pollution. Though agriculture contributes a significant amount of bacterial pollution, other nonagricultural sources have been found to affect the greater proportion of beaches in the St. Lawrence Beaches Study area. These particular non-agricultural sources include inadequate septic systems, storm sewer and sewage treatment plant outfalls, geese and gull droppings, and parkland runoff.

Given the predominantly agricultural nature of the CURB Program, Sections 2,3, and 4 of this document deal with the location, identification, and remediation, including options and costs, of farm operation based bacterial pollution found at downstream rural beaches. Section 5 deals with non-agricultural sources of bacterial pollution which were either studied in depth as part of the two year study phase, or have been selected as likely pollution sources by a process of elimination and expert opinion. Section 6 addresses the total cost of all remedial measures, based on the most reliable estimates available. Section 7 outlines a number of potential benefits which may occur as a result of the implementation of the CURB Program. Section 8 describes the strategy and formal structure needed to make the program operable at the local level.

2. AGRICULTURAL SOURCES OF RURAL BEACH BACTERIAL POLLUTION

2.1 Background

Current and previous bacterial testing of two subject area tributary sub-basins of the St. Lawrence River, the Raisin River and Finney Creek, indicate that these two watercourses are significant transport sources of fecal pollution. This pollution, affecting the downstream St. Lawrence River beaches of Lancaster and Glengarry Parks, can be traced to human and livestock sources.

Careful study of other Rural Beaches reports and relevant literature on the topic of rural sources of bacterial contamination of receiving waters, indicate that the two most significant and prevalent sources of fecal contaminants in rural watercourses leading to beach closures, are septic system failures and agricultural livestock operations.

2.2 Current Context

The identification of the sources of actual/potential fecal bacteria was the focus of the second year of the St. Lawrence Beaches Study. Particular attention was paid to agricultural sources, especially the management of manure from livestock, and the disposal of milkhouse wash water from dairy operations.

In various studies conducted elsewhere in Ontario, these two agricultural related sources of fecal bacteria contributed significantly to the degradation of downstream rural beach water quality.

This situation exists in both the Raisin River and Finney Creek watersheds, which drain immediately upstream of two St. Lawrence River Beaches. Both beaches have recorded high fecal coliform counts in the recent past. In brief, the purpose was to identify those agricultural operations contributing to downstream bacterial beach water degradation, for the express purpose of directing future remediation efforts.

2.3 The Study Area

The beaches of Glengarry and Lancaster Parks studied in this section, are located along the St. Lawrence River, east of Cornwall. Both are downstream of the mouths of two tributaries, the Raisin River and Finney Creek (see Figure 2).

Finney Creek is one of a number of minor watersheds within Lancaster Township draining into the St. Lawrence River. It drains and area of approximately 22.5 km^2.

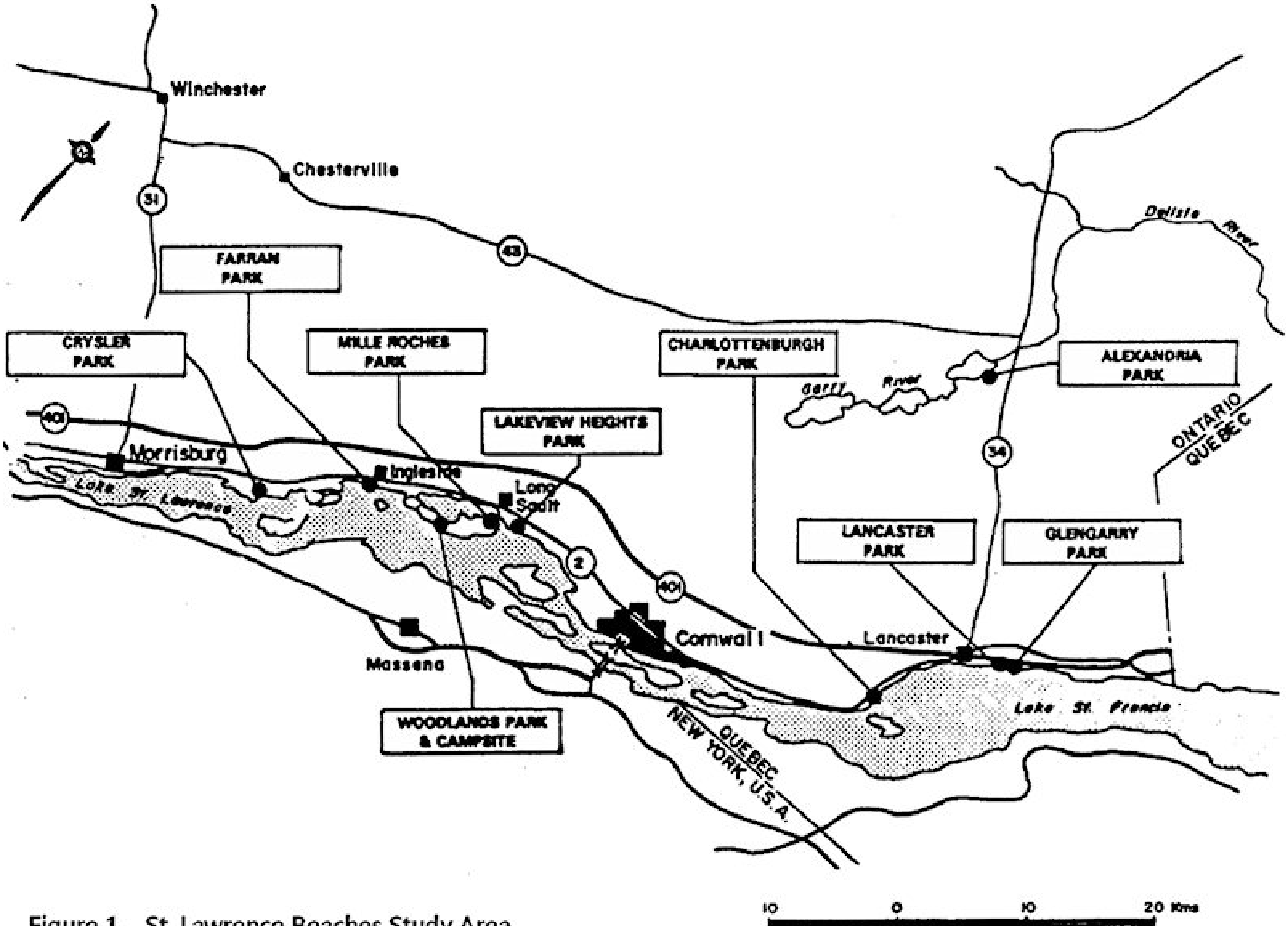

Figure 1. St. Lawrence Beaches Study Area.

This tributary has exhibited some of the most consistently high fecal coliform and E.coli counts (over 100 coliforms per 100 mL of water)in the entire Rural Beaches study area. Based on site observations, topographic map and drainage map interpretation, and farm site locating, it is fairly certain that the predominant source of fecal pollution in the Finney Creek watershed, is as a result of agricultural activity. This creek functions as a primary drain for the majority of farm field tile drains and ditches. Direct human sources of fecal pollution in appreciable amounts are unlikely, because of the almost entirely agricultural nature of this stream and watershed.

The Raisin River watershed, in contrast to Finney Creek, drains an area of 546 km^2. It is because of the large size of this watershed, and the relationship between bacterial die off and distance, from source to beach, that only 180 km^2 of the watershed, was studied. This area along the Raisin extends from its mouth on Lake St. Francis, part of the St. Lawrence River, to MacGillivray's Bridge, 15 kilometres upstream.

The sources of fecal pollution in the waters of the Raisin River are likely a combination of agricultural and human urban sources. Based on preliminary Ministry of the Environment findings, the two potential human sources of fecal bacteria which could affect nearby beaches on the St. Lawrence River, originate from the rural communities of Williamstown (within the study area), and Martintown (upstream of the study area). Of these two rural communities, only Martintown has been studied by the Ministry of the Environment in regards to sewage disposal needs. Both communities at present lack communal water and sewage systems. The rural community of South Lancaster is also a suspected contributor of fecal bacteria affecting downstream beaches. The majority of dwellings use individual septic systems, or else improperly discharge or bypass their individual sewage systems in some manner. Water is supplied by individual wells.

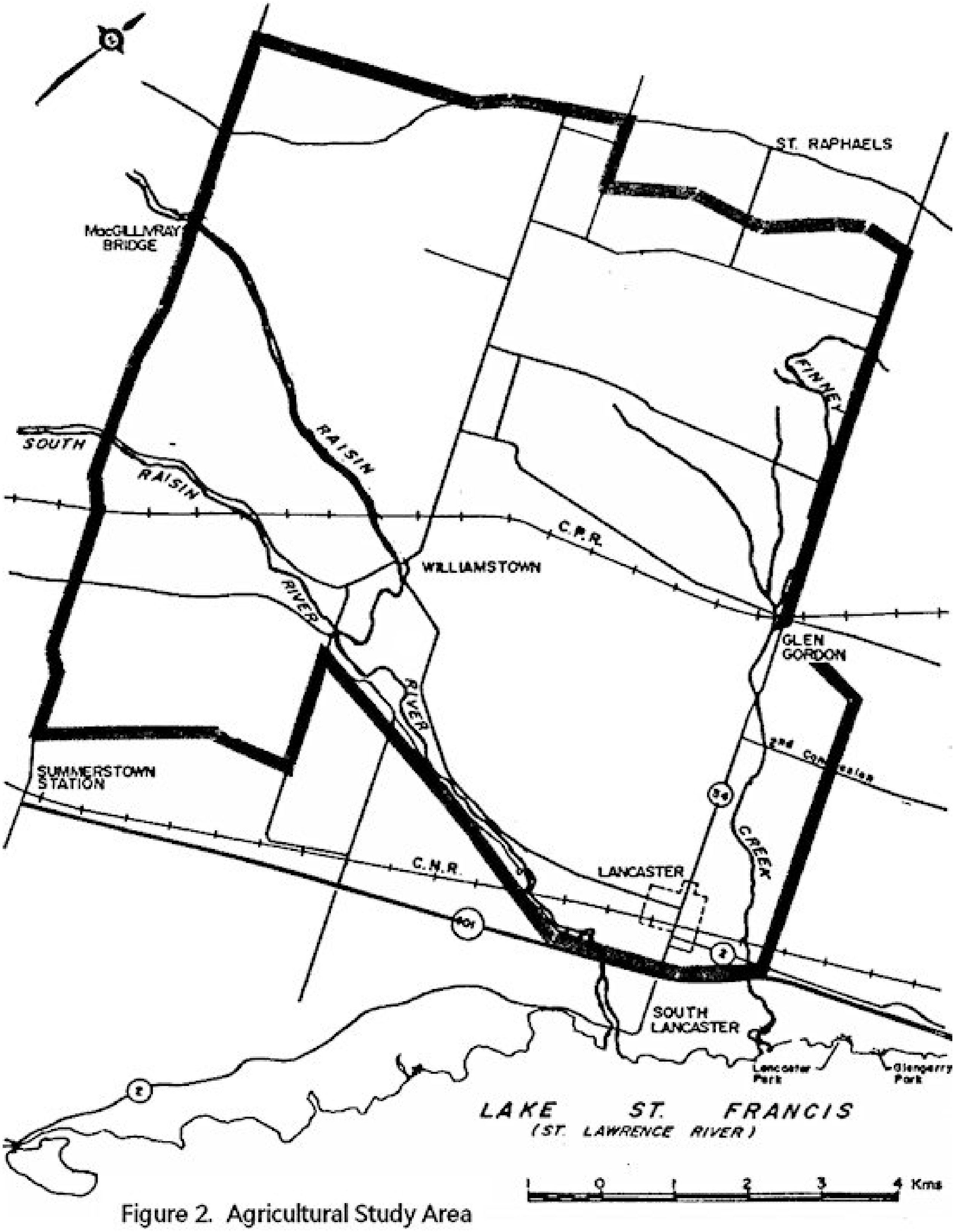

Figure 2. Agricultural Study Area

3. EVALUATING AGRICULTURAL SOURCES: METHODOLOGY

The first step of the evaluation process involved the identification of target agricultural operations within the defined watersheds. The second step required the ranking of those identified operations which are actual/potential significant contributors of fecal pollution to subject rural beaches.

The analytic method employed in this study is a modified version of the ranking equation employed by the CURB Plan - Beaverton River Drainage Basin, 1989 by The Lake Simcoe Region Conservation Authority. In brief, the objectives of this method are to:

1. calculate the relative contribution of a target agricultural operation's manure storage and management practices (including milkhouse/parlour washwater disposal where applicable);

2. rank, from high to low, an agricultural operation's actual/potential contributions to beach fecal coliform contamination.

3.1 Tools

The tools used to determine the relative production of bacteria by an agricultural operation are a survey and on-site inspection, various maps and other information sources, primarily relevant reports and information sheets.

3.1.1 The Survey and On-Site Inspection

Concurrent with regular chemical/bacterial water sample taking, a survey of farms within the defined Finney Creek and Raisin River watersheds was undertaken. The purpose of this survey was to identify operations which are actual/potential significant contributors of fecal bacteria into tributary watercourses which enter the St. Lawrence River upstream of the two subject beaches.

The survey, delivered person to person, covered several specific areas, including livestock manure storage and management practices, type and size of operation, location of barns and manure storages to drains and watercourses, and general site conditions and characteristics.

In addition to the questionnaire, an on-site inspection of manure storage structures (if any), livestock housing facilities, and milkhouse/parlours (as applicable), was conducted. The purpose of this inspection was to observe first-hand the unique characteristics and practices of each individual operation, and to gather impressions of any specific area(s) of concern not covered by the survey.

3.1.2 Maps

Several types of maps were used in this section of the study, but essentially three maps were of prime importance, namely area drainage maps, topographic maps, and a county soils map.

Area topographic maps were used to determine the relative slope of lands within the study watershed areas, and to plot the relative location of the agricultural operations which were targeted for the survey and on-site inspection.

The county soils map provided two important pieces of information about the study watersheds: soil type and texture, and drainage characteristics. Most area soils are silt or sandy loams, with drainage characteristics ranging from good to poor, the majority being of the latter type.

The drainage map of area creeks, rivers, and municipal farm drains, was used in conjunction with the county soils map and the topographic maps to define the extended boundaries of the two study watersheds, and to determine the extent and concentration of area agricultural activity. In addition, the drainage characteristics of the area were used to locate the relative distance of farm operations and manure storages from adjacent municipal drains, creeks, or other watercourses emptying into either Finney Creek or the Raisin River, and potential bank erosion problem areas.

3.1.3 Other Sources

Several in-house reports and studies of the study watersheds were used to identify specific characteristics of the tributaries and their banks in terms of erodibility, flooding potential, and overall watershed dimensions. A variety of publications were consulted concerning manure storage and handling practices, agricultural drainage, and soil erosion.

3.2 Calculations

The ranking of agricultural operations by their relative production of fecal bacteria requires the calculation of several individual factor scores, as they apply to each operation. The sum of these individual factor scores will generate an overall Farm Priority Score for the purpose of overall ranking, from the greatest actual/potential producers of fecal bacteria, to the least. These individual factors include manure storage characteristics, runoff management, transport of bacteria, and milkhouse washwater disposal.

3.2.1 Relative Bacteria Concentrations

Fecal Coliform bacteria are reliable indicators of fecal pollution at the beach, transported by tributary sources. The following list of livestock species includes their respective fecal coliform bacterial concentrations per cubic metre, production of manure per day, and the number of fecal coliforms produced by an individual animal per day. The fifth column is a bacterial index, derived by dividing the daily bacteria produced by 1×10^{10}.

Table 2. Relative Bacteria Concentrations Produced per Day

Animal Type	Fecal Coliforms per m^3	Manure Production m^3 per day	Daily Bacteria Produced	Bacteria Index (I)
Beef	5.0×10^{11}	0.0340	1.7×10^{10}	1.7
Dairy	5.0×10^{11}	0.0599	3.0×10^{10}	3.0
Sheep	1.6×10^{13}	0.0042	6.7×10^{10}	6.7
Poultry	9.9×10^{13}	0.0001	0.99×10^{10}	0.99
Horse	8.7×10^{10}	0.0566	0.49×10^{10}	0.49
Swine				
Sows & Litters	1.0×10^{13}	0.1700	170×10^{10}	170
Feeders	1.0×10^{13}	0.0071	7.1×10^{10}	7.1
Weaners	1.0×10^{13}	0.0023	2.3×10^{10}	2.3

source: Maitland Valley Conservation Authority CURB Plan, 1990

Determination of a total bacteria factor per operation is achieved through the use of the most appropriate of three calculations;

$$BF_1 = 3.0 \times \# \text{ of milk cows} \qquad \text{(Dairy Livestock)}$$

$$BF_2 = \Sigma (I \times L_1) ++ (I_n \times L_n) \qquad \text{(All Livestock)}$$

$$BF_2 = \Sigma (Ip_1 + Lp_1) + \ldots + (Ip_n + Lp_n) \qquad \text{(Pastured Livestock)}$$

where,
- BF = Bacteria Factor
- I = Bacteria Index
- Ip = Bacteria Index for Pastured Animals
- L = Number of Livestock
- Lp = Number of Livestock in Pasture

The first equation was used to calculate the bacteria factor for dairy operations. The second equation was used to calculate the bacteria factor for all types of livestock. The third equation was used where livestock have been pastured for at least half a day.

3.2.2 Manure Storages

A rating system was employed to classify surveyed manure storage systems according to suitability and/or effectiveness of minimizing or preventing bacterial runoff associated with manure, from entering watercourses. The rating system, from one to five, gave the most effective structure a score of one, the least effective a score of five.

Score	**Description**
MS = 5	where little or no manure containment is in evidence; roof and barnyard runoff can freely mix with manure pile(s), causing it to enter watercourses, including field tiles.
MS = 4	manure is not in direct contact with bare ground ie. sits on a concrete pad, but may lack adequate liquid manure containment or diversion of runoff waters from mixing with the manure stack
MS = 2	manure is stored in a pit, particularly an earthen berm structure
MS = 1	the use of a concrete or steel tank to contain manure

3.2.3 Runoff Factor

The factoring of runoff into the manure storage score can greatly influence the acceptability and effectiveness of the existing system to deal with additional volume. Factors which extend the capacity or overall effectiveness of a manure storage system to prevent the runoff of fecal contaminated waters, will lower the original manure storage type score. Factors which will negate these storage system attributes will increase the score.

A. Covered Storage (MS = MS - 1)

The covering of a manure storage site will prevent direct precipitation from accumulating and mixing with manure, thereby increasing manure storage capacity and decreasing the likelihood of runoff contamination and liquid manure overtopping the containment structure.

B. Storage with Runoff Pond (MS = MS - 1)

Accumulated precipitation is directed away from stored manure and toward a settlement pond, before entering any watercourse.

C. Storage with Liner (MS = MS - 1)

Intended to prevent the seepage of liquid component of manure from entering the surrounding ground, and/or entering nearby watercourses.

D. Storage with Retaining Walls (MS = MS - 1)

This factor only applies to storages with concrete pads, and is to contain and confine stored manure to a specific area.

E. Storage Receiving Runoff from Yard and/or Roof:

Designed for runoff **(MS = MS - 1)**
(manure storages which have specific designed capacity to contain both manure and average annual precipitation)

Not designed for runoff **(MS = MS + 1)**
(manure storages not designed to account for precipitation, but are uncovered)

F. Animal Manure Produced Exceeds Existing Storage Capacity (MS = MS + 2)

This condition occurs when a storage has insufficient manure storage capacity to prevent manure from over-topping the containment walls, and/or requires the farmer to remove and spread manure on frozen fields. Storages with less than 200 days designed storage capacity are included in this category.

3.2.4 Transport Factor

The movement of fecal materials from land to watercourse, whether spread as a fertilizer on fields, or as runoff from a feedlot, barnyard, or manure storage, is a factor of four primary variables: slope, distance, soil type, and soil cover.

The slope is a percentage measure of the tilt of the land from where manure is spread or stored to the watercourse. The greater the tilt of the land, or slope, the greater the acceleration of surface runoff towards a watercourse.

Distance was a consideration when manure, either stored, spread, or deposited by pastured animals, was located less than 120 metres from a watercourse, thereby requiring a transport factor.

Soil type will also influence the movement of surface runoff. Generally, the greater the soil component particle size, the greater the rate of infiltration. The soils within the study watersheds of Finney Creek and the Raisin River east of Martintown, range from sandy loam to clay loam, with drainage conditions from imperfect to very poor. Given these soil types and drainage conditions, the vast majority of farmers have installed field tile drains to minimize or eliminate surface water ponding. Tile drainage significantly alters the natural soil absorption by making even naturally poor draining soils, such as clay loams, better absorbers of surface runoff. For this reason, soil texture has been discounted as an important transport factor in this study.

Soil cover is the percent area of a yard or field exhibiting vegetative cover, such as grass or field crops. Covered soil is better able to intercept, absorb, and reduce runoff water flow volume and velocity. A low percentage of soil cover will be unable to achieve these benefits, resulting in soil loss due to erosion, and will increase the amount of bacteria laden organic material transported to nearby drains and watercourses.

ASSESSMENT OF TRANSPORT FACTORS

Slope	**Factor**
if % slope is <=0.5	0.75
if % slope is >0.5 & <=2	1.50
if % slope is >2 & <=5	2.25
if % slope is >5 & <=9	3.00
if % slope is >9 & <=15	3.75
if % slope is >15 & <=30	4.50
if % slope is >30	5.25

Soil Cover	**Factor**
if % soil cover is >80	0.75
if % soil cover is <=80 & >60	1.50
if % soil cover is <=60 & >40	2.25
if % soil cover is <=40 & >20	3.00
if % soil cover is <=20	3.75

Transport Factor* = *Slope Factor* + *Soil Cover Factor

3.2.5 Milkhouse/Parlour Wash Water Factor

This factor applies only to dairy operations. Milkhouse wash water has been found to be a significant contributor of bacterial contamination in tile drains and ditches and streams into which they drain. This wash water tends to have a relatively high phosphorous content, as a result of the soaps used to clean milk pipelines and tanks. Whole milk is an ideal bacterial generator, especially when improperly disposed.

Milkhouse wash water systems which have been proven acceptable *when properly installed and maintained,* receive a score of zero.

Acceptable Systems: (ME = 0)

a. expanded and appropriately designed manure storage structure capacity
b. grey water holding tank
c. treatment trench
d. septic tank and weeping bed

Unacceptable Systems: (ME = 10)

e. overland disposal
f. field tile drain disposal

3.2.6 Manure Spreading Practices

The spreading of manure on fields as a fertilizer impacts on adjacent watercourses by way of manure runoff into ditches, either directly or through field tile outlets. This source of bacterial contamination is made worse by improper manure field management practices. Such undesirable practices include the spreading of manure when soils are frozen, allowing manure and soil to wash into ditches and streams. The spreading of manure when the soil is not frozen can also cause runoff contamination, if not incorporated into the soil soon after spreading. Manure spread in fields closer than 120 metres from the banks of a watercourse may be a problem, and were assessed using a transport factor.

A. manure spread when ground is frozen **(MF = 10)**

B. manure is spread less than 120 metres from an adjacent watercourse when ground is not frozen **(MF = transport factor)**

C. manure is spread more than 120 metres from an adjacent watercourse when ground is not frozen **(MF = 0)**

3.2.7 Livestock Access

The ability of pastured livestock to reach a watercourse is another important factor when calculating bacterial concentration from an agricultural operation. Direct access allows bacteria from feces to enter the water when fecal bacteria are in greatest concentration. If livestock are restricted in access to a watercourse, but are still within 120 metres of its edge, transport factors come into play.

A. livestock have access to watercourse **(P = 10)**

B. livestock access restricted, but still within 120 metres of watercourse **(P = Transport Factor)**

C. livestock access restricted more than 120 metres from a watercourse **(P = 0)**

3.3 Farm Priority Scores

The following equations are a combination of all the previously mentioned factors that when calculated, produce Farm Priority Scores for each activity contributing to bacterial pollution.

$FPS_1 = BF_1 \times MH$ (Milkhouse)
$FPS_2 = BF_2 \times MS$ (Manure Storage)
$FPS_3 = BF_2 \times MF$ (Manure Spreading)
$FPS_4 = BF_3 \times P$ (Livestock Access)

where;

FPS =	Farm Priority Score
BF =	Bacteria Factor
MH =	Milk House
MS =	Manure Storage
MF =	Manure Spread on Field
P =	Manure From Pastured Animals

3.4 Sample Calculations

Farm #1: 170 beef cattle; 1 covered manure storage with 6 months storage capacity; 1 covered manure storage with 1 year capacity; manure spread on nearly level fields in spring, 4 are approximately 0.3 to 3.0 metres from a watercourse

$BF_1 = 0$	- No Dairy
$BF_2 = 1.7 \text{ X } 170 = 289$	- Bacterial Factor (manure)
$BF_3 = BF_2$	- Bacterial Factor (pasture)
MH = 0	- No Milkhouse
MS = 1 (tank storage)	- Manure Storage Score
MS = 1 - 1 = 0 (storage tank is covered)	- Runoff Considered
	- Total Manure Storage Score = 0

MF = Transport Factor (manure spread < 120 metres from a watercourse)

MF = 1.5 (slope factor) + .75 (soil cover) = 2.25

P = 0 (no livestock access)

$FPS_1 = 0 \times 0$
$FPS_2 = 289 \times 1 = 289$
$FPS_3 = 289 \times 2.25 = 650$
$FPS_4 = 289 \times 0 = 0$

Farm #11: 100 dairy cows; manure is stored in a concrete bottomed earthen pit, and is pumped out twice a year; liquid component drains into a second earthen pit. Pasture and barn area have thick grass cover with few bare spots; land has noticeable slope towards Finney Creek, about 0.5 to 2%. Milk house rinse water handled by septic tank system. Farmer gives first five pails of rinse to calves to avoid plugging up system. Manure is applied to fields in Spring (liquid) and Fall (solid). Cattle have access to creek.

BF_1 = 70 X 3 = 210 - 70 Mature Cows
BF_2 = 100 X 3 = 300 - Total Number of Animals
BF_2 = 100 X 3 = 300 - All Animals Pastured
MS = 2 (manure storage)
MS = 2 - 1 = 1 (Runoff collected in pond)
MN = 0 (adequate milkhouse disposal system)
MF = Transport Factor (manure is spread < 120 metres from watercourse)
MF = 1.50 + .75 = 2.25
P = 10 (livestock have access to watercourse)

FPS_2 = 210 x 0 = 0
FPS_2 = 300 x 1 = 300
FPS_2 = 300 x 2.25 = 675
FPS_4 = 300 x 10 = 3000

4. RANKING OF SURVEYED FARMS, REMEDIAL OPTIONS, AND ESTIMATED COSTS

This section of the report looks at the results of the farm surveys conducted during 1991, using the method explained in the previous section. The calculated scores are used as the basis for a CURB Plan for the identified watershed areas of Finney Creek and the Raisin River.

4.1 Ranking Agricultural Operations

The calculation of the Farm Priority Score (FPS) for each agricultural operation was determined by translating the collected survey data into factors. These factors were entered into a Lotus spreadsheet, which calculated individual operation priority scores for milkhouse, manure spreading, manure storage, and livestock access. The scores were then sorted, from highest to lowest, for each of the individual score items. The sorted results for each operation were further refined by referring to the original survey data and comments to account for any notable scores.

4.2 Presentation of Survey Results

The identification of agricultural operations contributing to past and current rural beach and tributary bacterial pollution is the primary purpose of this study. In the interest of confidentiality, operations will only be identified by a farm number, not by owner or specific address.

The scores and rankings in this report represent those farms within the defined agricultural study area (see Figure 2). It is estimated that the 45 farms surveyed represent approximately 95% of the total number of agricultural operations within the study area.

4.3 The Ranked Scores

Table 3 gives the overall Farm Priority Scores of the surveyed agricultural operations. Farms which did not require remedial work were not included in this table.

Table 3. Overall Farm Priority Scores (FPS)

Farm #	Milkhouse Wash Water	Manure Storage	Manure Spreading	Livestock Access
	FPS_1	FPS_2	FPS_3	FPS_4
1	0	289	650	0
2	1500	3360	720	0
4	0	357	510	510
5	0	0	450	0
6	0	0	1870	1323
7	0	2708	6770	0
9	0	0	975	0
10	0	528	396	2400
11	0	300	675	3000
12	0	1302	1860	0
13	0	440	0	0
14	0	1620	2700	1200
16	0	405	911	743
17	0	76	846	0
18	0	0	1553	0
20	1350	252	567	0
21	0	1080	405	1800
22	0	273	614	23
23	0	225	338	0
24	0	0	421	383
25	0	1057	340	1160
26	0	25	675	0
27	0	1530	765	0
29	0	0	450	371
30	750	125874	40459	365
31	0	0	495	0
32	0	0	495	0
33	0	1830	549	0
34	1800	300	150	315
35	0	747	374	1350
36	0	0	0	0
37	0	432	648	1650
38	0	240	360	203
39	0	300	135	600
40	0	480	144	960
41	0	5	2	2
42	1680	2226	716	608
43	0	2163	695	0
44	0	1155	371	0
45	0	1995	641	1800

4.3.1 Milkhouse Wash Water

A. Ranking

Table 4 ranks those operations which have unacceptable or inadequate milkhouse wash water disposal methods.

Table 4. Milkhouse Priority Scores

Rank	Farm #	Score
1	34	1800
2	42	1680
3	2	1500
4	20	1350
5	30	750

B. Remedial Options

There are several options available to operators to properly deal with milkhouse wash water.

1. Sediment tank and treatment trench system
   - sediment tank retains separated solids, liquids dissipate through evaporation/absorption by flowing through a tile treatment trench disposal field.

2. Add wash water to liquid manure system
   - may necessitate the expansion, upgrade, or replacement of existing manure storage structure to handle added liquid components.

3. Holding tanks
   - require regular emptying, and may be covered or uncovered (covered is preferred option to eliminate odour and flies)

C. Cost of Remediation

1. Sediment tank and treatment trench system
   - cost and suitability of this system are dependent on soil type, size of milking herd, and water table level.
   Current conventional system: $4,500 to $6,000
   Raised bed system: $5,000 to $7,000

2. Addition of wash water to liquid manure system (see section **4.3.4 Manure Storage**)

3. Concrete Holding Tank for 50 Head Herd Size:

   a. without lid

      30' diameter x 10' $11,000.00

   b. with lid

      30' diameter x 8' $16,500.00

   note: includes cost of labour, materials, equipment, and applicable taxes

4.3.2 <u>Livestock Access</u>

A. Ranking

The ranking of operations (see Table 5) which have livestock access to watercourses, includes both those where access is for the purpose of drinking water purposes, and also where livestock are pastured on or near runoff ditches and intermittent streams.

Table 5. Livestock Access Priority Scores

Rank	Farm #	Score
1	11	3000
2	10	2400
3	21	1800
4	45	1800
5	37	1650
6	35	1350
7	6	1323
8	14	1200
9	25	1160
10	40	960
11	16	743
12	42	608
13	39	600
14	4	510
15	24	383
16	29	371
17	30	365
18	34	315
19	38	203

B. Remedial Options

Where cattle have direct access to flowing watercourses, fencing would be required to restrict access.

1. installation of temporary electric fencing
2. installation of permanent page wire fencing or barbed wire

Bank stabilization will most likely be required to repair trampled banks and control erosion. Bank stabilization may take one or a combination of the following forms:

3. repairing trampled stream banks using appropriate materials and methods (application of rip rap and/or gabion baskets, revegetation of banks by planting appropriate species on slope and buffer strip.

Where cattle have access to an intermittent or runoff watercourse, or are confined to a fenced pasture that is adjacent to a flowing watercourse or municipal drain, the following course of actions may be taken:

4. installation of temporary or permanent fencing to restrict access to the watercourse

5. where fencing exists but is considered too close to a watercourse, fencing should be moved away from the bank to increase the buffer width from fence to streambank. Repairs to banks and/or buffer strip as needed.

6. encourage the landowner to retire the subject pasturing or yard lands, and use them for reforestation purposes, or pursue other appropriate and available options.

C. Cost of Remediation

1. temporary electric fencing (single strand with 8 foot T-post & insulators per 1000 metres; not including charger and batteries):
   $760.00

2. permanent page wire fencing (cost per 1000 metres of 8 strand including 8 foot T-post): $2,736.00
   barbed wire fencing (cost per 1000 metres of 3 strands of 13 gauge single barb wire including 8 foot T-post): $1,465.00

3. repairing streambank (includes cost of rip rap, equipment rental, labour and revegetation) cost per metre: $20.00 to $170.00

4. installation of fencing (see 1 & 2)

5. widening of buffer strip (if fence required, see 1 & 2)

6. retirement of pasture lands: grants/trees for reforestation are available through the Ministry of Natural Resources
   $ variable

note: *costs for fencing materials do not include installation or applicable sales taxes*

4.3.3 Manure Storage

A. Ranking

Table 6 shows the ranking of operations which have unacceptable or inadequate manure storage and/or containment systems.

Table 6. Manure Storage Priority Scores

Rank	Farm #	Score
1	30	125874
2	2	3360
3	7	2708
4	42	2226
5	43	2163
6	45	1995
7	33	1830
8	14	1620
9	27	1530
10	12	1302
11	44	1155
12	21	1080
13	25	1057
14	35	747
15	10	528
16	40	480
17	13	440
18	37	432
19	16	405
20	17	376
21	4	357
22	5	315
23	11	300
24	34	300
25	39	300
26	1	289
27	22	273
28	20	252
29	38	240
30	23	225

B. Remedial Measures

The situations existing with respect to manure storages within the study area are that some farm operations lack any containment of manure or manure runoff, or have insufficient storage capacity (less than 240 days or were not designed for rainfall if uncovered).

The costs below reflect the construction of a new manure storage structure, designed for 240 day storage capacity. The actual design of a structure must necessarily take into

account the particular situation existing at each farm operation.
For costing purposes, the following assumptions were made: storage size based on the requirements for a 50 head dairy herd; a 10% increase in cost was calculated per option to account for variations in storage size requirements, to compensate for the original cost calculation based on a 200 day storage period, regional price variations, and inflation.

C. Cost of Remediation

Manure and Milkhouse Waste Included:

1. roofed rectangular storage: 80' x 40' x 8' — $49,500

2. concrete pad with separate runoff storage tank; options include cost of a 65' x 65' pad
   a. concrete tank without lid: 40' diameter x 10' — $28,600
   b. concrete tank with lid: 35' diameter x 10' — $35,200

3. Concrete Tank
   a. without lid: 65' diameter x 10' — $27,500
   b. with lid: 60' diameter x 10' — $49,500

Manure Storage Without Milkhouse Wastes Included:

4. Roofed rectangular storage: 60' x 40' x 8' — $38,500

5. Concrete pad with separate runoff storage tank including cost of a 62' x 62' pad
   a. concrete tank with lid: 26' diameter x 10' — $20,900
   b. concrete tank with lid: 24' diameter x 10' — $24,200

6. Concrete tank
   a. without lid: 55' diameter x 10" — $18,700
   b. with lid: 50' diameter x 10' — $38,500

source: Harold K. House, Agricultural Engineer, OMAF May 14, 1991

For total remediation cost calculation purposes, a cost of $50,000 per manure storage has been used to account for average study area herd sizes of more than 50 head of dairy cows and/or other types of livestock such as poultry, deer, and swine.

4.3.4 Manure Spreading

A. Ranking

The ranking of operations according to their manure spreading practices in this study, is concerned with not only the time of year during which manure is spread on fields, but the proximity of fertilized and ploughed fields to adjacent watercourses. Fields ploughed within 120 metres of a watercourse are included. Table 7 gives the priority rankings related to manure spreading practices.

Table 7. Manure Spreading Priority Scores

Rank	Farm #	Score
1	30	40459
2	7	6770
3	14	2700
4	6	1870
5	12	1860
6	18	1553
7	9	975
8	16	911
9	17	846
10	27	765
11	2	720
12	42	716
13	43	695
14	11	-675
15	26	675
16	1	650
17	37	648
18	45	641
19	22	614
20	20	567
21	33	549
22	4	510
23	31	495
24	32	495
25	5	450
26	29	450
27	24	421
28	21	405
29	10	395
30	35	374
31	44	371
32	38	360
33	25	340
34	23	338

B. Remedial Measures

Based on survey responses, the overall problems associated with manure spreading are both the spreading of manure during the winter months (including the field storage of manure), and the spreading of manure in close proximity to watercourses. While most farmers claimed to leave buffer strips between the bank and the ploughed portion of fields, when asked the width of this buffer, the distance ranged from 1 to 200 metres. The majority of farmers said that they maintained buffer strips from 1.5 to 3 metres in width. Such a width of buffer strip is not considered adequate for the absorption of field runoff before it enters a watercourse.

1. encourage farmers to improve manure spreading practices, especially on sloping lands and those adjacent to watercourses, including creeks and municipal drains, and to discourage winter spreading of manure

2. encourage farmers to maintain buffer strips at least 15 metres in width

3. where buffer strips are created or expanded, apply permanent soil covers to maximize nutrient absorption and control soil erosion. Such covers include various types of grasses and legumes.

C. Cost of Remediation

1. Improve manure spreading practices (part of CURB farmer information sessions)
   $ CURB Facilitator

2. Encourage maintenance of 15 metre buffer strips (part of CURB farmer information sessions)
   $ CURB Facilitator

3. Application of permanent soil covers such as tall fescue, creeping red fescue, common timothy, birdsfoot trefoil, and crown vetch. Prices per kilogram of seed range from $1.50 to $65.00. An average cost would have to take into account seed application rates, seed type mixtures, method of seed application, slope conditions, and other special site specific considerations.
   $ variable

5. NON-AGRICULTURAL SOURCES OF RURAL BEACH BACTERIAL POLLUTION

5.1 Sources of Concern

Non-agricultural sources of bacterial pollution which are covered in this section of the plan include point sources such as sewage treatment plants and storm sewer outfalls, and non-point sources such as geese and gull feces and individual septic systems.

5.2 Source Identification and Remedial Options

This section includes a summary of non-agricultural bacterial sources affecting those beaches identified in the 1991 St. Lawrence Beaches Study Final Report, remedial measures to deal with each problem, costs (if assessed) of implementing suggested remedial measures, and possible sources of funding.

5.2.1 Sewage Treatment Plants and Sewer Outfalls

A. Summary

The Ingleside Sewage Treatment Plant and storm sewer outfalls have been identified as probable contributors to bacteria pollution affecting the rural beaches at Long Sault, particularly Woodlands Park (campground)(see Figure 3). There are several reasons why this STP can be a bacterial contributor. The plant itself dates from the 1950's when the town was created, and has since proved to be inadequate in handling the demands made upon it by increased development. In addition, breakage in the outfall pipe detected during the current year may have also contributed to some elevated bacterial counts.

The Long Sault Sewage Treatment Plant, immediately upstream of Lakeview Heights Park also has insufficient capacity to handle recent community growth. This plant may also have an impact on bacterial contamination at Lakeview Heights Park beach. Though bacterial counts during the 1990 and 1991 testing periods were acceptable, the beach had been placarded for a total of 125 days during the summers of 1988 and 1989.

B. Remedial Measures

Repairs to the Ingleside STP outfall should be completed as soon as possible. Both the Ingleside and Long Sault Sewage Treatment Plants require upgrading to reduce the likelihood of sewer overflows during major rainfall events. Currently, studies under the *Environmental Protection Act* are being conducted concerning these two existing facilities.

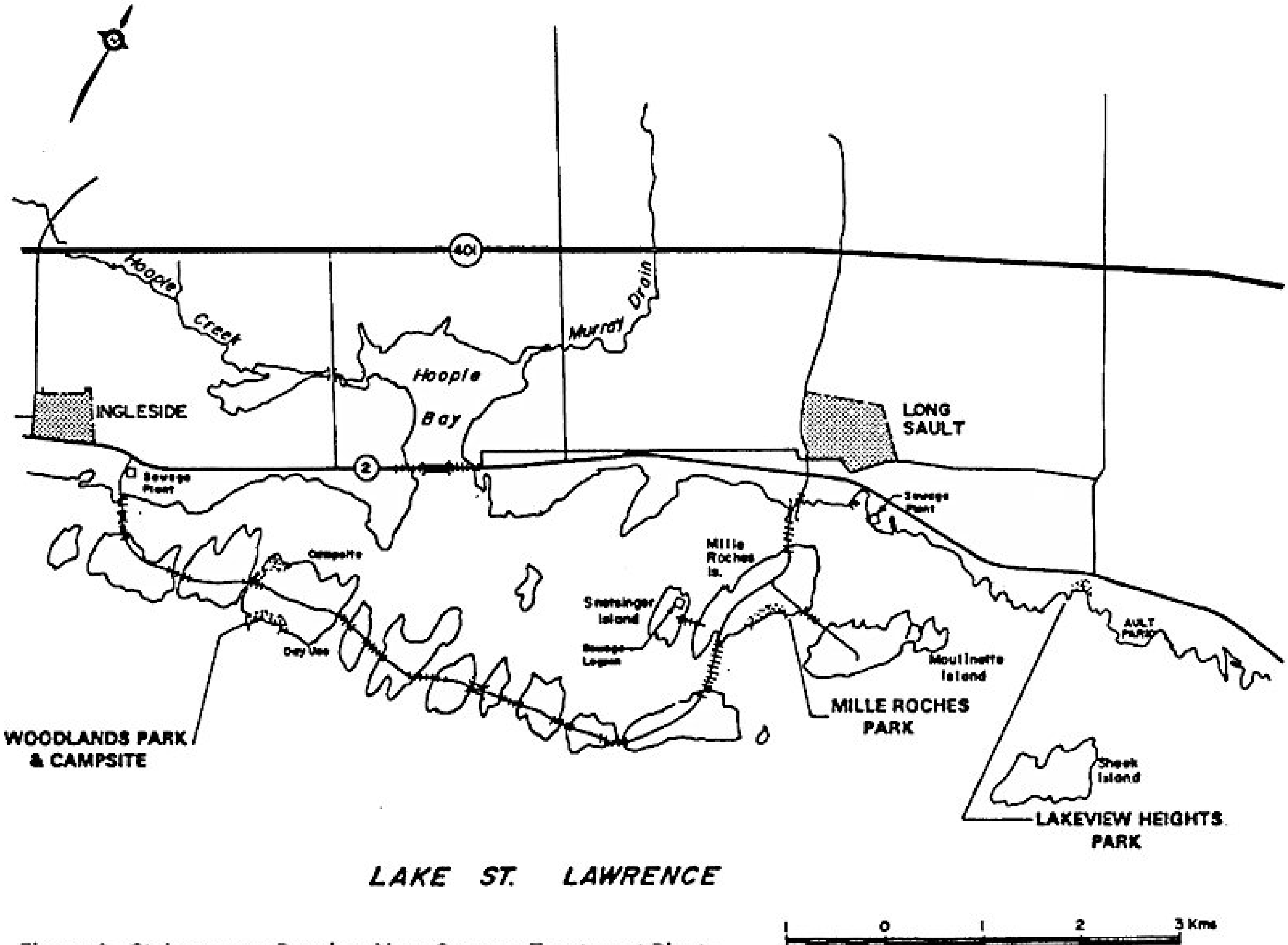

Figure 3. St. Lawrence Beaches Near Sewage Treatment Plants

C. Cost of Remediation

The urban nature of the sewage treatment plant and sewer outfalls do not qualify them for remediation grant monies under the CURB Program, therefore no cost of remediation has been assigned.

D. Source of Remediation Funding

The cost of upgrading both Sewage Treatment Plants and related outfalls will be borne by the affected municipalities and the Ministry of the Environment.

5.2.2 Individual Sewage Septic Systems

A. Summary

Individual septic systems are suspected of contributing to beach bacterial pollution. Notable suspected source areas include South Lancaster, Williamstown, and Martintown. The latter two communities are located on the Raisin River, which flows into the St. Lawrence River, immediately upstream of Lancaster and Glengarry Parks. South Lancaster is located on the banks of Lake St. Francis, a widening of the St. Lawrence River, immediately east of the mouth of the Raisin River. The urban nature of these areas makes comprehensive individual system testing a task beyond the means and resources of the Rural Beaches Program.

During the first year of the St. Lawrence Beaches Study, elevated bacterial counts were recorded nearshore in the vicinity of Summerstown, immediately upstream of Charlottenburgh Park. Probable sources are faulty septic systems immediately west of the park, especially houses and cottages in and around Pilon's Point.

In Alexandria, possible bacterial pollution sources include a small number of dwellings in and around Alexandria Lake and the Garry River, immediately upstream of Alexandria Lake. These dwellings are not connected to the Town of Alexandria sanitary sewer system.

For the purposes of the CURB Program, dwellings within the following areas were selected for inclusion in this CURB Plan. These areas include 1. the agricultural study area; 2. the waterfront area between Summerstown and Charlottenburgh Park, and 3. Alexandria Lake and the Garry River immediately upstream of Alexandria Park. The estimated number of rural dwellings with private septic systems which may be affecting beaches at both Charlottenburgh Park and Alexandria Park do not exceed thirty in number.

To determine the magnitude of the problem which individual sewage system failures create within the study area, a failure rate of 30% was assumed (M.V.C.A., 1989). The estimated number of dwellings within the agricultural study area which are not part of a sanitary sewer network is 480 (Simpson, 1991). Given these figures, it is estimated that there may be 150 inadequate septic systems contributing to beach water bacterial pollution
.

B. Remedial Measures

There are few options available to deal with the problem of faulty rural septic systems. Where populations are dense, sewage and/or water treatment plants are an option, albeit an expensive one. For more widely scattered populations, upgrading or replacing defective tanks and/or fields is a more effective and economical measure.

Faulty septic systems pose potential health hazards to rural beach users and to individual homeowners. The individual rural resident should be made aware of the need to maintain their septic systems through regular periodic pumping out of solids, and proper care of weeping beds and tiles. To ensure that rural citizens are aware of the frequency and potential hazards of septic system failures, a public awareness program should be initiated. In conjunction with such a program, citizens within the total St. Lawrence Beaches Study area should be encouraged to request inspection of their systems, if they suspect any actual or potential failures. If problems are discovered, the qualifying homeowner may request grant funding assistance.

C. Cost of Remediation

1. replacement of septic system (based on cost for a three bedroom detached dwelling:

   (raised bed) installed: $ 3450

   tank (precast concrete 4500 litre/1000 gallon): $ 725

   tile bed (4" pipe, 340' total run) $ 322

2. septic system inspection and evaluation (cost for application): $ 50

3. public awareness campaign concerning septic system program and grants available:
   $ CURB Facilitator

D. Sources of Remediation Funding

The upgrading or repair of individual residential septic systems within the Beaches study area will be subsidized by the CURB Program upon approval of applications submitted to the CURB Committee. Approved program funds will be available to assist and encourage homeowners to improve their contribution to water quality. However, the program will not pay the complete cost of septic system repairs, replacement, or upgrading. The homeowner is responsible for contributing towards the remainder of any project costs.

Public information should be a component under the CURB Program. Funding will be made available to the CURB Facilitator for public awareness programs.

5.2.3 Natural Sources of Pollution: Geese and Gulls

A. Summary

The bacterial pollution problem posed by large numbers of geese and gulls making use of the study area beaches during the water recreation season, has been studied in some detail. The geese and gull study, as outlined in the 1991 St. Lawrence Beaches Study Final Report, monitored the relative impacts of both bird species at Crysler, Farran, and Woodlands (day use) Parks.

The results of the study as stated in the 1991 St. Lawrence Beaches Study Final Report indicate that bird populations are a significant contributor of bacterial contamination at the studied beaches. Both Farran and Crysler Parks bracket the Upper Canada Migratory Bird Sanctuary, with Farran just east of it, and Crysler immediately to the west.

Mille Roches Park, though not part of the Geese and Gull Study, was observed on several occasions to have relatively large numbers of gulls present. Increased gull populations frequently coincide with increased numbers of park and beach users. As is common in almost all the parks mentioned above, both geese and gulls are willing recipients of food scraps, whether they are placed in waste cans, are fed directly by park users , or are dropped on the ground. Currently, the Ministry of Natural Resources is conducting a program to control geese populations.

B. Remedial Measures

Some possible remedial options available to control gull and geese populations at the rural beaches of Crysler, Farran, Woodlands (day use) and Mille Roches might include:

1. population control program through the Ministry of Natural Resources or other agency to reduce the overall number of geese and/or gulls in the beach and park area;

2. installation of monofilament gull screens over the beach area;

3. daily or as needed collection of bird feces from beach sands and nearby grassed areas;

4. covering of all food waste receptacles and discouragement of bird feeding by park users.

C. Cost of Remediation

1. Program to control gull populations through offspring numbers reduction (egg control program):
   $ 5,000 per year

2. erection of monofilament gull screen(s):
   $ 7 /m^2

3. frequent collection of bird feces from beach(es) and nearby grassed areas:
   $ part of park maintenance cost

4. covering of waste containers and discourage public feeding of birds:
   $ part of park maintenance cost

D. Sources of Remediation Funding

The first option should be funded jointly by the Ministry of Natural Resources and the CURB Implementation Program. The second option should be funded by the Parks Commission, with cost subsidy through the CURB Implementation Program for a demonstration project. Either one or both of the final two options would be funded entirely by the Parks Commission, perhaps reflected as part of increased operating costs, on-going park maintenance and improvement, and public relations. Options considered for Farran Park should be funded by the Parks Commission and/or the leaseholder.

5.2.4 Park Site Sources: Surface Runoff

A. Sources

Much of the local surface runoff at several of the beaches studied is channelled either by culverts or land contours to the beach area. This runoff is most likely contaminated by droppings from birds or other animals, as well as from other natural sources. Three parks in particular, Farran, Woodlands (day use) and Mille Roches Parks, have runoff waters channelled to the swimming beach area via culverts.

Most of the remaining beaches have inadequate structures to divert surface runoff around or otherwise away from the swimming beach area. Most lack berms or a consistent berm system to channel flows. This particular problem may be more acute at parks such as Glengarry, Charlottenburgh, and Farran which have extensive uphill grassed or treed areas, and fairly steep downslopes and contours which direct most if not all drain waters over the beach area(s).

B. Remedial Measures

1. redirect or relocate culverts draining local surface runoff away from the beach;

2. erect or otherwise reconstruct earthen berm structures where appropriate to redirect storm waters around or away from beach area.

C. Cost of Remediation

Farran Park:	$34,000
Woodland Park (day use):	$24,000
Mille Roches Park:	$25,000

These costs were estimated by Raisin Region Conservation Authority staff.

D. Sources of Remediation Funding

The cost of any project to redirect runoff waters away from the swimming beach area should be borne by the St. Lawrence Parks Commission, as part of its long term capital works program to maintain and upgrade park facilities.

5.2.5 Park Site Sources: Sewage Systems

A. Sources

Parks within the jurisdiction of the St. Lawrence Parks Commission rely on-site sewage disposal facilities. Most of these parks systems were installed when the parks were originally created in the 1950's. The passage of time and increased demands placed upon these systems can lead to sewage system failures. Although no study of park sewage systems was undertaken by the St. Lawrence Beaches Study, these systems can not be ruled out as possible bacterial contamination sources. This is especially true where runoff waters from upland areas travel over sewage tanks and weeping tile beds, and are channelled across beach areas.

B. Remedial Measures

It is the intent of the St. Lawrence Parks Commission to conduct an engineering study of its park sewage systems during 1992. Recommendations from this report should be considered by the Commission for immediate action.

C. Cost of Remediation

No cost of remediation has been assigned.

D. Source of Remediation Funding

All costs of remediation flowing from the engineering study should be borne by the St. Lawrence Parks Commission and/or leaseholders of any parks under its ownership.

6. TOTAL COST OF REMEDIATION

A summary of remedial measures and associated costs are given in Tables 8 and 9. The estimated total remediation costs for both agricultural and non-agricultural sources of bacterial pollution is $2.84 Million. The total cost does not include major items such as municipal sewage treatment plants.

The agricultural component of the estimate is approximately $1.76 Million. This figure was determined by multiplying the highest or most appropriate remedial option cost by the number of remedial items required, based on needs determined by the farm survey. Costs include the installation of milkhouse wash water systems, manure storage structures and livestock access control measures.

Non-agricultural bacterial source remedial costs were estimated to be $1.08 Million. Costs include private septic systems, bird population control and diversion of surface runoff waters.

Table 8 Cost of Remediation of Agricultural Sources

Item	Average Item Unit Cost	Number of Farms or Units	Total Item Cost
Milkhouse	$15,000	5	$75,000
Livestock Access Fencing	$2.70/metre	20,000 metres	$54,000
Streambank Repair	$95/metre	1,400 metres	$133,000
Manure Storage	$50,000	30	$1,500,000
Manure Spreading	$0	34	$0
Total Cost of Remediation			**$1,762,000**

Table 9. Cost of Remediation of Non-Agricultural Sources

Item	Average Item Unit Cost	Number of Units	Total Item Cost
Private Septic Systems with Permit	$3,500	150 dwellings	$525,000
Gull Control Program	$5,000	5 years	$25,000
Monofilament Gull Screens	$7 m^2		
- Crysler Park		13,900 m^2	$97,000
- Farran Park		18,800 m^2	$132,000
- Woodlands (day use)		15,300 m^2	$107,000
- Mille Roches		16,000 m^2	$112,000
Diversion of Surface Runoff Waters			
- Farran Park			$34,000
- Woodlands (day use)			$24,000
- Mille Roches			$25,000
Total Cost of Remediation			**$1,081,000**

Please note that as of the date this CURB Plan was submitted for approval, not all of the items listed in Table 9 are funded by the CURB Implementation Program. For a summary of CURB Program grant rates, please see Table 1, section 1.2.

7. BENEFITS OF REMEDIATION

The specific benefit of implementing those measures outlined in this CURB Plan is the reduction in bacterial pollution from rural sources which have caused beach closures in the recent past. Related benefits to this clean rural beaches goal can be summarized as being economic and environmental.

Economic benefits include the increase in gate receipts at parks with beaches. Several other regional CURB Plans have shown that the closure of a popular beach for even a relatively short period of time, can have significant economic impacts on both the park itself, and nearby local businesses. Most local businesses located near beaches are dependant on seasonal tourism. The loss of revenue from a long summer weekend because of high bacterial counts can be the difference between survival and failure. In the St. Lawrence Beaches Study area, those communities which benefit from increased tourism as a consequence of clean beaches are Long Sault, Ingleside, Lancaster Village, South Lancaster, Alexandria, and indirectly, the City of Cornwall.

A significant benefit derived from the CURB Implementation Program is financial assistance made available to farmers to improve and upgrade their operations, making them more ecologically and operationally efficient.

Assistance to rural homeowners to repair and/or replace faulty septic systems will not only reduce bacterial pollution, but will also reduce the serious health risk posed by malfunctioning systems.

Reduced stream nutrient loadings will mean a possible increase in fish numbers in the Raisin River, as stream fish habitats improve with less weed growth and improved water quality. Similar benefit may occur on the St. Lawrence River nearshore areas downstream of the Raisin River and Finney Creek. Increase in fish numbers will also benefit the sport fishing industry and related local businesses in the area.

Remedial measures to restrict livestock access to watercourses and the provision of vegetated buffer strips between ploughed fields and drains will not only improve water quality, but will also have the added benefit of reducing drain maintenance costs due to sedimentation and streambank erosion.

Economic benefits to local businesses supplying labour and materials towards these remedial measures will provide a much needed injection of monies into the local area economy overall.

8. IMPLEMENTATION STRATEGY

This final section of the CURB Plan deals with the process to be used to implement the proposed remedial options. The following is an outline of the process and the persons involved (please see Figure 4).

8.1 Proposal for Remedial Action: The Water Quality Improvement Plan

A Water Quality Improvement Plan is a document prepared by an applicant outlining a course or courses of action with the intent of improving surface water quality. The plan should include the following: a detailed sketch of the subject property; a detailed description of farm resources (for agricultural operations), current practices, and existing structures; a description of specific water quality problems with emphasis on locating and describing the sources and pathways of contamination; specific remedial measure or measures and alternatives to reduce the problem, and their impacts on the environment; an estimate of remedial cost and request for grant assistance.

8.2 CURB Facilitator

The facilitator's primary tasks are as follows;

1. deliver the Provincial CURB Implementation Program at the Raisin Region Conservation Authority level;

2. assist applicants in completing their Water Quality Improvement Plans for consideration by the CURB Program Local Area Review Committee;

3. verifying the completion of approved projects funded under the CURB Program, and maintain an on-going water quality monitoring program to measure the effectiveness of Water Quality Improvement Plan projects as they are put into place;

4. promote conservation and education through workshops, displays, brochures, press releases, and on-farm demonstrations.

8.3 CURB Program Local Review Committee

Applicants, upon completion of their Water Quality Improvement Plan, must submit it to the Local Review Committee for funding approval. The committee will consider the merits of the application, based upon the information supplied by the applicant, and the overall project priority determined by a set of guiding principles. The committee will have representation from the Raisin Region Conservation Authority, Ministry of the Environment, Ministry of Agriculture and Food, Ministry of Natural Resources, Eastern Ontario Health Unit, and the local chapter of the Ontario Soil and Crop Improvement Association. The CURB Facilitator will also sit on this committee, and provide information and advice as to the priority of the project(s), and verification of the project(s) completion.

8.4 CURB Program Provincial Review Committee

Upon approval of the applicants Water Quality Improvement Plan by the Local Review Committee, the plan is then submitted to a similar committee at the provincial level for consideration. Various Ministry of the Environment representatives sit on this committee, as does a representative from the Ministry of Agriculture and Food. Should the project meet the committees funding guidelines, it will be entered into a Ministry of the Environment database, and approval notification will be given to the Local Review Committee and the applicant.

8.5 Guiding Principles for Water Quality Improvement Plan Approvals

The following principles are not intended to be considered in isolation of each other. Instead, they are to considered in combination, where appropriate.

8.5.1 Proximity of W.Q.I.P. Site to Rural Beaches

Those farms or properties which have been identified as having surface water quality problems and are bacterial generators, will be given priority status the closer they are located to a rural study beach. The further away a project is from the beach, the lower its priority.

8.5.2 Cost Effectiveness

Those projects which contribute significantly to improving beach water quality, and can be achieved at moderate cost will be given priority consideration over more costly projects, particularly in the initial years of the CURB Implementation Program.

8.5.3 The Manure Practices Component

Agricultural projects with a manure management component will be given priority if they are in close proximity to a rural study beach, and are identified as actual/potential contributors of surface water bacterial pollution at downstream beaches.

8.5.4 Further Considerations

The Local Review Committee will give heed to other factors which its members consider relevant, in order to' facilitate the prioritization of submitted Water Quality Improvement Plan projects.

8.6 CURB Implementation Program Principles

Distinct from but in harmony with the principles described above, the following principles will be used to guide the overall implementation of the CURB Program at the local level during the five year period.

8.6.1 Legislation, Regulations, and Policies

The Local Review Committee must recognize and comply with legislation, relevant regulations, and policies, which are in place at the municipal, provincial, and federal level which affect any or all aspects of the CURB Implementation Program.

8.6.2 Programs and Projects

The Local Review Committee should also be aware of other programs and on-going area projects which impact upon any or all aspects of the CURB Program, in order to coordinate efforts to achieve and maintain a cleaner, healthier, environment in an economically viable manner.

8.6.3 Overall Program Project Protocol

Should the quality of water at the study beaches improve significantly during the five years, less effort will be expended on those projects with lower priorities.

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