Severn Sound

Remedial Action Plan

IMPLEMENTING THE SEVERN SOUND REMEDIAL ACTION PLAN: SOCIO-ECONOMIC CONSIDERATIONS

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Prepared for
The Severn Sound Remedial Action Plan

by

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FOREWARD

Under the amended Great Lakes Water Quality Agreement of 1987, Remedial Action Plans (RAPs) have been initiated for 43 Areas of Concern in the basin. The main purpose of RAPs is to restore and preserve the beneficial uses (e.g. restrictions on fish and wildlife consumption, beach closings, degradation of benthos and aesthetics) for the present and the future.

RAPs include the participation of government agencies, industry and public in the identification of environmental problems, alternatives for restoration, goals and uses, and the implementation of clean-up activities. The process and the plans are intended to be comprehensive in scope, and therefore encompasses a range of initiatives and activities occurring or planned throughout the community's ecosystem.

The Ontario Ministry of the Environment and Energy and Environment Canada are working with other federal and provincial agencies and local stakeholders in the Severn Sound area to develop a Remedial Action Plan (RAP). The Stage 1 report (description of environmental conditions and problem definition) was submitted to the International Joint Commission (IJC) in February 1989.

Stage 2 of the Severn Sound RAP identified and evaluated remedial options, and developed an implementation plan along with a surveillance and monitoring plan to gauge the remedial goals and targets. The Stage 2 document was completed and released in April 1993. The main challenges in Severn Sound lie in addressing excessive nutrient enrichment of the Severn Sound water and restoring and maintaining a healthy ecosystem.

As part of the Severn Sound Stage 2 document, a range of socio-economic considerations were addressed to assist in the evaluation of options and the preparation of an implementation plan. In addition, a socio-economic perspective was important in ensuring that the RAP process reflected the concepts of comprehensiveness, integration and the ecosystem approach. Consequently, some analysis in the areas of cost, cost-effectiveness, financing, economic impact and benefits was undertaken in the context of the Severn Sound RAP.

This brief report collates some of the socio-economic work undertaken in the course of preparing the Severn Sound Stage 2 document, and presents it here under one cover.

The report presents the findings and conclusions of the authors and does not necessarily represent the view or policy of the sponsoring agencies.

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SUMMARY

The cost of implementing the Severn Sound RAP is in the order of $62 million. Of this, $22 million is for sewage plants upgrades, $35 million for storm water management, $4.1 million for agricultural source control and $1 million for eliminating combined sewer overflows and raw sewage bypass at pumping stations. Excluding stormwater, the capital costs are $27 million, of which $14 million in capital projects has been committed to date. The estimate for storm water management is very rough. Revised estimates are underway.

Based on the overall comparison of cost effectiveness, the treatment of milkhouse waste is the most cost effective action for controlling phosphorus. The next most cost effective action is the upgrade of sewage plant pumping stations and some sewage plant upgrades.

Potential cost-sharing arrangements, based on existing programs, and impact are provided for sewage treatment plant and agricultural remedial options. For example, the per capita annual cost for upgrading sewage plants ranges from $3.60 to $75 depending on the community and degree of assistance. To provide further context on impact, the cost of upgrading sewage plants averages ranges from 0.5% to 16% of 1992 total consolidated municipal expenditures, for those communities in the Severn Sound Area of Concern.

As with many Ontario municipalities, financing the upgrading of sewage works in Severn Sound may be a substantial burden on municipal finances, taxation and on taxpayers. Full-cost pricing of water supply and wastewater services represents perhaps the most efficient and equitable mechanism to pay for required upgrades.

Implementing the Severn Sound RAP will yield substantial socio-economic benefit. Of those aspects that have been quantified, the direct economic impact from required capital expenditures represents the greatest potential monetary benefit. Capital expenditures could generate over 1,100 jobs and $58 million in income. Increases in water quality and aesthetics could generate additional recreational opportunities. Direct expenditures from additional and improved recreational fishing and swimming are estimated at over $1.6 million annually, with roughly 65 jobs and $ 2.1 million in annual income generated. Also, previous experience suggests a potential for further substantial benefit from land value appreciation, tourism and infrastructure savings. These last three components have not been quantified for the Severn Sound area.

The range of potential benefits is not, however, restricted to those that can be quantified. Many other social benefits will accrue from implementing the RAP. These include: improved health (and lower health costs); residents feeling better

about the place in which they live; retaining natural ecosystems for future generations; enhanced comfort and satisfaction by the business sector regarding the long-term future of investment and ability to attract workers; and satisfaction from the knowledge that the ecosystem is inherently safe, clean and productive even if one may never use it directly. Although in general the value of these social or intrinsic benefits is difficult to quantify, their impact is equally valid and important, and in many ways represents the main rationale for the initial development of the remedial action planning process in the Great Lakes basin.

1. INTRODUCTION

A range of publications and discussion papers have addressed the need for socio-economic analyses in Remedial Action Plans (IJC, 1988; Talhelm, 1989; IJC, 1990; Stokoe and Boyle, 1990; Rivers, 1989; IJC, 1991a; IJC, 1991b; Schaefer and Rivers, 1991). In short, Stage 2 documents are generally viewed as incomplete if there is no attention to social and economic information. In fact, these aspects are essential to evaluating remedial options and identifying potential implementation leads and funding sources - a key requirement of Stage 2 documents as outlined by the IJC.

As the Severn Sound RAP Stage 2 document evolved and as more precise cost estimates were generated, a range of other questions and information needs were identified. For instance, given the large number of recommended options, which ones were more cost-effective at reducing pollutant levels? What might the cost-sharing alternatives be, and how will this impact the numerous municipalities in the Area of Concern? What is the impact at a household level or on municipal budgets of implementing certain components of the RAP? What would be the impact of financing sewage plant upgrades through water bills? What other potential funding arrangements or instruments are available? Given the magnitude of required monies to implement all aspects of the RAP, what are the potential benefits, both quantifiable and intrinsic?

The answer to these kinds of questions became increasingly important as the Stage 2 document neared completion and the need for all stakeholders to know more about how implementing the RAP would affect them, became more acute.

In this context, effort was expended trying to answer some of the questions for the Stage 2 document. This report collates the analysis of the socio-economic implications of implementing the Severn Sound RAP, under separate cover.

This report is organized into three sections. The first section summarizes all RAP costs by activity, followed by cost-effectiveness analysis. The second section identifies the impact on municipal budgets from implementing the RAP, and then focuses on two of the major cost components of the RAP - sewage treatment and agricultural practices. This section also identifies scenarios of financing and the impact on users, beneficiaries and polluters. Section three identifies the potential socio-economic benefits of implementing the Severn Sound RAP.

The analysis provided herein is by no means extensive or definitive. Constraints of time and information restricted the breadth of possible analysis. Further, the conclusions from this report are illustrative and not necessarily absolute. It is intended only as a guide to aid in describing potential costs, impacts and benefits.

2. ESTIMATED COSTS OF THE SEVERN SOUND RAP

The Severn Sound RAP is at a stage where the approximate costs for clean-up are known but the detailed financial arrangements for implementation require more discussion during the implementation phase. For instance, general storm water costs, included below will require detailed study before final costs are available. Cost-sharing arrangements between the province and the municipalities for sewage plant upgrades are presently under review and may change. While still preliminary, this section begins to address these questions, the answers to which are critical to making clean-up a reality.

As mentioned, the description of potential cost-sharing arrangements outlined here is preliminary and not exhaustive. They are based on existing areas of jurisdiction and assume that existing provincial funding programs continue. The intent is solely to explore and identify possible options for funding the RAP. Also, ability to pay is assessed by comparing RAP costs with other forms of taxation and municipal spending. The principles of beneficiary and polluter pay are examined, other funding options outlined and the anticipated benefits from RAP implementation assessed.

2.1 Summary of Costs by RAP activity

Costs have been estimated for many of the phosphorus control actions (Table 2.1).

Capital costs of sewage plant upgrades, shown in Table 2.1, incorporate the expected growth in population and the target effluent phosphorus concentration outlined in the Stage 2 document. The first three plants in order have already received funding commitment while the remaining plants require final design and cost estimates. The most expensive upgrade estimated will be the new Elmvale sewage plant for which funding has already been committed. This is because a high degree of phosphorus removal and a completely new plant is required to achieve a low effluent phosphorus concentration in order to improve and protect the quality of the Wye River. The Midland plant upgrade (final design not completed) may only require upgrade of some components of the existing plant following the results of a plant optimization study presently under way. With minor additional cost the existing Victoria Harbour plant will meet the RAP effluent phosphorus target as the existing plant already includes tertiary phosphorus removal. At present, capital costs for these projects would be borne by the provincial government and the local municipality.

Replacing faulty private shoreline septic tanks and tile bed systems will cost an average of $5,000 per system. The Severn Sound RAP shoreline pollution survey has shown that up to 20% of the 3,000 shoreline systems require replacement. The responsibility for maintaining and replacing systems remains with the landowner. A combined total of up to $3,000,000 may have to be spent in order to meet the RAP.

The Town of Midland has identified two pumping stations that require upgrading in order to eliminate combined sewer overflows (CSOs) and bypass of raw sewage to Severn Sound. These upgrades have a combined cost of approximately $1,000,000[1]. Urban storm water treatment costs were not based on local cost estimates but rather were based on very general assumptions of Hickling (1992). The $35,000,000 cost for urban storm water treatment should be considered a rough estimate. Before this recommended remedial action is carried out, studies of best storm water management practices technology for the urban areas of Severn Sound and detailed local cost estimates should be carried out.

Table 2.1 also indicates costs for four agricultural source actions (livestock access or fencing, milkhouse washwater, septic system and manure runoff) as estimated using the provincial Clean Up Rural Beaches (CURB) model. The costs for each action are subdivided by capital cost and operation and maintenance costs. In all farming option calculations, we have assumed full provincial funding under the CURB project. A total potential capital cost for agricultural sources could be up to $4.1 million. These actions are the responsibility of the landowner with potential support by the CURB implementation program and the Severn Sound RAP tributary rehabilitation program, already under way in the Severn Sound watershed.

The potential total capital cost for phosphorus control is $62 million. However, more than half of the total represents a rough estimate of the cost of treating stormwater from existing urban areas. Excluding stormwater, the capital costs are $27 million. Of this amount $14 million in capital projects has been committed to date.

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[1] Funding of $165,000 has recently been provided from Jobs Ontario for these two pumping stations.

Table 2.1: Summary of costs by remedial action

	Capital Cost(1) ($1,000s)	Annual Capital Cost ($1,000s/y)	Annual O&M Cost ($1,000s/y)	Total Annual Cost (1) ($1,000s/y)	Potential Municipal Share ($1,000s/y)	Potential Phos. Reduction (kg/yr)	Cost Effect. ($/kg.yr)	Status
SEWAGE PLANT UPGRADES								
Penetang Main St	5,000	571	64	635	355	1,494	425	C
Penetang Fox St	500	57	27	84	56	498	169	C
Elmvale	7,000	799	72	871	207	1,878	464	C
Midland	6400(6)	731	344	1,075	826	2,789	385	S
Coldwater	1,460	167	40	207	68	1,187	174	P
Port McNicholl	1,500	171	14	185	53	146	1,267	P
Victoria Harbour	15	2	<1	2	2	129	16	P
	15,475			3,059	1,569	8,121	377	
PRIVATE SEWAGE (2)								
	3,000	761	0	761		1,488	511	P
URBAN STORM WATER								
CSO/Bypass	1,100	114		114	97	1,216	94	C
Storm (3)	35,000	4,000		4,000	3,400	627	6,384	S
AGRICULTURAL SOURCES (4)								
Milkhouse	159	25	12	37		1,680	14	C
Manure storage	2,873	452	79	531			333	C
Fencing	900	142	45	187			94	C
Rural septic	218	34	5	39		108	115	C
				794				

Notes:

(1) Initial capital and operating & maintenance (O&M) cost estimates from XCG, 1991b;
updated cost estimates from individual projects for Penetang Main and Fox St Plants(Reid and Associates, 1992),
for Elmvale (Ainley and Associates, 1992); municipal share calculated using current funding formula
for provincial capital grants and assuming that municipality pays all O&M costs

(2) Assuming 20% of 3,000 systems need replacement @$5K each

(3) Assuming 20% potential reduction in phosphorus load, costs using unit storm costs and areas from Hickling (1992)

(4) Assuming 20% potential reduction in phosphorus load. Individual costs have been multiplied by the number of sites needing remediation. See Table 4.3 and Appendicies 4.1 and 5.3 of the Stage 2 Report (Severn Sound RAP,1993).

(5) Since this latest draft the Town of Midland capital estimate has been revised to about $5.813M of which $2.342M consists of provincial funds through the Municipal Assistance Program.

C = funding committed

S = study underway toward final design

P = planned, no approved design or funding

2.2 Cost-Effectiveness Analysis

Table 2.1 includes the application of Severn Sound's phosphorus control strategy and a comparison of the cost-effectiveness of phosphorus control actions. Cost-effectiveness analysis provides some indication of the dollar value required for each kilogram of phosphorus removed, to assist in prioritizing remedial actions for implementation.

The cost-effectiveness for sewage plant upgrades range over two orders of magnitude from $16 to $1,267 per kg of phosphorus removed per year ($/kg.yr, see Table 2.1). The overall cost effectiveness is $377 /kg.y. The upgrade for Port McNicoll will be the least cost effective sewage plant upgrade because the plant is presently approaching the RAP effluent phosphorus objective. The minor upgrade for the Victoria Harbour sewage plant is the most cost effective. The cost-effectiveness for the Midland sewage plant, $385/kg.y, ranks 4th amongst the sewage plant upgrades while achieving the largest phosphorus load reduction (2,789 kg/y).

The cost-effectiveness of private sewage systems is slightly higher, but comparable with the sewage plants. The value of $511 /kg.y assumes that 80% of the phosphorus is removed by the system. The phosphorus removal efficiency is considered to be much less effective on the thin, granular soils of the north shore of Severn Sound where cost effectiveness would be less favourable.

The upgrade of the Town of Midland's sewage pumping stations to eliminate the combined sewer overflows and the bypass of raw sewage into Severn Sound has a very favourable cost-effectiveness ($94 /kg.y).

The cost effectiveness for agricultural sources (based on Hayman, 1989), other than targeted soil conservation measures, indicates that directing milkhouse washwater to treatment is the most cost effective action followed by restricting cattle access by fencing, upgrading rural septic systems and constructing manure storage facilities.

Based on the overall comparison of cost effectiveness, the treatment of milkhouse waste is the most cost effective action for controlling phosphorus. The next most cost effective action is the upgrade of sewage plant pumping stations and some sewage plant upgrades.

3. FINANCING REMEDIAL OPTIONS

3.1 RAP Costs in the Context of Municipal Spending

Municipal programs are typically financed through property taxes, grants, developer fees, user fees and service charges. Thus, two methods can be utilized to get a better sense of affordability or ability-to-pay of implementing RAP options: (1) evaluating the impact of implementing the recommendations on municipal budgets; and, (2) measuring the required increase in taxation to fund implementation, in this case, STP capital upgrades. While municipalities receive funds from other sources, property taxes fundamentally define the level of spending that occurs.

Table 2.1 highlights the potential cost-sharing arrangements, by community, for the suggested sewage plant upgrades in the Severn Sound area. For instance, in the Town of Penetanguishene, to achieve effluent concentrations of less than 0.1mg/LTP, which may be necessary to maintain the desired open water phosphorus concentration in Penetang Bay, the capital cost is estimated at approximately $5.5 million (Reid and Associates, 1992 estimate) or $628,000 per year over 20 years ($571,000 + $57,000). If full provincial funding of approximately 49% is obtained, the associated capital cost, to the municipality would be approximately $411,000 per annum over 20 years.[2] For comparison purposes, this translates to an annual per capita cost in the Town of Penetanguishene of $62 or $192 per household (see Table 3.2).

For further illustration, to achieve the RAP objective for effluent phosphorus reductions at Victoria Harbour, the total cost is estimated at approximately $15,000 or roughly $2,000 per year over 20 years. Given the population of Victoria Harbour, the potential full provincial funding of approximately 77% may be obtained. Consequently the associated capital costs to the municipality would be approximately $460 annually. For some indication of affordability, this translates to an annual per capita cost in Victoria Harbour of less than $1 or $3 per household. Again, it should be noted that the existing funding formula used is under review by the provincial government and may change.

To assist further in assessing the potential impact on the local community, RAP costs can also be compared to existing municipal expenditures. For example, following from the previous example, Figure 3.1 illustrates that the Village of Victoria Harbour spends more than $2.2 million per year, or approximately

[2] The precise amount of potential assistance is obtained from a 1992 provincial grant formula based on population size. This funding formula is currently under review by the provincial government and is expected to change in the near future.

$1,127 per resident per year. In 1992 Victoria Harbour allocated approximately 70% of total consolidated (operations + maintenance + capital) expenditure on such items as roadways, social services etc.; 26% on education; while 4% was transferred to the county. With respect to water and sewer services, Victoria Harbour in 1992 allocated roughly $425,000 or 16.5% of total municipal expenditures on these services.

For comparison, the annual cost to upgrade the sewage treatment plant in Victoria Harbour under the RAP, would be less than 0.5% of the total per capita consolidated municipal expenditure, or as mentioned above, less than $1 per capita per year. The sewage plant cost is also equivalent to 3% of 1992's expenditure of water and sewage services. Appendix A provides a cost comparison of sewage plant projects in relation to municipal consolidated expenditures for the other communities in Severn Sound.

For the purpose of comparison, Table 3.1 shows 1992 total expenditure on water and sewage for the municipalities in Severn Sound. Table 3.1 also shows the necessary increase in municipal water and sewage expenditure required to meet annual RAP related STP costs. For instance, in the case of Midland, 1992 water and sewage expenditure would have to increase by about 23 percent to pay for the annual RAP related STP costs.

Table 3.1 Annual RAP STP Costs as a Percentage of Total Water and Sewer Expenditure, 1992

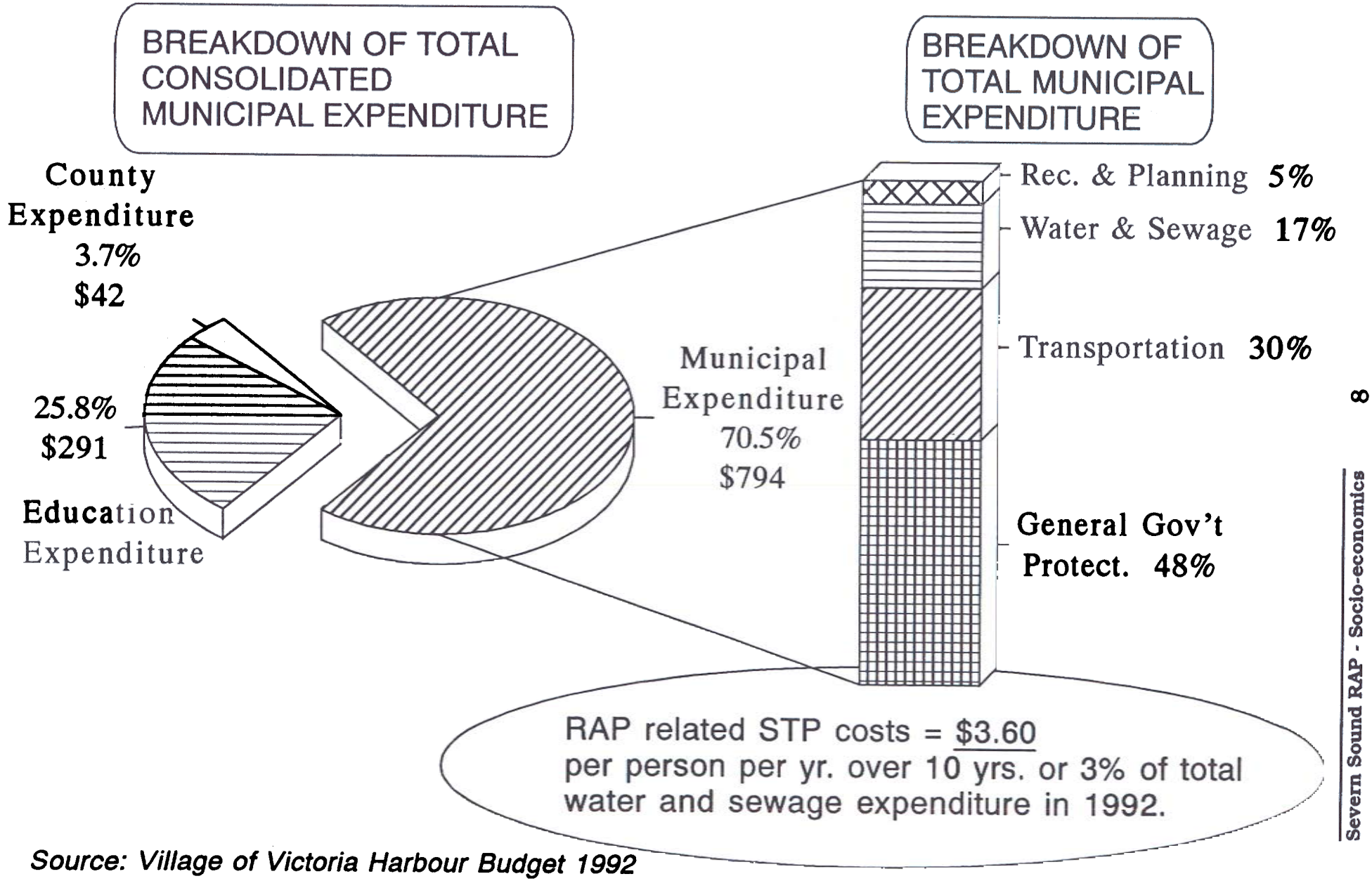
MUNICIPALITY	TOTAL WATER AND SEWAGE EXPENDITURE	PERCENTAGE INCREASE IN WATER AND SEWAGE[3]
Victoria Harbour	$425,000	3%
Elmvale	$1,135,000	7%
Port McNicoll	$369,000	16%
Coldwater	$236,000	20%
Midland	$2,732,000	23%
Penetang.	$1,656,000	24%

[3] Column three describes the necessary increase in total water and sewage expenditure, based on 1992 figures, required to pay for the average annual municipal RAP related STP costs.

Figure 3.1

STP Costs in Relation to Municipal Per Capita Expenditures

Village of Victoria Harbour



Source: Village of Victoria Harbour Budget 1992
STP costs: Assumes RAP effluent target of 0.1mg/LTP.

Over the past several years, spending in many municipalities throughout Ontario, including municipalities in the Severn Sound RAP, has increased. For instance in the Town of Midland, the 1992 budgeted expenditure is 68% higher than in 1988 and 138% higher than in 1983. After adjusting for inflation, these increases from 1988-1992 and 1983-1992 are still 46% and 72% respectively (Figure 3.2). For purposes of comparison, through 1985 to 1991, Canada's Gross Domestic Product increased by 40 percent or 5 percent per year. In other word's, the rate of municipal spending in Midland has exceeded the aggregate rate of Canada's economic expansion by a sizable measure. To recover the municipal cost of STP upgrades in Midland, consolidated expenditure[4] would have to increase by approximately 6% per year for 10 years. This assumes that no municipal monies are already allocated to STP-RAP related options. Appendix B shows similar patterns of expenditures and taxation for the other municipalities within the Severn Sound AOC.

Table 3.2 provides an indication of potential impact of phosphorus control actions on area households and also compares the cost of the RAP to current municipal expenditures (on water, sewage and waste).

Refers to municipal own expenditures (total expenditures less county and educational transfers).

Figure 3.2

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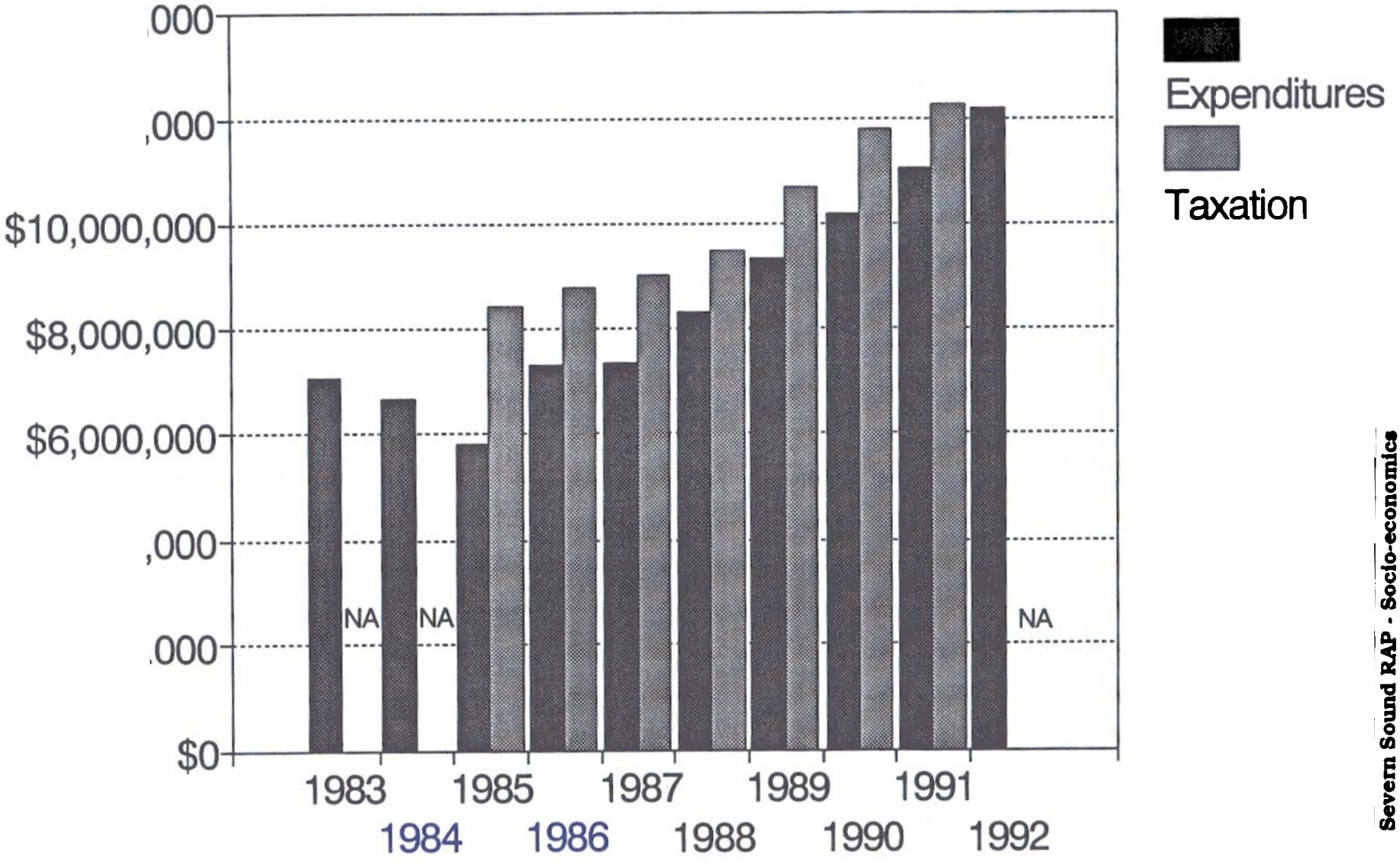


Real terms: actual dollars adjusted for inflation
Consolidated = operations & management + capital
Source: Town of Midland's Financial Information Returns

Expenditure
educational

municipal expenditure less

ity

Table 3.2

Potential Impact of Severn Sound RAP on Area Households
(annual cost to the household excluding potential provincial grants)

		Town of Midland	Town of Penetang-uishene	Village of Elmvale	Village of Victoria Harbour	Tay Twp. farm(5)	Georgian Bay Twp. Cottage
STPs	Sewage Plants (1)	$195	$192	$382	$3		
PRIVATE	Private systems (2)					$285	$535
	Urban Stormwater						
BYPASS	CSO/Bypassing (3)	$23		$38			
STORM	existing storm (4)	$332	$161	$461	$388		
W'SHEDS	Watersheds						
	Habitat Rehab. (6)						$10
	Total all actions	$550	$353	$881	$391	$1,165	$545
	Total -new storm	$218	$192	$420	$3	$1,165	$545
	Munic. Expenditure	$447	$554	$526	$508	$108	

Notes (1) costs include both additional treatment for RAP and basic expanded plant
(2) assumes septic must be replaced (ONLY 20%); farm septic replacement are subsidized under CURB; and maintenance cost of $35/yr for all systems
(3) Projects to eliminate bypassing at pumping stations and combined sewer overflows
(4) assuming $25,000/ha for storm water treatment of all existing area(Hickling, 1992); REVISED COST ESTIMATES UNDER PREPARATION
(5) NOTE THIS IS A WORST CASE EXAMPLE SHOWING THE MAXIMUM IMPACT OF A LIVESTOCK OPERATION
(6) assumes shoreland owner spends $10/yr to plant trees, shrubs and habitat enhancement

3.2 Sewage Plant Upgrades

The normal route of financing municipal expenditures is through collecting property taxes, grants, developer fees, user fees and service charges. While the town receives funds from other sources, property taxes fundamentally defines the level of spending that occurs. Impact, or affordability, can also be determined by assessing the required tax increases to fund STP options.

As mentioned in Section 3.1, property taxation has increased about 5% per year more than the average inflation level in the Town of Midland over the 12 year period from 1979 to 1991 (Figure 3.3). Much of this increase in Midland, as with many other municipalities in Ontario, is a result of the increasing cost (particularly servicing costs) of accommodating growth. Municipal budgets are being strained by the need to provide additional services (water supply, wastewater, roads, schools, recreation, etc.).

Consequently, the choice between retaining undeveloped lands as open space and urban expansion is becoming increasingly difficult. For instance, the perceived notion that urban expansion has a positive real effect on the tax base is not always the case. In fact, a growing body of literature indicates that the cost of expansion often outweighs the revenues to local governments resulting from the expanded tax base (Crain, 1988; Larson and Vance, 1988; American Farmland Trust, 1986).

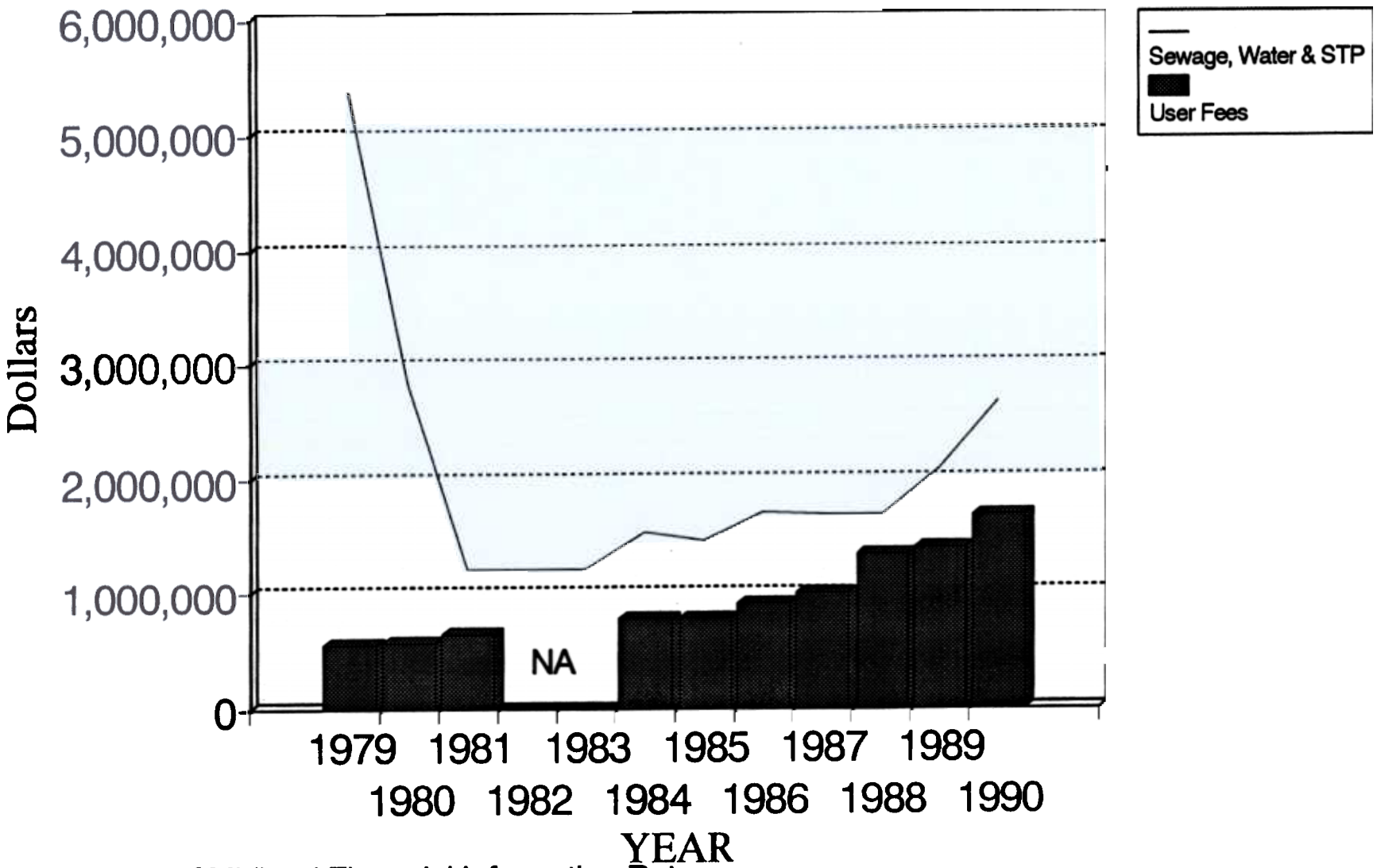
Furthermore, different development densities or land use forms have different impacts on servicing costs (American Farmland Trust, 1986; IBI, 1990). A study in Loudoun County, VA, indicated that "over a wide range of development densities ... the ongoing public costs of new residential development will exceed the (public) revenues from such development." Of those units analyzed, annual revenues per thousand dwellings were between $2.7 million and $2.9 million, while costs averaged between $3.5 and $5 million. The annual net deficit per thousand units ranged from $0.6 million to $2.3 million (1986 dollars). The greatest predicted shortfall was for the lowest-density - termed by the Trust as "rural sprawl". The least shortfall was for medium density development (AFT, 1986). Similar conclusions have been drawn from Ontario case studies (IBI, 1990).

In short and with respect to the RAP, financing the upgrading of sewage plants in many municipalities in the Severn Sound AOC has become a great burden on finances, taxation and on taxpayers.

Figure 3.3

TOWN OF MIDLAND

Water & Sewage vs User Fees



Source: Town of Midland Financial Information Returns.

An alternative, more equitable and sustainable approach that puts less burden on tax increases, is the increased use of user fees, such as water and sewage rates, and full cost pricing. Full cost pricing is viewed as including the cost of construction, operation and maintenance, renovation, and external costs (such as pollution) (Tate, 1990; Rawson, 1990; Fortin and Mitchell, 1990).

To illustrate, the Town of Midland's current average household water consumption level is 44m^3 per month (Town of Midland, Jan. 1992), compared to the provincial average of 28m^3 per month (Ontario, 1992). The Town is fully metered and has already initiated some rate charges. However, the high level of water consumption is likely related to the average monthly household water supply charge of $12.30, which is less than the 1989 provincial average of $14.33 (Tate, 1992).

The most common rate structure utilized by the municipalities in Severn Sound is that of a flat rate charge. Flat rate schedules levy fixed periodic, usually monthly, charges for water to consumers regardless of the volume of water used. The principal disadvantage of a flat rate structure is that it promotes excessive water use because the extra price of an additional unit of water is zero. Hence, customers have no or little incentive to conserve water, and the municipality has little control over water demand, except through administrative measures such as lawn watering restrictions.

The most progressive, equitable and sustainable rate structure is the increasing block rate structure (ie. the marginal price of water increases progressively through the blocks of the rate schedules). Under this pricing scheme, consumers have an incentive to conserve water to avoid the rates in the upper blocks.

This is not to suggest that the type of rate schedule alone will have a positive impact on reduced residential demand (Stevens, Miller and Willis, 1992). However, the ultimate price of water and the impact on one's water bill, as a result of a more progressive rate structure such as a constant or increasing block rate, can have some impact on how much water people use.

As shown in Table 3.3, half of all Severn Sound municipalities' average monthly household water and sewer bills are below and half are above the 1991 provincial average.

Returning to the above discussion of full-cost pricing, Figure 3.2 demonstrates the Town of Midlands' shortfall between water and sewage expenditures and revenues from water bills. Like many Ontario municipalities, the full cost of supplying the service is augmented by taxation. As a result, financing during periods of high expected capital and operation and maintenance costs (such as

those advocated under the RAP to meet more stringent environmental standards) becomes very burdensome on municipal budgets. Modifying water rates to include the full cost of constructing, maintaining, renovating, replacing and upgrading water supply and sewerage systems will avoid shortfalls in revenue during periods when these capital requirements are needed.

The last column in Table 3.3 provides some indication of the potential impact of funding the RAP-STP upgrades through water bills. For instance, increasing Midland's average water and sewer bill for all customers by 41% would generate sufficient revenue to pay for the entirety of required STP upgrades, on an annual basis. At a minimum bringing Midland up to the 1991 provincial average of $24 per month would yield almost 30% of the required revenue to finance the STP upgrade. The Town of Midland has recognized this opportunity and has already increased water and sewer rates in 1993 to move towards full cost pricing (personal communication with Town staff).

The last column of Table 3.3 clearly highlights that the full-cost recovery of STP upgrades is clearly more manageable, with the exception of Victoria Harbour, for larger municipalities. However, these estimates are upper boundary estimates. They exclude potential provincial grants, lot levies and other potential sources of revenue. Consequently, actual increases could be much lower that those reported. However, the table is useful in identifying the full impact on users from a more progressive pricing scheme. This is increasingly important since many municipalities in Ontario are increasing water rates to avoid revenue shortfalls, and in anticipation of reduced financial support from the two senior levels of government.

Furthermore, water rates in Canada are already extremely low and consumption very high in comparison to most other developed countries (OMOE, 1991; Tate, 1990). Because rates are low, there is often little reason for consumers to make an effort to conserve, hence the high water consumption levels and the increased pressure on infrastructure.

From a socio-economic perspective, full-cost pricing represents perhaps the most economically efficient and equitable mechanism for paying for the required water-related infrastructure upgrades. In the Severn Sound RAP, it is therefore important that all municipalities develop a water demand management program, including the pricing of water that reflects the full cost of providing the service.

Table 3.3 - Average Household Water and Sewer Prices in Severn Sound Municipalities, 1993 and Required Increase to Pay for STP Upgrades.

Municipality	Water Rate Structure	Monthly Water Rate	Average Monthly Water Bill	Sewage Rate Structure	Average Monthly Sewage Bill	Average Monthly Water & Sewer Bill	Maximum New Monthly Bill & % Increase to Pay for STP Upgrades[5]
Midland	Constant + Service Charges	$4.80[1] + $2.25[2] + ($1.50/1000 Gallons)[3]	$12.30	Surcharge of 56.25% June-Oct. & 75% Oct-June	$6.92 June-Oct. $9.23 Oct.June	$19.22 - $21.53	$28.11 - $30.42 41% - 46%
Penetanguishene	Flat	$9.45	$9.45	Surcharge of 110% of water rate	$10.40	$19.85	$31.54[6] 59%
Coldwater	Flat	$7.90	$7.90	Flat	$25.30	$33.20	$80.79 - 143%
Elmvale	Flat	$8.64	$8.64	Surcharge of 100% of water rate	$8.64	$17.28	$116.98 577%
Port McNicoll	Flat	$12.50	$12.50	Flat	$19.75	$32.25	$52.40 - 63%
Victoria Harbour	Flat	$15.75	$15.75	Flat	$15.75	$31.50	$31.68 0.6%
Ontario (1991)	NA	NA	NA	NA	NA	$24.00[4]	NA

Source: Personal Communication: Town of Midland, Town of Penetanguishene, Village of Coldwater, Village of Elmvale, Village of Port McNicoll and Village of Victoria Harbour, Tate and Lacelle (1992).

[1] Flat monthly water charge.

[2] Flat monthly water service charge.

[3] Constant water charge per 1000 gallons.

[4] From Environment Canada's 1991 Municipal Water Utilities' Pricing Database.

[5] This increase includes the generation of revenue from the residential, commercial and industrial sectors in proportion to consumption. The increase recovers RAP-related STP upgrades over 20 years, amortized at 10% (Table 2.1). The estimated increase is an upper limit estimate since no other sources of assistance, with the exception of Penetanguishene, are assumed (e.g. grants, lot levies).

[6] This increase incorporates the $2.6 million recently received by Penetanguishene from the province in capital grants.

3.3 Agricultural Clean-Up

Table 3.4 presents agricultural non-point source costs for the Severn Sound RAP under both polluter pay and beneficiary pay principles. In this instance under polluter pay the cost of remediation would be borne by the farm operators within the Severn Sound RAP AOC. The figures presented for Total Annual Cost/Acre and Total Annual Cost/Farm simply divides annualized costs by the number of acres and the number of operations[5]. Under the polluter pay principle the farm operator would pay $4.31 per acre or $2,808 per farm annually over ten years. The total annual cost/farm amounts to approximately one-tenth of one percent of the average Simcoe County farm's gross receipt ($98,362)[6] for the year 1991.

Table 3.4

AGRICULTURAL NON-POINT SOURCE CONTROLS-SEVERN SOUND RAP	
Capital Cost	$4,150,000
Total Annual Cost	$1,053,000
Total Acreage	244,129[7]
Number of Farms	375[8]
Number of Households	10,054
Population	26,779
Total Annual Cost/Acre	$4.31
Total Annual Cost/Farm	$2,808
Total Annual Cost/HH	$105
Total Annual Cost/Capita	$39
Average Farm Receipts	$270,571,104[9]
Average Household Income	$33,573[10]

[5] Total acreage and number of farms is based on the number of farms with greater than 10 animal units in the Severn Sound watershed.

[6] This weighted average is based on Simcoe County and Muskoka District. Source: Statistics Canada All Small Area Data, not published.

[7] Source: Severn Sound Remedial Action Plan Stage 2.

[8] Total farms represents the number of farms in the Severn Sound watershed, with greater than 10 animal units.

[9] Average farm receipts is based upon total receipts for Simcoe County $266,463,565 divided by the number of farms in Simcoe County, 2,709.

[10] This is the 1986 average household income for Simcoe County. Source: Statistics Canada Cat. No. 90-4112.

Table 3.4 also provides a figure under the title of Total Annual Cost/Household. This is based on the assumption that property-owners would benefit from the enhancement of recreational facilities and other elements of the local environment. Accordingly, under the beneficiary-pay principle the full cost would be borne by the property-owners. Consequently the cost would be $105 per household annually, which is approximately 0.3 percent of the annual average household income in the Severn Sound RAP areas.

Phosphorus loadings from agricultural sources are a major concern in Severn Sound. The discharge of waste material to streams can result in elevated bacterial concentrations, nuisance algae blooms, fish kills, and present a potential health hazard to humans and livestock using the water. Five main options have been recommended including: reducing soil erosion from farmland; restricting livestock access to watercourses; improving manure management practices; eliminating direct discharge of milkhouse washwater wastes; and upgrading faulty rural septic systems.

With respect to the financing of agricultural options, assistance is possible through the provincial Clean Up Rural Beaches (CURB)[11] program. The objective of the CURB Program is to identify the relative impact of pollution sources, and develop a course of action leading to the restoration and long term maintenance of acceptable water quality at provincial rural beaches. Severn Sound RAP has essentially completed the source identification and has become eligible for CURB implementation funding.

Under CURBs, monies are distributed to farm projects on a priority basis. If a particular farm project in Severn Sound is not of highest priority in a given year, it is eligible to apply for provincial funding in subsequent years.

CURB grants, as well as grants from sources such as OMAF's Land Stewardship Program, are available to rural residents in designated watersheds to carry out projects that address upstream pollution problems. They are directed at four of the five recommended options for Severn Sound, including:

- livestock access,
- manure management,
- milkhouse wastes, and
- septic systems.

CURBs Funding formulas: 50% to a ceiling of $2,000 for privates sewage systems, 50% to a ceiling of $5,000 for milkhouse washwater disposal systems, 50% to a ceiling of $12,000 for manure storage/barnyard runoff controls, and 75% to a ceiling of $10,000 for livestock access restriction.

The tables in Appendix C indicate agricultural costs and cost-effectiveness for the four source actions outlined above by watershed, as delineated under the provincial CURBS model. The costs for each action are subdivided by capital cost, maintenance cost and operation cost. In all farming option calculations, full provincial funding under the CURBs project is assumed.

For example, in the septic system remedial practice (option) for the North watershed, the total capital cost per project is $5000 or $500 per year. The operation cost of a septic system is $35 per year bringing the annual cost per system to $535, or $7223[12] for the watershed as a whole. The cost-effectiveness value in this case is $115.00[13] for each kilogram of phosphorus removed.

Based on the CURBS model, and aside from targeted soil conservation measures, milkhouse washwater treatment (followed by septic system improvements) proved to be the most cost-effective option.

3.4 Other Funding Options and Economic Instruments for Environmental Protection

Aside from the user fee concept outlined earlier in this section, other mechanisms for funding the RAP could include effluent charges, product charges, environment funds and a variety of other funding mechanisms or tax incentive programs.

Effluent charges are payments on the direct release of pollutants into the environment. Typically this mechanism focuses on identifiable points of discharge and levies charges more often on large sources of pollutants. Charges are more broadly applied and are therefore usually administered by a provincial or federal level of government to finance individual or collective systems of pollution control.

Product charges are applied to the prices of products which create pollution as they are manufactured, consumed or disposed of. They have been used to finance collection and treatment systems and, as with effluent charges, are typically, although not exclusively, initiated by senior levels of government.

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[12] The total number of septic system was derived by taking the total number of septic systems, within 200 meters of a watercourse, in the watershed and multiplying by 25%, or the assumed number of faulty systems.

[13] Derived by using the CURBs model equation in Appendix G.

Private and public environment funds are usually financed through lottery revenues, voluntary contributions by individuals, corporations, etc. Monies collected are generally dedicated to habitat restoration, conservation and protection, and wildlife.

Other funding mechanisms can include: **'earmarked' taxation funds** (taxes levied on income or property used to raise revenue to fund or finance specific environmental-related projects) or the **short-term reallocation of municipal expenditures** (where some monies can be moved from certain areas to specific environment-related issues for the short-term).

Other economic mechanisms that are not necessarily funding sources but can be implemented as instruments for enhanced environmental protection include **tax incentives**. Usually, these incentives (such as credits, exemptions or deductions) can be offered to provide preferential tax treatment to encourage certain types of investment. For instance, environmental tax incentives could reduce the price of environmentally friendly activities (e.g. recycling rebates), encourage capital investment in pollution abatement and control equipment (e.g. tax credits, accelerated deductions), or lower the cost of funds for investments in environmental projects (e.g. tax-free 'green bonds').

There is a growing body of literature devoted to alternative funding mechanisms and economic instruments for environmental restoration and protection (Canada, 1992; Hickling, 1992; Apogee, 1992). More effort in assessing the utility and effectiveness of individual mechanisms is important in identifying their specific usefulness for Severn Sound.

4. THE BENEFITS OF REMEDIATION

The implementation of the Severn Sound RAP will yield considerable benefits not only for the environment, but also for the economic and social makeup of the area. Identification and quantification of these benefits, where possible, is important to put the overall costs of the RAP in some perspective, to help prioritize remedial options, and to enhance the awareness of society and decision-makers of the numerous benefits that can result from commitment to RAP implementation.

The discussion of benefits here is not exhaustive, nor is the quantification of certain benefits precise. However, it does represent the best available information. The estimates provided herein do not represent the full and absolute "value" of benefits, but are rather close economic approximations given available techniques. The exact magnitude of benefits will be a function of numerous factors, the most influential of which is the extent of remediation. Ultimately, the "real" benefit or value of the RAP defies adequate quantification.

The socio-economic benefits associated with the Severn Sound RAP can include employment and income generated from expenditures on capital projects, increased recreational opportunities, a range of social benefits, increases in land values, tourism activity, and infrastructure savings.

4.1 Employment and Income Generated

The current cost estimate for remediating Severn Sound is in the order of $65 million. Associated with this cost (or alternately, investment in enhancing environmental conditions) is the economic impact (in the form of employment and the generation of income) created by these expenditures that will accrue to the area.[14]

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[14] Increased demand for goods and services, to implement the capital component of the RAP generates, for instance, an increase in labour and material requirements. An increase in the need for these elements translates into an increase in employment and income. Ultimately, all expenditures made in connection with implementing RAP options translates into income either in the form of profits, labour or taxes. Recipients of the income spend part or all of the proceeds and these expenditures reverberate through the economy with further employment and income effects. The economic impact can be estimated by way of 'multipliers' which relate the final increases in employment and income to the direct expenditure.

If for instance, $21.9 million is spent on capital sewage treatment plant upgrades, a total of approximately 404 direct and indirect jobs would be created and $ 19.6 million in associated income generated (Table 4.1). Similarly, capital expenditures on private septic systems, urban stormwater control and treatment, and agricultural options requires the input of labour and materials, generating employment and income. In total, if all capital components of the Severn Sound RAP are implemented, roughly 1200 jobs and $58 million in income could be generated.

The above estimates are likely underestimated since the projects would typically be carried out over a number of years, increasing the total cost. These jobs are one-time in nature and would not continue after capital projects are complete. The requirements of additional annual operating and maintenance (O&M) could, however, result in the need for more ongoing employment. Obviously the economic impact in this area will be less if the full extent of RAP remediation is not undertaken.

Table 4.1 - POTENTIAL ECONOMIC IMPACT FROM INITIAL CAPITAL EXPENDITURES

AREA OF CAPITAL EXPENDITURE	CAPITAL COST	JOBS CREATED[a]	INCOME GENERATED[b]
Sewage Plant Upgrades	$21,875,000	404	$19,687,000
Private Sewage	$ 3,000,000	55	$ 2,700,000
Urban Stormwater	$36,000,000[c]	666	$32,400,000
Agricultural	$4,150,000	76	$ 3,735,000
TOTAL	$65,000,000	1,201	$58,522,000

NOTES:

[a] Assumes the creation of 11 direct and 7.5 indirect jobs for every $1 million expended on capital projects (Source: Jobs Ontario multiplier).

[b] Based on an additional income multiplier for non-residential construction of 0.9 (Source: MMM, 1988).

[c] Includes $36 million for urban stormwater treatment. This cost, and the resultant potential economic impact, should be treated as very rough estimates.

4.2 Recreational Uses

4.21 Swimming

Implementing remedial options will also have some impact on the opportunity and value of increased recreational activity. One study undertaken earlier in the RAP process estimated the use benefit associated with achieving a select number of water quality objectives (Apogee et al., 1990). The study included estimates for all RAP sites and estimated that in Severn Sound, remediation could result in 130,000 occasions per year in new swimming activity, with an associated value of $800,000 annually (in 1989 dollars). In 1993 dollars, the value of this additional use is around $913,000 annually.

The use value is referred to here as the consumer surplus, or the benefit derived from the creation of water or environmental conditions that makes possible certain activities which were not formerly possible or not enjoyable to the same extent as under previous conditions. A value of $6 per swimming occasion was used. That is, the typical price a recreational user incurs in the course of participating in the activity (usually travel costs and time incurred in getting to the site) is around $6 for swimming.

In addition to direct expenditures, there are employment and income generation opportunities associated with the increased swimming activity. These benefits can also be quantified through the use of multipliers - in this case, the generation of 40 person years of employment and an income generated multiplier of 1.3 for every $1 million in expenditures[15]. Consequently, direct expenditures on swimming of $913,000 will yield 37 person years of employment and $1,186,900 in income generated, annually.

This estimate is by no means definitive since the economic value one associates with a swimming occasion is highly personal and may not be fully captured in a travel cost survey. Also, use value estimates do not consider external factors such as suitable access and facilities. Further, the estimated additional recreational activity does not consider potential diverted activity, nor does the overall increase in user days include participation from residents outside of the

[15] Economic impact multipliers for expenditures on new recreational activity are generally higher than the impact multipliers for implementing and maintaining the control (capital) measures, because the industry serving recreational activity is generally more labour intensive and there are fewer leakages to regions outside of the Ontario economy (OMTR, 1985).

Area of Concern and the rest of the province[16]. This last point suggests that the estimate of use and its associated value, is likely an under-estimate given the substantial out of area participation in recreational activity in Severn Sound. Consequently, these estimates should be treated as economic approximations, and not indicative of the full economic value or benefit of recreational activity from implementing the RAP.

4.22 Fishing

The same study estimated the increase in use value for enhanced sportfishing at $300,000 per year (1989 dollars). This estimate includes the benefit derived solely from the increase in value from reduced consumption restrictions[17], and does not include new sportfishing activity. However, implementing the RAP, along with the current stocking programs, could return catch levels and angling effort to mid-1970s levels.

Creel surveys in Severn Sound indicate a significant drop in total weight caught (28,119 kg) and rod-hours of effort (165,058) in 1976 and 1975 respectively, to 1992 levels of 10,477 kg and 120,134 rod-hours of effort. If top-level predators (i.e walleye and northern pike) are restored to early 1970's levels, total fishing effort could conceivably return and exceed early 1970's levels. For instance, returning the total effort to 165,068 rod-hours could generate an additional 11,231 user days of activity, with a use value of around $325,700 per year[18]. Combined, and adjusted to 1993 dollars, the potential economic use benefit for recreational fishing could be around $714,000 per year. As with swimming, this additional direct spending would spin-off to create 37 person years of employment and approximately $928,200 in additional income, each year.

In 1993 dollars, the annual monetary benefit from increased and enhanced swimming and sportfishing would total roughly $1.6 million in direct use expenditures, 66 person-years of employment and over $2 million in income generated.

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[16] The study estimated new swimming activity by residents of the RAP sites only. Swimming which may be done by people from neighbouring locations or other parts of the province is not included in the estimate of new swimming activity.

[17] Based on an increase in consumer surplus from $19 per angler day for sportfishing with consumption restrictions, to $29 per angler day for unrestricted sportfishing.

[18] Based on four rod-hours equalling one angler day of activity, with a consumer surplus of $29 per angler day.

Although no estimates have been prepared, there is likely significant benefit associated with the enhanced use of recreational boating and a host of other outdoor activities in the AOC. Consequently, the above estimate by no means represents the total potential recreational benefit associated with RAP implementation.

4.3 Social or Non-Use Benefits

The Apogee study also offered another measure of RAP benefits - non-use, social or intrinsic benefits. Non-use values are those which individuals place on improving (or preventing deterioration in) environmental quality, but which are not related to current use of the resources affected. In other words, and as opposed to the previous recreation estimates, a non-use estimate is the value associated solely with the satisfaction of residents knowing that the water in Severn Sound is cleaner, regardless of whether they participate or use the resource. Quantification of these values has generally been approximated by the use of willingness-to-pay surveys[19].

In Severn Sound, the non-use value associated with enhancing water aesthetics, the sportfishery **and** swimming was estimated at $ 800,000 per year (or $913,000 in 1993 dollars)[20].

These social values have been expressed in economic terms to help in demonstrating the general worth or magnitude of the benefit. Many other social benefits, although not quantified, will accrue from implementing the RAP. These include improved health; residents feeling better about the place in which they live; retaining natural ecosystems for future generations; enhanced comfort and satisfaction by the business sector regarding the long-term future of investment and ability to attract workers; and satisfaction from the knowledge that the ecosystem is inherently safe, clean and productive even if one may never use it directly. Although in general the value of these social, intrinsic or non-use

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[19] There remains some debate regarding the usefulness of this technique for valuation. For instance, simply the design of such a survey can greatly impact the response and hence the value one attaches to a resource or opportunity. Consequently, the estimates here should be regarded as illustrative, rather than conclusive. Despite its limitations, willingness-to-pay studies do assist in demonstrating that many individuals value environmental improvements, irrespective of whether they ever expect to directly participate or use the resource.

[20] Based on an average willingness to pay of $65 associated with swimmable water, $50 associated with fishing, and $15 associated with aesthetics, per household.

benefits is difficult to quantify, their impact is equally valid and important, and in many ways represents the main rationale for the initial development of the remedial action planning process in the Great Lakes basin.

4.4 Property Values

Although there has been no quantification, there is some rationale to suggest that the Severn Sound RAP (through improved environmental conditions, water quality, recreational opportunities, etc.) could impact land values positively.

Previous study in other locations in North America (Dornbusch and Barrager, 1973; Dornbusch et al., 1975) has resulted in a range of results. Studies at residential sites have indicated that effective pollution abatement on polluted water bodies can increase the value of single-family homes by 0% to 25%. Pollution abatement on rural land near a large water body can be positively impacted by 8% to 65%. This positive impact on property values was felt up to 4000 feet (1.2 km) away. The large range of appreciation was attributable to a number of factors or conditions. These conditions included: the specific land use type; the extent of initial degradation/contamination and duration of pollution in the water body; the breadth of subsequent clean-up; distance of property from shore; the type and size of the water body; visual and physical access; the perceived improvement; as well as a number of locational amenities (i.e. parkettes) or disamenities (i.e. industry, major transportation corridors). Given the abundance of these external influences in Severn Sound, exact quantification becomes difficult and imprecise.

However, a descriptive assessment of the potential impact of the Severn Sound RAP on land values can provide a number of observations. First, because of the nature of the approach utilized in RAPs (i.e. ecosystem approach, comprehensive and integrated principles), it will yield improvements not just to water quality (like previous studies), but to a range of other environmental conditions throughout and beyond the Sound. Consequently, this approach suggests that the extent of clean-up is high and the potential impact on land values is positive. Second, previous research indicates that land immediately adjacent to the Sound waters is likely to realize the greatest appreciation in value. This is not to say that waterfront owners would be the sole beneficiaries. As environmental conditions and water quality in the Severn Sound area continue to show improvement, the entire Severn Sound area could become increasingly desirable as a place to live, recreate and to do business. As a result, even land well removed from the water's edge might expect to show some appreciation. Third, there are very few, if any, disamenities significant enough in the Area Of Concern (AOC) to buffer or reduce the extent of potential appreciation. Finally, implementing the RAP will reduce

the degree of nutrient enrichment in Severn Sound, yielding an improvement in aesthetics. This is perhaps the most noticeable impairment improvement to the public, and can further positively impact land values.

There is, however, substantially less previous study and experience with the impact specifically on recreational land use which makes up a significant proportion of the usage of the AOC. From an initial review though land values could potentially increase as a result of implementing the RAP.

4.5 Tourism

Tourism is one of Ontario's most important industries. It ranks fourth in terms of export earnings and sixth in terms of its income multiplier. In 1988, direct tourism expenditure in Ontario amounted to almost $15 billion. This generated total income of $22 billion, 750,000 person-years of employment, and over $6 billion in taxes to all levels of government (MTR, 1990).

Recent trend analyses show that weekend trips to nearby areas are on the increase, while the traditional two-week summer vacation is on the decline for today's travellers. Also, outdoor recreation, natural, historical, and cultural resources are increasingly important attractions for travellers. Recreational and environmental opportunities, as well as historic and cultural attractions, can be relevant to greenway projects, which often link together cultural and natural resources. The Wye Marsh and Martyrs' Shrine are good examples of this in the Severn Sound area.

Tourism is a significant component of the Severn Sound economy. The Georgian Lakelands area generated $415 million in income and employed 18,500 people in 1985 (MTR, 1985). In Midland alone, tourism generates $15-$17 million in annual retail sales (Midland, 1991). The tourism component of the AOC's economy is expected to grow as approximately 2,600 condominium units are proposed from Penetanguishene to Victoria Harbour, and 2,600 additional boats slips are planned for the Severn Sound area (Keir, 1991).

The potential impact of the RAP on waterfront development and tourism in the area is best articulated by the Centre for the Great Lakes' recent report. "Centre research found that new development enhances property values and image of urban communities.... Keys to successful waterfront development include promoting public access and recreation,... linking waterfront renewal with economic development,... to make the waterfront a year-round amenity,... and restoring waterfront environments. The success of the region's waterfront development effort is inextricably linked to improvements in the water quality of

Table 4.2 - SUMMARY OF POTENTIAL QUANTIFIABLE BENEFITS OF IMPLEMENTING THE SEVERN SOUND RAP - 1993

	Increase in Annual User Days	Use Value per Year	Non-Use Value per Year	Person-Years of Employment	Income Generated
Direct Economic Impact from Capital Expenditures				1,169	$58,522,000
Recreational Fishing	11,231	$714,000 ($300,000- unrestricted[a] -1989) ($325,700- add. activity[b] -1989)		29/yr	$928,200/yr
Swimming	130,000	$913,000 ($800,000 - 1989)	$913,000 ($800,000[c] - 1989)	37/yr	$1,186,900/yr
Other Benefits 1. Property Values - not quantified although previous research shows a positive correlation between water quality improvements and land values. Range of appreciation in previous study was from 0% to 65% depending on land use. 2. Tourism - although unquantified, RAP instrumental in the potential development of some 2,600 condominium units from Penetanguishene to Victoria Harbour and 2,600 additional boat slips in the Severn Sound area (Keir, 1991). 3. Infrastructure - unquantified, but potential long-term deferral of infrastructure expansion.					
TOTALS	**141,231**	**$ 1,627,000**	**$913,000**	**1,169 - one-time 66/yearly**	**$58.5 M - one-time $ 2.1 M/yearly**

Notes: Estimates in 1993 dollars.
[a] Use value associated with unrestricted fishing.
[b] Use value from additional new sport fishing activity to 1975 levels.
[c] Includes willingness to pay for enhanced water aesthetics, sportfishing and swimming.

REFERENCES

American Farmland Trust (1986) Density-Related Public Costs. Washington, D.C. From National Park Service (1991) Economic Impacts of Protecting Rivers, Trails and Greenway Corridors- A Resource Book. 2nd Ed. Rivers, Trails and Conservation Assistance, NPS.

Anthony Usher et al. (1987) Beach Use and Environmental Quality in Ontario. Prepared for Policy and Planning Branch, Ontario Ministry of the Environment by Anthony Usher Planning Consultant, Jack B. Ellis and Associates Limited, and Michalski Associates. May.

Apogee et al. (1990) Overview Economic Assessment of Remedial Action Plans for the Great Lakes' Areas of Concern. Prepared for Policy and Planning Branch, Ontario Ministry of the Environment by Apogee Research, Peat Marwick, and James Hickling Management. April.

Apogee Research (1992) An Ontario Test Case of Economic Instruments in Support of Environmental Protection Goals. Prepared for Ministry of the Environment. October.

----- (1992) "Canadian Water Utility Makes Successful Switch to Metering" in Water:Engineering and Management, March.

Canada, Government of (1992) Economic Instruments for Environmental Protection. A Discussion Paper prepared under Canada's Green Plan. Supply and Services, Ottawa.

Centre for the Great Lakes (1991) Water Works 1991 - A Survey of Great Lakes/St. Lawrence River Waterfront Development: How Great Lakes/St. Lawrence River cities keep their waterfronts thriving in the 1990s. Michigan.

Coldwater, Village of Financial Information Returns, Financial Reports and Budgets, 1980-1992, Treasury Department.

Crain, J. (1988) Director, Real Estate/Open Space, City of Boulder, Colorado. Letter to Dr. A. Bartlett. From National Park Service (1991) Economic Impacts of Protecting Rivers, Trails and Greenway Corridors- A Resource Book. 2nd Ed. Rivers, Trails and Conservation Assistance, NPS.

Dornbusch, D.M. and S.M. Barrager (1973) Benefit of Water Pollution Control on

Property Values. Prepared for Office of Research and Monitoring, U.S. EPA, Washington, D.C. U.S. EPA 600/5-73-005.

Dornbusch, D.M., C.O. Falcke, P.M. Gelb, and L.W. Kozimer (1975) Benefits from Water Pollution Abatement on Property Values. National Commission on Water Quality, 75/21.

Ecologistics (1990) Benefits to Beach Users from Water Quality Improvements. Prepared for Policy and Planning Branch, Ontario Ministry of the Environment. November.

Elmvale, Village of Financial Information Returns, Financial Reports and Budgets, 1980-1992, Treasury Department.

Fortin, M. and B. Mitchell (1990) Water and Wastewater Charges for Ontario: The User Pay Principle. October.

Hickling Corporation (1992) Potential Funding Mechanisms for Implementation of Remedial Action Plans and their Impact on Users, Beneficiaries, Polluters and Society. Prepared for Ontario Ministry of the Environment, Toronto. April.

IBI Group (1990) Greater Toronto Area Urban Structure Concepts Study - Background report No. 4, Water Sewers and Solid Waste. Prepared for the Greater Toronto Coordinating Committee. June.

IJC (1988) Remedial Action Plan Research Needs. Compiled by C.B. Gray and D. Rathke for the Council of Great Lakes Research Managers. October.

IJC (1990) "Roundtable on Socio-economic Considerations Relevant to Remedial Action Plans" Unpublished summary of thoughts and conclusions. Windsor, Ontario. September.

IJC (1991a) Stage 2 Remedial Action Plans: Content and Key Issues. Report of the Stage 2 RAP Workshop Steering Committee held on April 15-16 in Romulus, Michigan.

IJC (1991b) Summary of the "Remedial Action Plan Forum" in Traverse City, Michigan, September 27-28.

Keir Consultants Inc. (1991) Severn Sound Remedial Action Plan - Socio-Economic Profile of the Community. Prepared for Inland Waters Directorate, Environment Canada, September. Burlington, Ontario.

Larson, A.B. and T.A. Vance (1988) "Fiscal Impacts of Residential Development in Culpeper County, Virginia." Piedmont Environmental Council, VA. From National Park Service (1991) Economic Impacts of Protecting Rivers, Trails and Greenway Corridors- A Resource Book. 2nd Ed. Rivers, Trails and Conservation Assistance, NPS.

Midland, Town of (1991) Midland Economic Strategy. Prepared by Stephen Chait Consultants Ltd. Midland Community Planning Study, Final Discussion Draft. January.

Midland, Town of Financial Information Returns, Financial Reports and Budgets, 1980-1992, Treasury Department.

Muller, R.A. (1985) The Socio-economic Value of Water. Prepared for Inquiry on Federal Water Policy, Research Paper No. 5., Ottawa. March.

National Park Service (1991) Economic Impacts of Protecting Rivers, Trails and Greenway Corridors- A Resource Book. 2nd Ed. Rivers, Trails and Conservation Assistance, NPS.

Ontario, Ministry of Environment (1991) "Water Conservation in Ontario: Implementing the User Pay System to Finance a Cleaner Environment" Technical Report for MISA Advisory Committee. May.

Ontario, Ministry of Municipal Affairs (1993) "Cross-Boundary Issues in South Central Ontario" A discussion paper.

Ontario, Ministry of Natural Resources (1992) "Water Efficiency Strategy Workshop: Working Document Summary" Vol. 3.6, February.

Ontario, Ministry of Tourism and Recreation (1990) Tourism and the Economy, Ontario Visitor Trend Analysis and Strategic Directions for Growth, Summary.

Ontario, Ministry of Tourism and Recreation (1985) "Economic Impact of Tourism in Ontario".

Patry, G.G. and I. Takacs (1990) "Assessing the Effects of Hydraulic Load Reductions on Wastewater Treatment Plant Performance" Dept. of Civil Engineering, McMaster University, Hamilton, Ontario. Prepared for Environment Canada.

Penetanguishene, Town of Financial Information Returns, Financial Reports and Budgets, 1979-1992, Treasury Department.

Port McNicoll, Village of Financial Information Returns, Financial Reports and Budgets, 1980-1992, Treasury Department.

Rawson Academy of Aquatic Sciences (1990) Towards User Pay for Municipal Water and Wastewater Services. Occasional Paper No. 5. December.

Richardson (1989) Economic Benefits of a Clean Environment: Sudbury Case Study. Prepared for Department of the Environment, Canada by N.H. Richardson Consulting, Toronto. October.

Rivers, R. (1989) "Socio-economic Activities for Great Lakes Remedial Action Plans" Unpublished background and discussion document prepared for Canada-Ontario Agreement Steering Committee. Inland Waters Directorate, Environment Canada. February.

Rivers R. and R. Kalinauskas, (1991) "Water Demand Management: an Evaluation of a 'Soft' Solution for the Hamilton Harbour Remedial Action Plan", Water Science Technology, Vol. 23, Kyoto, Japan, pp. 105-109.

Statistics Canada (1991) Population and Dwelling Counts Cat. No. 93-304

Statistics Canada (1991) 1991 Census of Agricultural Small Area Data Cat. No 95-356.

Statistics Canada (1986) Household Income Figures Cat. No. 90-4112.

Schaefer, K.A. and R. Rivers (1991) "Towards Sustainable Remedial Action Planning in the Great Lakes: Environment-Economy Integration" Presented at Waterscapes '91 conference, Saskatoon, Saskatchewan, June 2-8. Inland Waters Directorate, Environment Canada.

Stevens, T.H., Miller, J. and C. Willis (1992) "Effect of Price Structure on Residential Water Demand" in Water Resources Bulletin 28 (4), 681-685.

Stokoe, P.K. and D. Boyle (1990) "Framework for Integrating Socio-economic Considerations into Remedial Action Plans" Unpublished paper prepared for the International Joint Commission. Dalhousie University, Halifax, Nova Scotia. March.

Talhelm, D.R. (1989) "A Framework for Economic and Social Considerations in Remedial Action Plans" Unpublished discussion paper prepared for Societal Committee, Science Advisory Board, International Joint Commission. Michigan State University, East Lansing, Michigan.

Tate, D.M. (1990) Water Demand Management in Canada: A State-of-the-Art Review Social Science Series No.23, Inland Waters Directorate, Environment Canada, Ottawa.

Tate, D.M. and D.M. Lacelle (1992) Municipal Water Rates in Canada, 1989 - Current Practices and Prices Social Science Series No. 27, Ecosystem Sciences and Evaluation Directorate, Environment Canada, Ottawa.

Tokarz, G. (1979) Demand for and Supply of Recreational Boating Opportunities in Southern Ontario.

Tourism and Recreation, Ministry of (1985) Ontario Travel Surveys.

Upper Thames River Conservation Authority (1989) Clean Up Rural Beaches (CURB) Plan for the Fanshawe, Pittock and Wildwood Reservoirs
Prepared for Ontario Ministry of the Environment.

Victoria Harbour, Village of Financial Information Returns, Financial Reports and Budgets, 1980-1992, Treasury Department.

Wynia, W., Sudar, A. and G. Jones (1990) Recycling Human Waste: Composting Toilets as a Remedial Action in Hamilton Harbour Water Planning and Management Branch, Inland Waters Directorate, Environment Canada, Burlington, Ontario.

XCG Consultants Ltd.(1991) A Review of the Performance and Upgrading Alternatives for Water Pollution Control Plants Discharging to Severn Sound
Prepared for The Severn Sound Remedial Action Committee and Wastewater Technology Centre. September, Kitchener, Ontario.

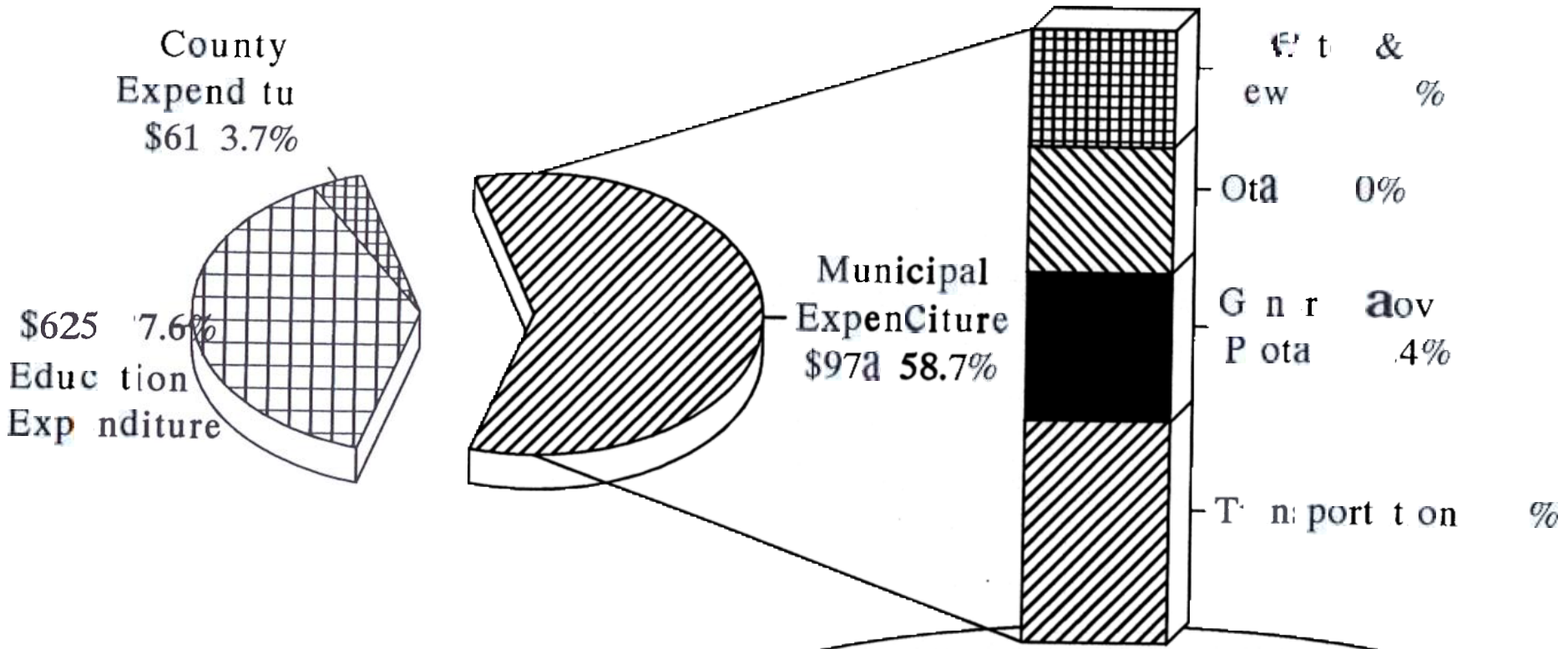
APPENDIX A

STP Cos n Re a on o Mun c pa Per Cap a Expend ures

Village of Coldwater

BREAKDOWN OF TOTAL CONSOLIDATED MUNICIPAL EXPENDITURE

BREAKDOWN OF TOTAL MUNICIPAL EXPENDITURE

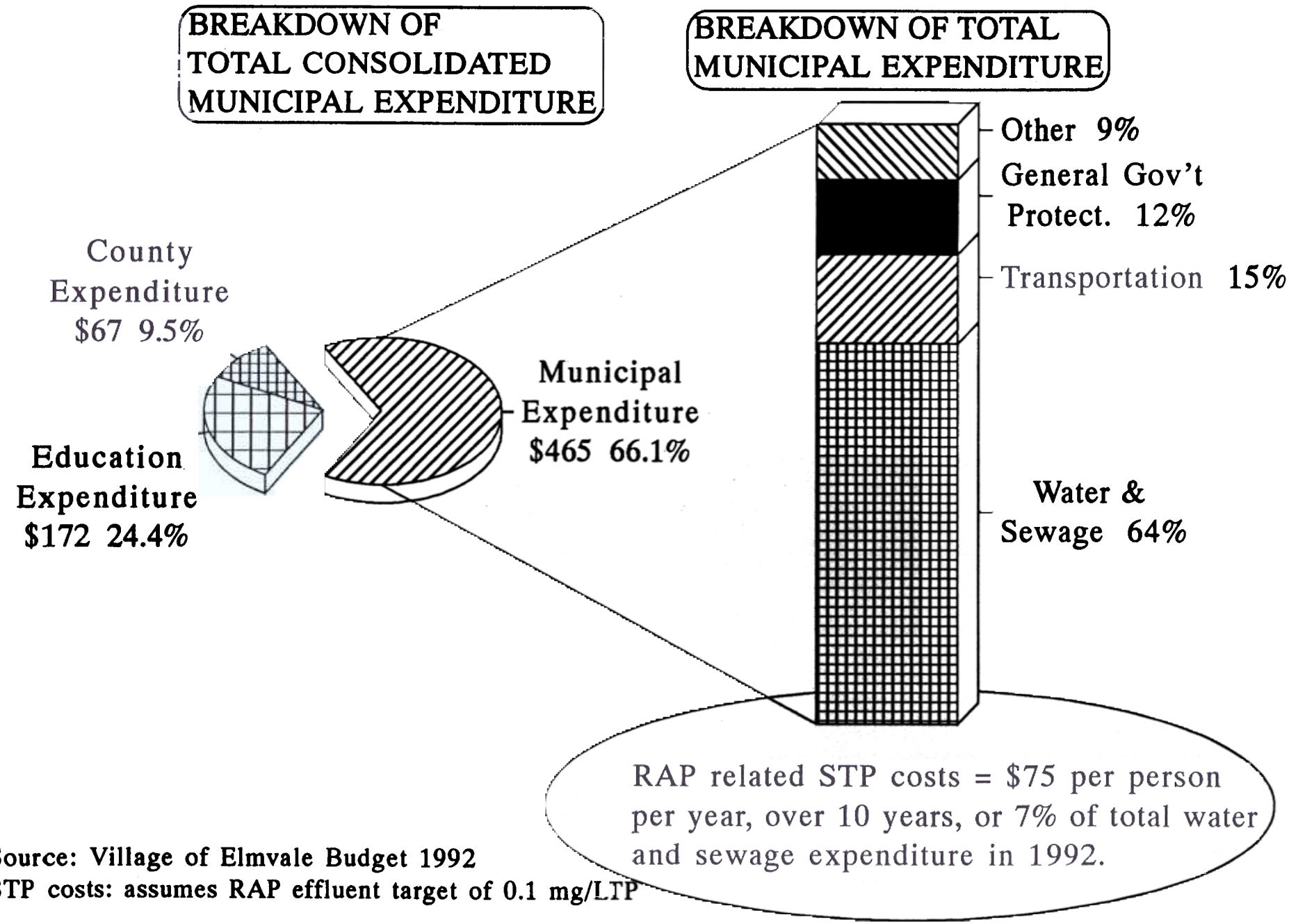


RAP related STa costs = $44 eer aerson per year, over 10 years, or 20% of total water and sewage exeenditure in 1992.

V ll f C l w 1
TP m RAP ffl g of /LTa

STP Costs in Relation to Municipal Per Capita Expenditures

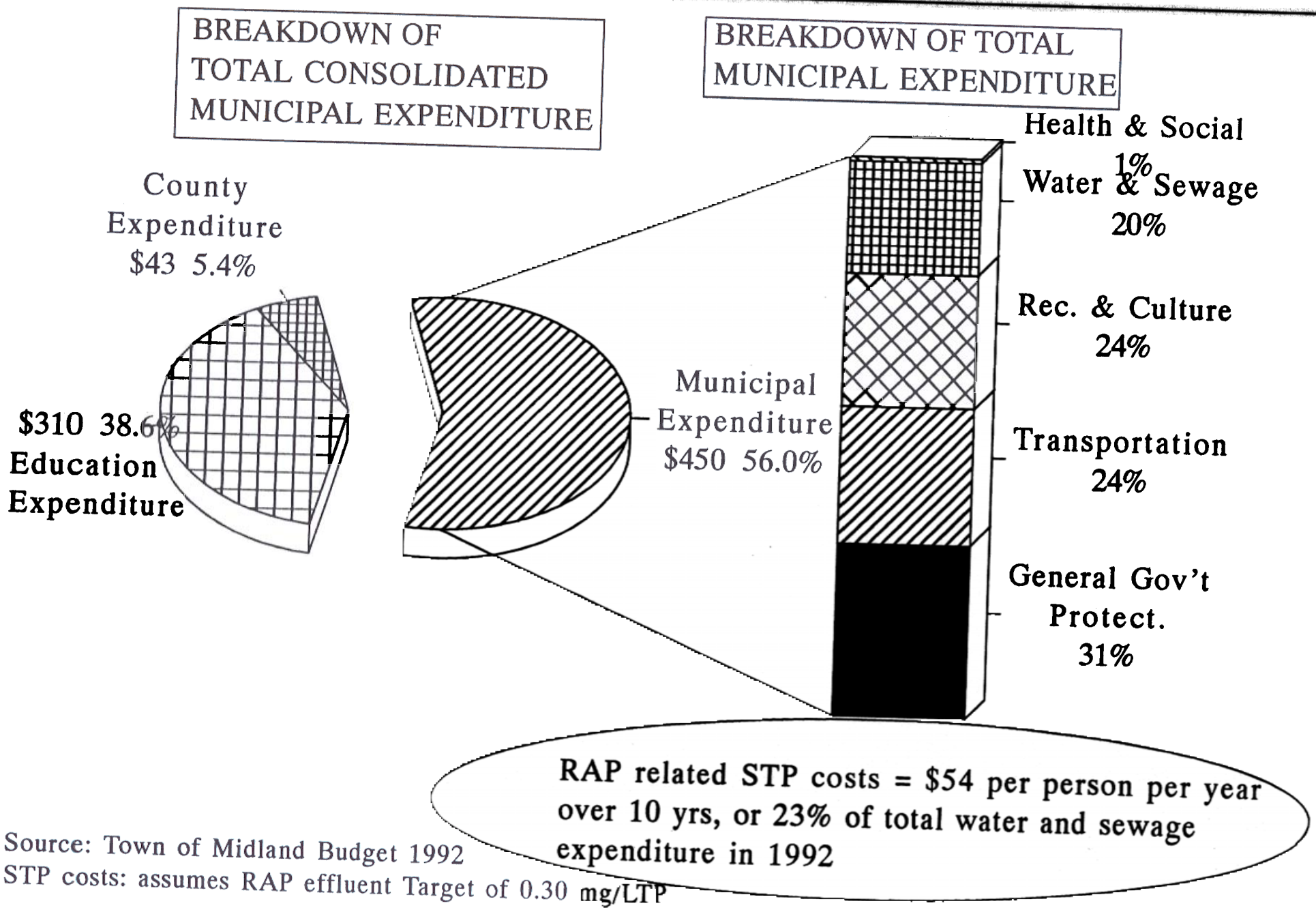
Village of Elmvale



Source: Village of Elmvale Budget 1992
STP costs: assumes RAP effluent target of 0.1 mg/LTP

STP Costs in Relation to Municipal Per Capita Expenditures

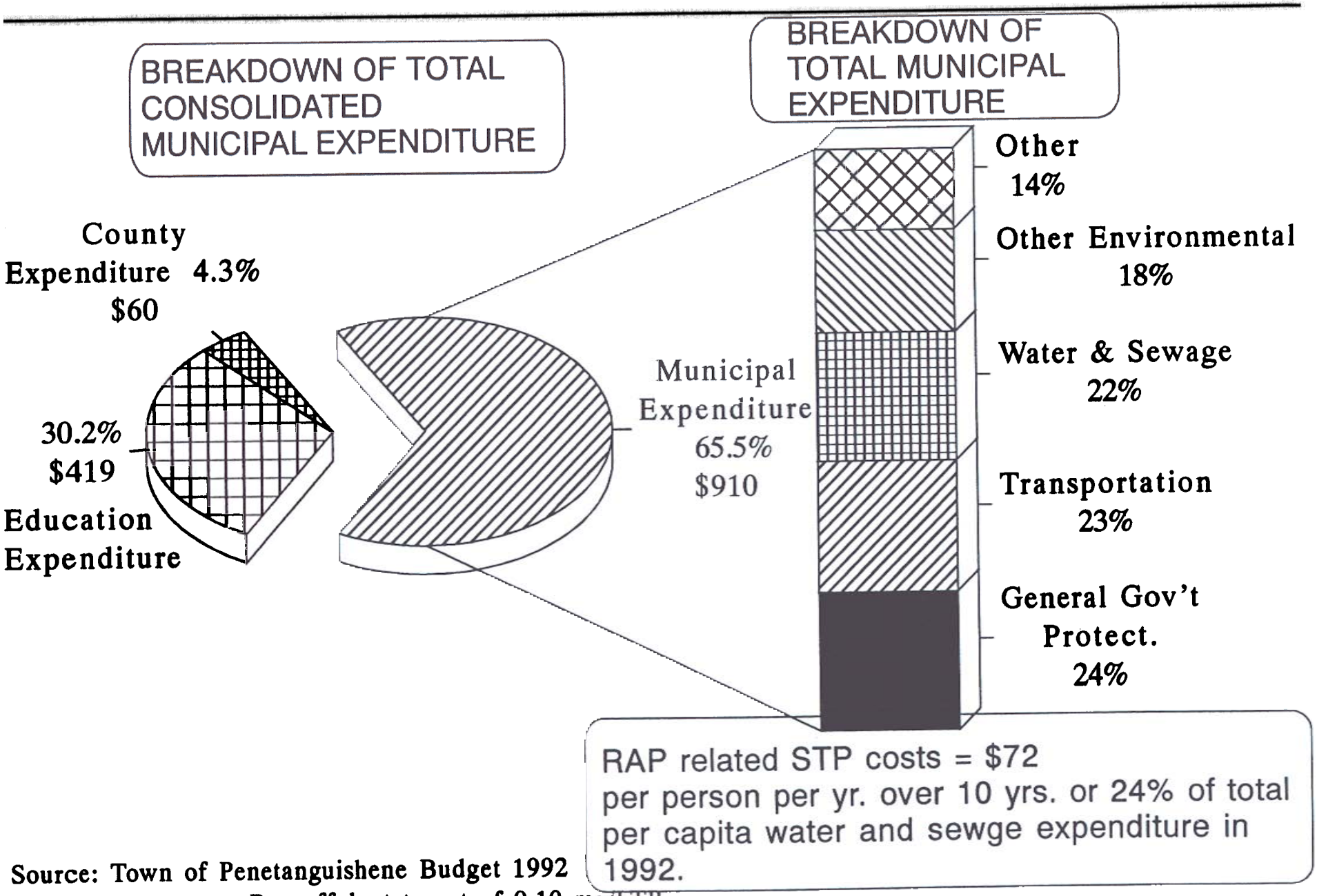
Town of Midland



Source: Town of Midland Budget 1992
STP costs: assumes RAP effluent Target of 0.30 mg/LTP

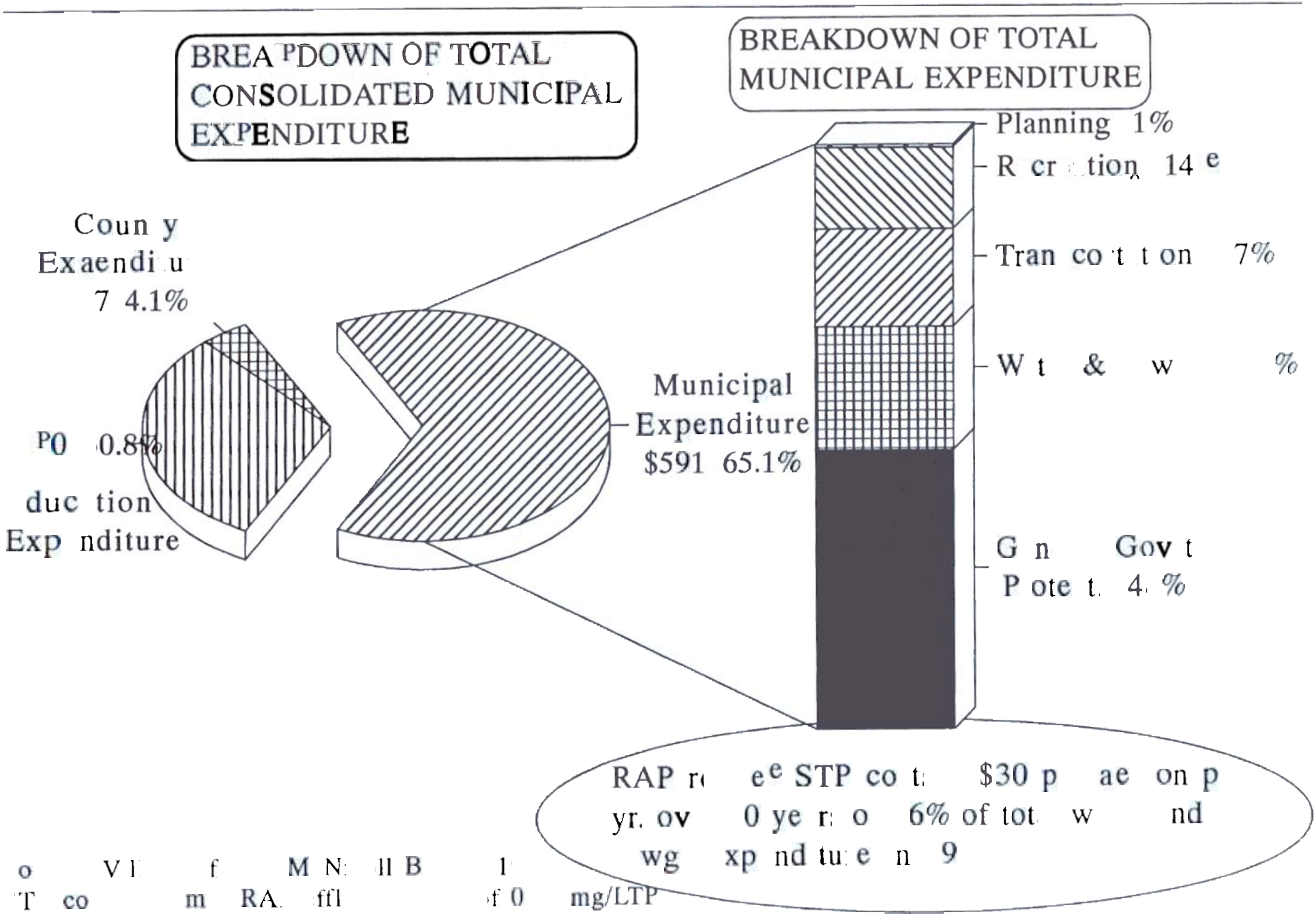
STP Costs in Relation to Municipal Per Capita Expenditures

Town of Penetanguishene



Source: Town of Penetanguishene Budget 1992
STP costs: assumes Rap effulent target of 0.10 mg/LTP

STP C gs n Re a on o Mun c pa Per Cap a Expend ures
V ag0 of Por McNi eo

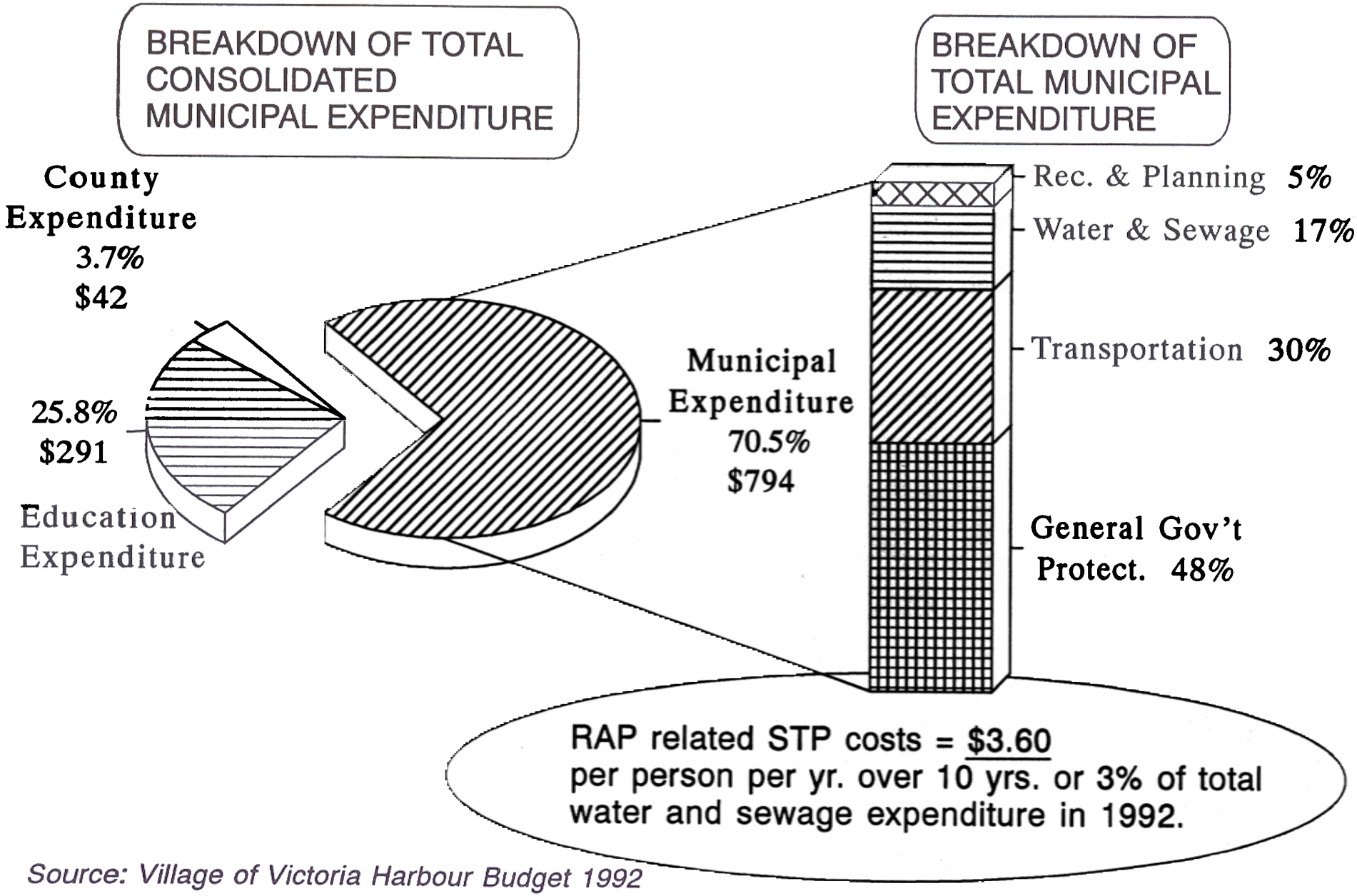


o V l f M N ll B l
T co m RA ffl f 0 mg/LTP

Figure 3.1

STP Costs in Relation to Municipal Per Capita Expenditures

Village of Victoria Harbour

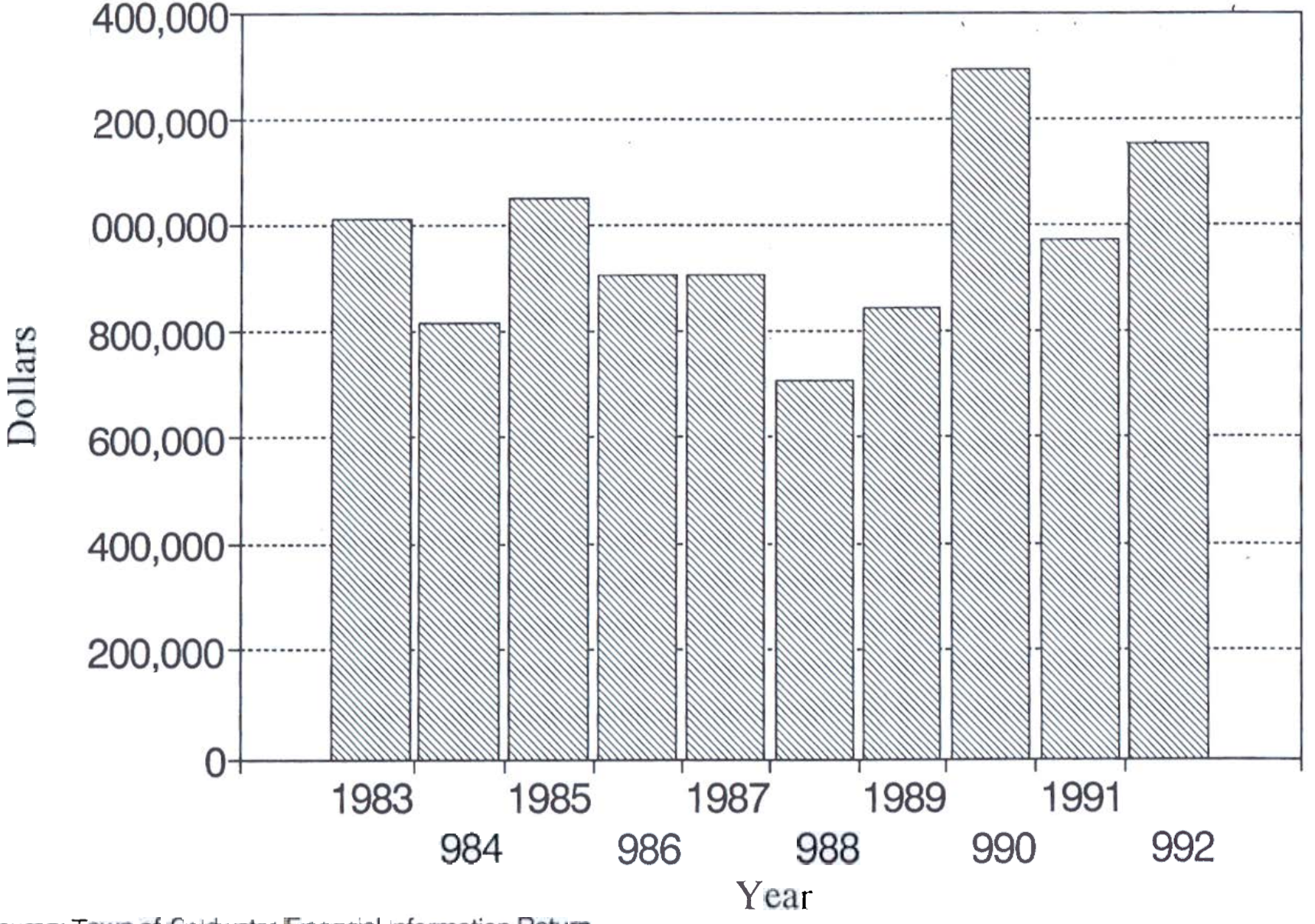


Source: Village of Victoria Harbour Budget 1992
STP costs: Assumes RAP effluent target of 0.1mg/LTP.

APPENDIX B

TOWN OF COLDWATER

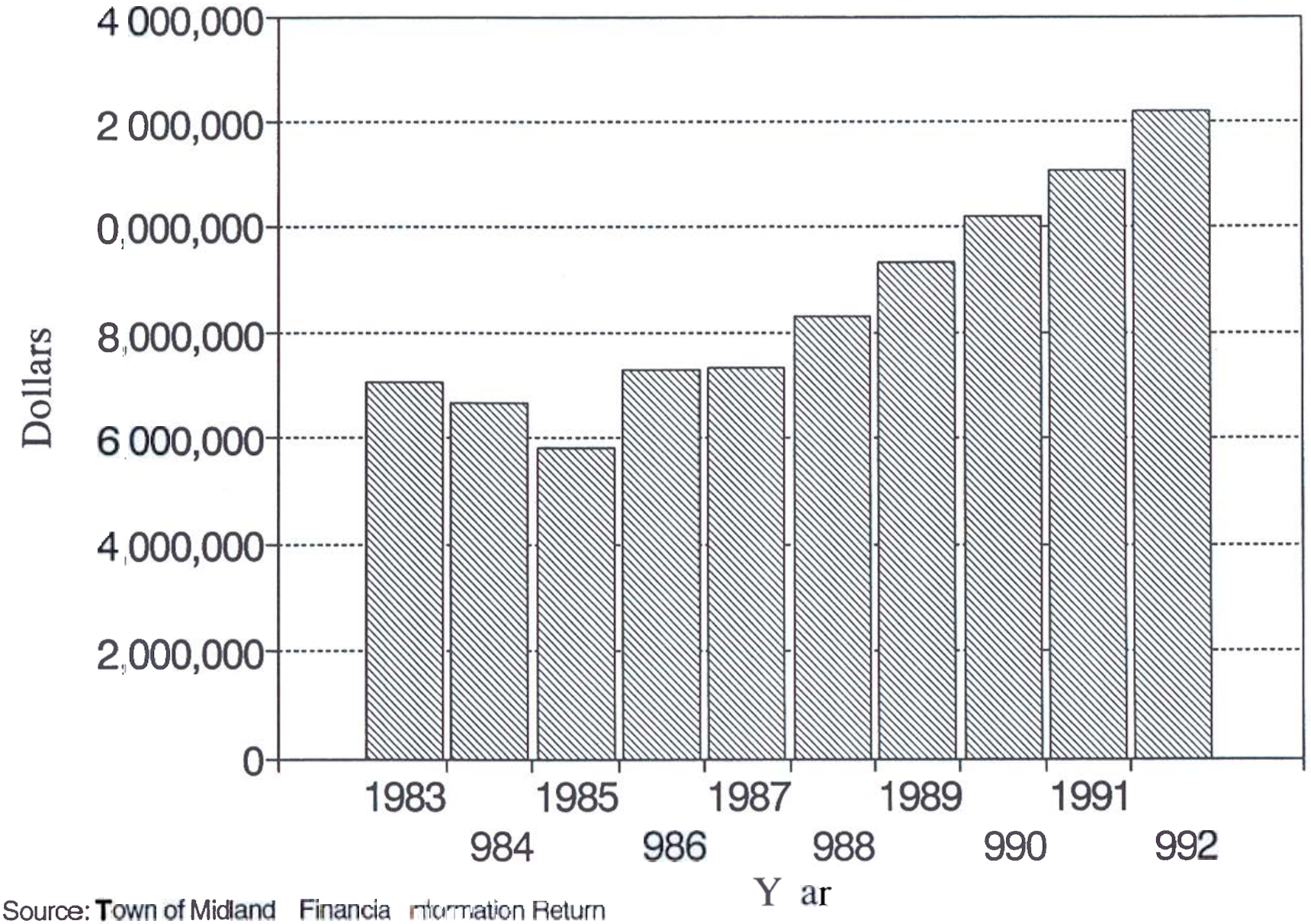
Rea Conso da ed Expend ture



Source: Town of Coldwater Financial information Return

TOWN OF MIDLAND

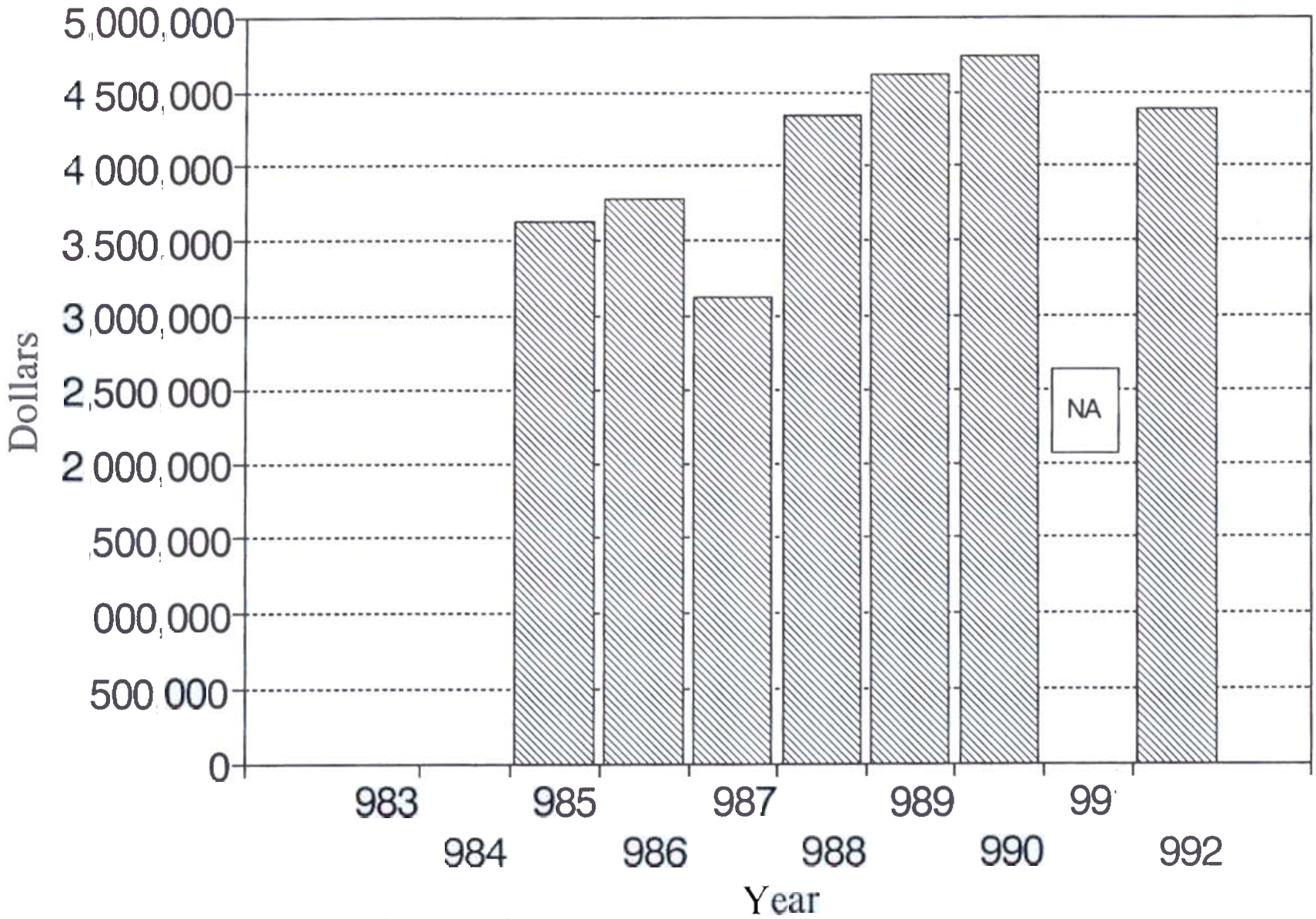
Rea Conso da ed Expend ure



Source: Town of Midland Financia rmation Return

TOWN OF PENETANGUISHENE

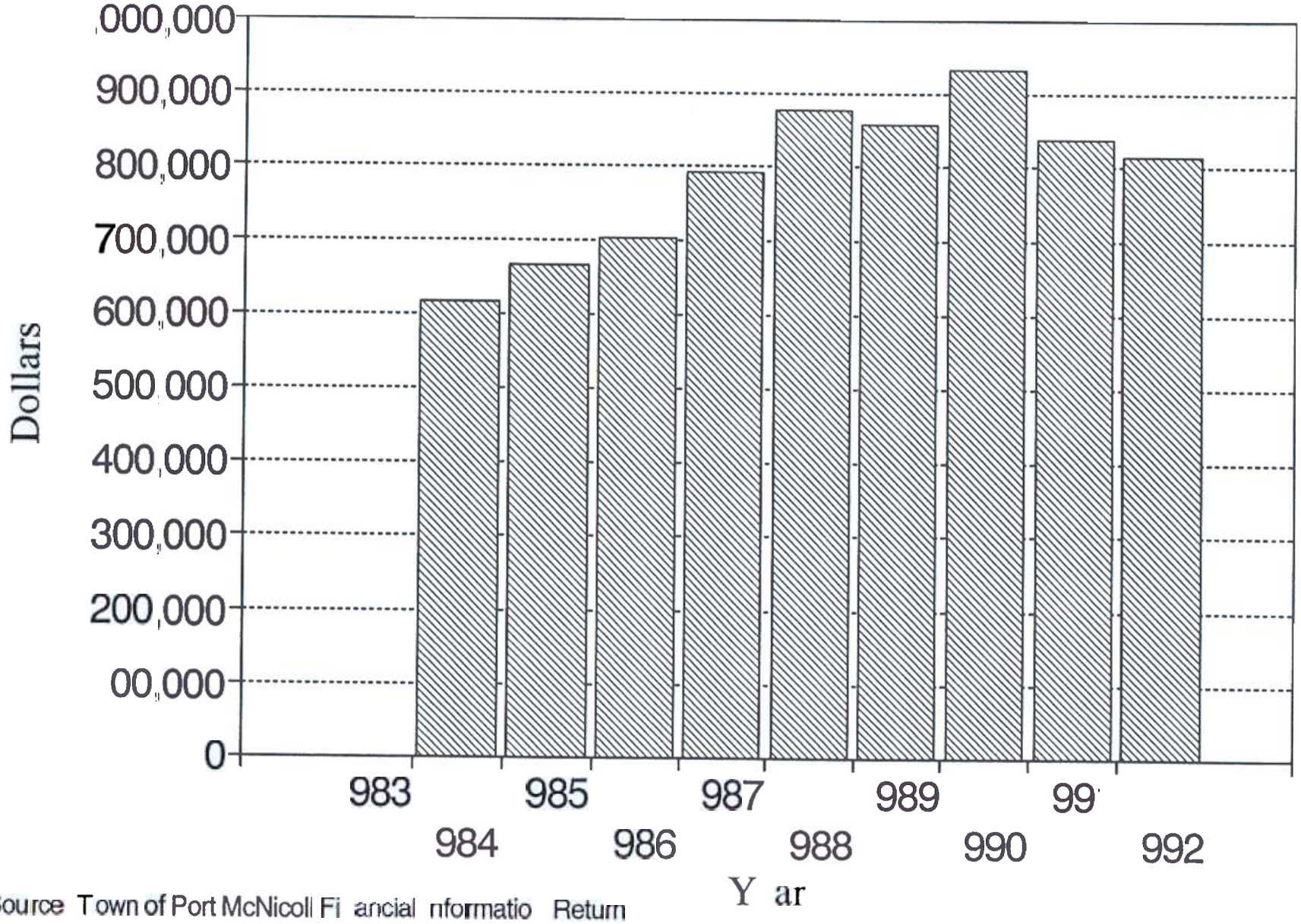
Rea Conso da ed Expend ture



Source: Town of Penetanguishene Financial Informatio Return

TOWN OF PORT MCNICOLL

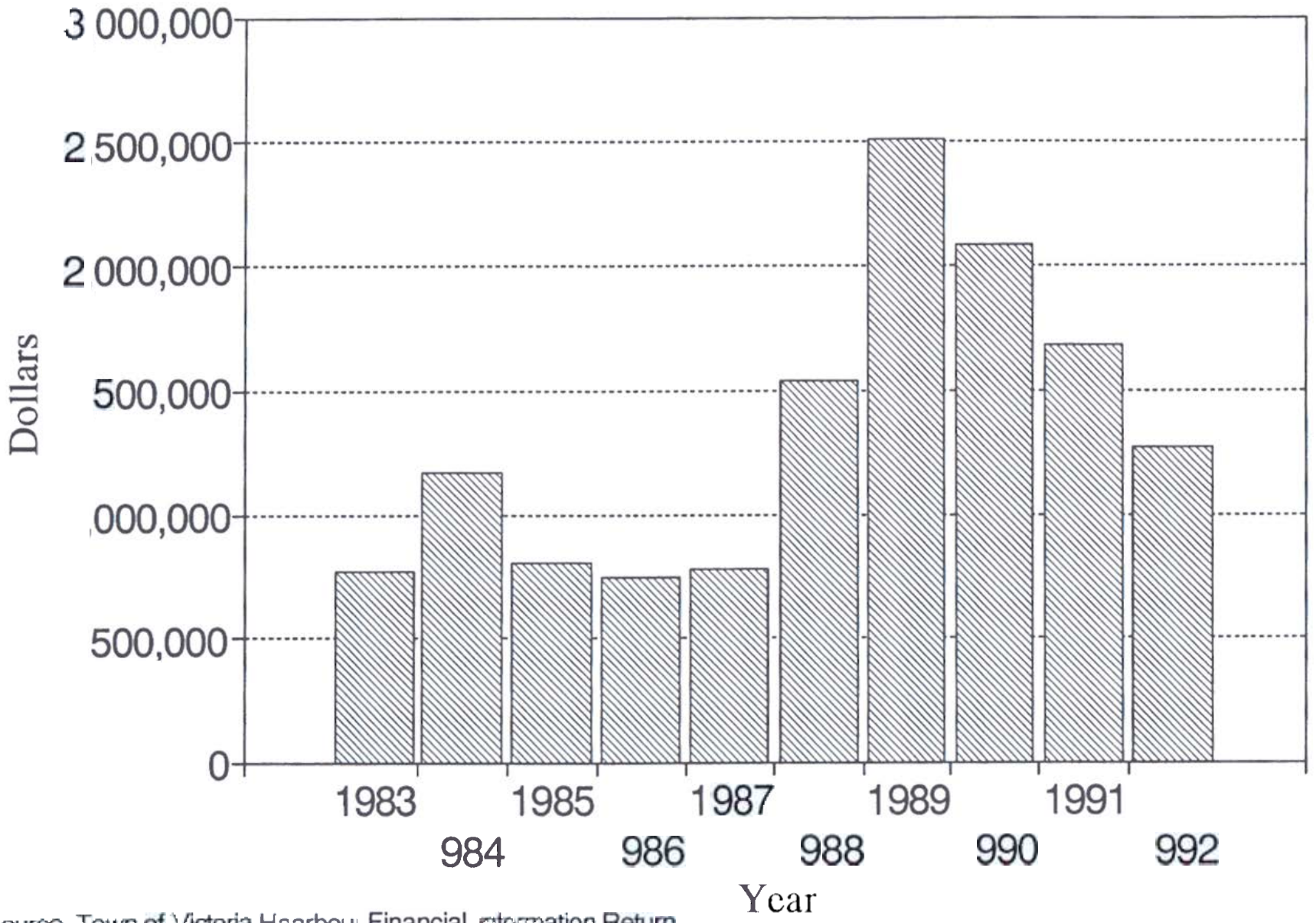
Rea Consolida ed Expend ture



Source Town of Port McNicoll Fi ancial nformatio Return

TOWN OF VICTORIA HARBOUR

Rea Conso da ed Expend ure



Source Town of Victoria Haarbou Financial nformation Return

APPENDIX C

Cost Effectiveness Analysis for Abatement of Identified Sources within the Coldwater Watershed

Source	Remedial Practice	Average Economic Life (years)	Capital Cost ($)	Amortized Cost ($/yr)	Maintenance Cost ($/yr)	Operation Cost ($/yr)	Total Annual Cost	Total Watershed Annual Cost	Annual Cost/Effectiveness
									Total Phosphorus ($/kg)
Livestock Access	1. Fence one side + alt. water	5	4500	900	225		1125	10125	109.08
	2. Fence both sides + restrict access	5	9000	1800	450		2250	20250	218.00
		20	10000	500	500		1000	22500	435.00
Milkhouse Washwater	1.Treatment trench	5	2750	550		115	665	3225	19.00
	2. Concrete tank + land application	20	3780	189		290	479	2395	13.69
Septic System	1. Tank + weeping bed	10	5000	500		35	535	2942	115.00
Manure Runoff	1. Liquid lagoon + fence	20	5500	275		2400	2675	42800	563.00
	2. Solid + concrete tank	20	25200	1260		690	1950	31200	333.00
	3. Solid + lagoon	20	19800	990		810	1800	28800	254.00

Cost Effectiveness Analysis for Abatement of Identified Sources within the Copeland Watershed

Source	Remedial Practice	Average Economic Life (years)	Capital Cost ($)	Amortized Cost ($/yr)	Maintenance Cost ($/yr)	Operation Cost ($/yr)	Total Annual Cost	Total Watershed Annual Cost	Annual Cost/Effectiveness
									Total Phosphorus ($/kg)
Livestock Access	1. Fence one side + alt. water	5	4500	900	225		1125	1125	178.00
	2. Fence both sides + restrict access	5	9000	1800	450		2250	2250	357.00
		20	10000	500	500		1000	2500	159.00
Milkhouse Washwater	1.Treatment trench	5	2750	550		115	665	3990	14.25
	2. Concrete tank + land application	20	3780	189		290	479	2874	10.26
Septic System	1. Tank + weeping bed	10	5000	500		35	535	535	115.00
Manure Runoff	1. Liquid lagoon + fence	20	5500	275		2400	2675	10700	563.00
	2. Solid + concrete tank	20	25200	1260		690	1950	7800	333.00
	3. Solid + lagoon	20	19800	990		810	1800	7200	254.00

Cost Effectiveness Analysis for Abatement of Identified Sources within the Hog Watershed

Source	Remedial Practice	Average Economic Life (years)	Capital Cost ($)	Amortized Cost ($/yr)	Maintenance Cost ($/yr)	Operation Cost ($/yr)	Total Annual Cost	Total Watershed Annual Cost	Annual Cost/Effectiveness
									Total Phosphorus ($/kg)
Livestock Access	1. Fence one side + alt. water	5	4500	900	225		1125	12375	178.00
	2. Fence both sides + restrict access	5	9000	1800	450		2250	24750	357.00
		20	10000	500	500		1000	27500	159.00
Milkhouse Washwater	1.Treatment trench	5	2750	550		115	665	3990	14.25
	2. Concrete tank + land application	20	3780	189		290	479	2874	10.26
Septic System	1. Tank + weeping bed	10	5000	500		35	535	11235	115.00
Manure Runoff	1. Liquid lagoon + fence	20	5500	275		2400	2675	50825	563.00
	2. Solid + concrete tank	20	25200	1260		690	1950	37050	333.00
	3. Solid + lagoon	20	19800	990		810	1800	34200	254.00

Cost Effectiveness Analysis for Abatement of Identified Sources within the North Watershed

Source	Remedial Practice	Average Economic Life (years)	Capital Cost ($)	Amortized Cost ($/yr)	Maintenance Cost ($/yr)	Operation Cost ($/yr)	Total Annual Cost	Total Watershed Annual Cost	Annual Cost/Effectiveness
									Total Phosphorus ($/kg)
Livestock Access	1. Fence one side + alt. water	5	4500	900	225		1125	58500	489.00
	2. Fence both sides + restrict access	5	9000	1800	450		2250	117000	978.00
		20	10000	500	500		1000	130000	435.00
Milkhouse Washwater	1.Treatment trench	5	2750	550		115	665	5895	19.00
	2. Concrete tank + land application	20	3780	189		290	479	4311	13.69
Septic System	1. Tank + weeping bed	10	5000	500		35	535	7223	115.00
Manure Runoff	1. Liquid lagoon + fence	20	5500	275		2400	2675	144450	563.00
	2. Solid + concrete tank	20	25200	1260		690	1950	105300	333.00
	3. Solid + lagoon	20	19800	990		810	1800	97200	254.00

Cost Effectiveness Analysis for Abatement of Identified Sources within the Sturgeon Watershed

Source	Remedial Practice	Average Economic Life (years)	Capital Cost ($)	Amortized Cost ($/yr)	Maintenance Cost ($/yr)	Operation Cost ($/yr)	Total Annual Cost	Total Watershed Annual Cost	Annual Cost/Effectiveness
									Total Phosphorus ($/kg)
Livestock Access	1. Fence one side + alt. water	5	4500	900	225		1125	4500	106.00
	2. Fence both sides + restrict access	5	9000	1800	450		2250	9000	212.00
		20	10000	500	500		1000	10000	94.00
Milkhouse Washwater	1.Treatment trench	5	2750	550		115	665	2660	19.00
	2. Concrete tank + land application	20	3780	189		290	479	1916	13.69
Septic System	1. Tank + weeping bed	10	5000	500		35	535	936	115.00
Manure Runoff	1. Liquid lagoon + fence	20	5500	275		2400	2675	2675	563.00
	2. Solid + concrete tank	20	25200	1260		690	1950	1950	333.00
	3. Solid + lagoon	20	19800	990		810	1800	1800	254.00

Cost Effectiveness Analysis for Abatement of Identified Sources within the Wye Watershed

Source	Remedial Practice	Average Economic Life (years)	Capital Cost ($)	Amortized Cost ($/yr)	Maintenance Cost ($/yr)	Operation Cost ($/yr)	Total Annual Cost	Total Watershed Annual Cost	Annual Cost/Effectiveness
									Total Phosphorus ($/kg)
Livestock Access	1. Fence one side + alt. water	5	4500	900	225		1125	14625	341.00
	2. Fence both sides + restrict access	5	9000	1800	450		2250	29250	682.00
		20	10000	500	500		1000	32500	303.00
Milkhouse Washwater	1.Treatment trench	5	2750	550		115	665	11970	19.00
	2. Concrete tank + land application	20	3780	189		290	479	8622	13.69
Septic System	1. Tank + weeping bed	10	5000	500		35	535	4949	115.00
Manure Runoff	1. Liquid lagoon + fence	20	5500	275		2400	2675	93625	563.00
	2. Solid + concrete tank	20	25200	1260		690	1950	68250	333.00
	3. Solid + lagoon	20	19800	990		810	1800	63000	254.00