Demonstration Report No. 2A

DEMONSTRATION OF LOCAL ECONOMIC/OTHER COMMUNITY IMPACTS

Lake Champlain Basin Program

Community Case Studies for Economic Plan Elements. The City of Vergennes, Vermont

Prepared by Economic and Financial Consulting Associates, Inc.

for
Lake Champlain Management Conference

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The City of Vergennes, Vermont

Prepared for the

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and

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October 25, 1993

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This demonstration report is the second in a series of reports prepared under the Lake Champlain Basin Program. Those in print are listed below.

Lake Champlain Basin Program Demonstration Reports

1. *Case Study of the Town of Champlain.* Yellow Wood Associates. October 1993.

2. *(A) Demonstration of Local Economic/Other Community Impacts.* Community Case Studies for Economic Plan Elements. The City of Vergennes, Vermont. Economic and Financial Consulting Associates, Inc. October 1993.

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Community Case Studies for Economic Plan Elements

The City of Vergennes, Vermont

Prepared for the

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OVERVIEW: STUDY OBJECTIVES

The Economic and Social Subcommittee requested that four tasks be completed in a Community Case Study of the City of Vergennes, Vermont. These tasks were:

> *1. Evaluate local economic base information to develop a strong working understanding of the nature of the local economy, its relationship to the broader region, and its dependence/interaction with Lake Champlain.*
>
> *2. Interview local business leaders and representatives of local business directly or indirectly dependent on Lake Champlain.*
>
> *3. Interview local officials and service system managers and review local budgets to determine current service requirements and capacity and potential changes which could be required due to revised water quality standards.*
>
> *4. In consultations with designated local government officials, including county/regional planning officials, prepare a comprehensive narrative with supporting data on the community's fiscal/public service and economic base which is related either directly of indirectly with Lake Champlain's resources and water quality. The case study will include an explanation of tourism/recreation based economic activities, agriculture and forestry, industrial development and local services that support lake-dependent economic activities. The potential change to each of the above economic sectors which could result from revised water quality standards should be identified as well as any issues related to the ability of the community to accommodate necessary changes in its infrastructure.*

Economic and Financial Consulting Associates, Inc. (EFCA) proposed to complete each of the four tasks by means of the following activities:

> *1. evaluating the economic base of the City of Vergennes, determining its relationship to the Lake Champlain Basin Region, and identifying the City's economic dependence and impact on the Otter Creek/Lake Champlain ecosystem,*

2. forming a Case Study Advisory Group (CAG) to work with that group to identify the perceptions of the business community about how the Lake contributes value to the economy,

3. interviewing state and local public servants in order to identify the current and expected (five year) capacity of water and wastewater treatment systems and to ascertain any potential impacts that water quality standards may have on capacity, and

4. preparing a narrative explaining the value of the Lake's resources and water quality to the community's fiscal/public-service and economic base.

This report is the final product of the work. It provides a description of the each of the tasks. Chapter One contains a brief description of the economic base of the City of Vergennes, a model of the region's economy and estimates of the value of water based travel, tourism and recreation. Chapter Two contains the results of a survey of the business community. Chapter Three provides alternative scenarios describing potential fiscal and financial impacts of the cost of water quality improvements. Chapter Four focuses on the dynamic effects of growth and the changes in the region's economic base. It contains specific recommendation regarding institutional issues in the management of water quality as the region grows.

EXECUTIVE SUMMARY

The economy of the City of Vergennes was estimated to include approximately a five town area surrounding the City. The City of Vergennes and the Towns of Addison, Ferrisburgh, New Haven, Panton and Waltham comprise the Greater Vergennes Market Area (GVMA). An economic analysis of the value of water based travel, tourism and recreation was prepared using the program IMPLAN.[1]

The method of calculating the economic value of travel, tourism and recreation in GVMA was specifically chosen so that this community case study could serve as a guide for other communities wishing to determine the economic value of lake related activities. Chapter One presents the step by step process used in the Vergennes Community Case Study. Appendix 1A contains instructions for and recommendations relating to the development of the required data.

The economic model provided estimates of the impact of travel, tourism and recreation on GVMA's regional output (net commodity supply[2]) and employment.

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[1] IMPLAN is a program designed for regional modeling. It is managed and maintained by the Minnesota IMPLAN Group, University of Minnesota, 248 Classroom Office Building, 1994 Buford Ave., St. Paul, MN 55108.

[2] IMPLAN provides estimates of regional net commodity supply. Net commodity supply is approximately gross regional product less the region's imports.

Expenditures by travelers, tourists and recreationists were estimated at approximately $27,000,000 annually. This represents 22% of GVMA's net commodity supply. Travel, tourism and recreation were estimated to generate approximately 1300 jobs annually. This represents 39% of GVMA's total employment.

In addition to the results of the economic model, a survey of the business community was conducted. The purpose of the survey was to describe the business community's perceptions about the importance of water quality and the impact of travel, tourism and recreation. Chapter Two contains the results of the business survey including a description of the businesses by: age type of business activity and size of firm in GVMA.

A copy of the business survey is contained in Appendix 2. There were 60 respondents out of 105 possible firms in GVMA. Since responses were in intervals, point estimates were made for discussion purposes. The survey findings included:

- The average firm in GVMA attributes approximately $140,000 in revenue annually to lake related business.

- Applying the estimated average revenue to the 105 firms in GVMA produces an estimated lake related economic base of $14,700,000 annually. With an estimated average multiplier of 2, the estimated value of lake related business is approximately $29,400,000 annually.

- With respect to water quality, 33% of the respondents felt that their business would improve if water quality improved.

- However, firms felt much more strongly about the impact of decreases in water quality. Of the respondents, 43% felt that their business would get worse if water quality decreased. Another 28% were uncertain about the effect, and only 18% said that there would not be an impact.

Chapter Three uses the information from the economic model to construct scenarios regarding the potential fiscal and financial impacts of the cost of water quality improvements. A hypothetical investment in water quality of $1,000,000 annually is assumed. If the full cost of this investment is to be paid for by travelers and recreationists, the water quality improvements would have to generate an additional 7200 visitor days per year with a per visitor day expenditure of approximately $70 to break even. Alternatively, if the cost is passed on to travelers and recreationists in the form of price increases, the approximately 112,000 visitor days would have to produce an additional expenditure per visitor day of approximately $5.00.

If the full cost of an additional $1,000,000 per year in investment is passed on completely to property owners in GVMA, then the average tax rate for municipal services would have to increase from 2.01 to 2.30 in 1990. For a property valued at $100,000 the 1990 tax burden would have increased by $290. However, with the

current rate of growth in the Grand List in GVMA, the impact would have been reduced to $100 in 1991.

A second area of concern with respect to the fiscal impact of water quality improvements is the upgrading and expansion of wastewater treatment facilities. These potential impacts are also discussed in Chapter Three.

The City currently has between 140,000 gpd (gallons per day) and 91,000 gpd in uncommitted reserve. It is estimated that the current assimilative capacity of the Otter Creek will permit the City to grow as outlined in the current Town Plan and still leave a residual capacity of 150,000 gpd in uncommitted reserve.

To date the City of Vergennes has been reluctant to provide services to customers outside the City. However, growth in the communities surrounding the City reduces the potential assimilative capacity of the Otter Creek when expansion rests on the development of in-ground and mound septic systems. A higher level of water quality for a higher level of growth could be achieved if the communities in GVMA jointly developed a plan for central wastewater treatment.

Chapter Four presents a review of the impact of changes in GVMA's economic base. The region's agricultural base is giving way to business and residential development in support of travel, tourism and recreation. The rapid conversion of land use from agriculture to business and residential development is most acute along the Otter

Creek and the lake shore. Unaltered, the current development pattern is likely to present problems for public access, aesthetics and water quality. It is recommended that the GVMA consider the development of a joint planning district to prepare mutual policies for the management of the area's water resources.

Chapter Four also discusses the impact of Green Mountain Power's hydroelectric facility in the City of Vergennes on the area's water quality. The plant is to be reviewed by the Federal Energy Regulatory Commission (FERC) for re-licensing in 1995. Under FERC guidelines the users of the Otter Creek can request a share of the plant's profits as a way of financing water quality improvements and public access. In terms of potential impacts, one estimate developed by the State of Vermont, Agency of Natural Resources indicates that every $100,000 in user fees for hydroelectric power will cost rate payers approximately $.08 per household per year.

The hydroelectric facility also reduces the assimilative capacity of the Otter Creek. It is suggested that, since this in effect caps the City's growth, the City may want to request additional compensation for the associated losses.

Other issues and recommendations include:

- a discussion of the potential value of the use of impact fees as a method of generating the capital necessary to pay for infrastructure for growth, and

- a discussion of sources of additional efficiencies in providing municipal services.

An extensive appendix is intended to provide:

- a theoretical description of the economics of poor water quality,
- a working definition of sustainable development,
- a theoretical framework for devising regulatory policies and guidelines, and
- a strong case for inclusion of water resources in any definition of the working landscape.

AN ECONOMIC MODEL OF THE CITY OF VERGENNES

Introduction

In the Town Plan the City of Vergennes describes itself as a multipurpose regional center. The following analyses provide some evidence that the City serves a market area including: the Towns of Addison, Ferrisburgh, Panton, and Waltham. However, the evidence indicates that the City is only a weak regional center.

This chapter begins with a short summary of the information which suggests that the City is a weak regional center. This is followed by a short discussion of alternative models which can be used to analyze the economic impacts of travel, tourism and recreation. The third section provides a brief overview of input-output models. The fourth section describes the application of the input-output model to the estimation of the economic impact of travel, tourism and recreation in City of Vergennes and its neighboring communities. The chapter closes with a summary of the key findings.

Overview of the City of Vergennes as a Regional Center

There are several different sources of evidence which suggest that the City of Vergennes is a somewhat weak regional center. The City may serve as a significant job center because of the prominence of a single large manufacturing employer. However, a review of shares of County sales based on the annual report prepared by

the Vermont Department of Taxes[3] shows that the City is substantially smaller than the other urbanized places in the County. Evidence from the analyses of the potential impacts of bypasses on the urbanized areas along U.S. Route 7 also indicates that the City is highly dependent on passerby business as opposed to destination business.

A calculation was made of the average size of firms by town within Addison County. For each town the average annual gross sales as reported for purposes of sales taxes for the Vermont Department of Taxes was computed. When the averages are ranked, the average firm in Middlebury and New Haven has annual gross receipts of approximately $90,000 per firm. Bridport ranks third with firms averaging annual gross receipts of approximately $54,000 per firm. Bridport is followed by Bristol with an average of $45,000 per firm. Ferrisburgh and Vergennes are next with firms averaging annual gross receipts of approximately $37,800 per firm. All other towns in the region are substantially smaller.

The U.S. Route 7 Corridor Study examined the potential impact of bypasses on six towns in the Corridor: Brandon, Middlebury, Pittsford, Shelburne, Vergennes and Wallingford. The analyses focused on the sensitivity of these towns to loss of passerby business. In terms of gross revenue Vergennes is only half as large as the

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[3] All references to gross sales are based on data published by the Vermont Department of Taxes as presented in the annual report for fiscal year 1991/92.

smallest of the destination centers, Brandon. In terms of revenue losses due to a decrease in passerby business, the expected losses for the City of Vergennes are three times that of the most sensitive of the destination center, Brandon.[4]

Both of the above results tend to suggest that the City of Vergennes is not a primary regional center. However even as a weak regional center the City of Vergennes is linked to, and is the trade and service center for, the adjacent rural economy. The geographic market area is estimated at fifty-two (52) square miles.[5] This market area includes the Towns of Addison, Ferrisburgh, New Haven, Panton and Waltham. Hereafter, the geographic market area will be referred to as the Greater Vergennes Market Area (GVMA).

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[4] "U.S. Route 7 Corridor Study: Economic Impact Analysis". Chapter 4, Working Paper #93-5, Economic and Financial Consulting Associates, June 15, 1993.

[5] The estimate of the market area is based on Reilly's Law. The calculation is designed to determine the market boundary between urbanized areas in a given region. The equation is $b = d/[1 + P_l/P_s]$, where b is the distance to the market boundary to be computed. The value of d is the distance between two towns where all towns in the area have been rank ordered from largest to smallest. P_l is the population of the larger of a pair of towns and P_s is the population of the smaller of a pair of the towns. The calculation for Vergennes was derived relative to Bristol. In that sense the boundary really measures how the population south and east are split between the Vergennes and Bristol market areas.

Economic Models of Travel, Tourism and Recreation

At the microeconomic level economic models of travel, tourism and recreation attempt to explain individual travel and expenditure choices. At the macroeconomic level economic models attempt to identify the cumulative impact of the individual decisions. In order to estimate the economic impact of water based travel, tourism and recreation in GVMA, both types of models are required. The following section describes some of the alternative microeconomic models.

Several general types of microeconomic models of travel, tourism and recreation choice dominate the economic literature. These can be categorized as 'travel cost' , 'willingness-to-pay' and 'recreational use-value/demand' models. Recreational use-value or demand models focus on activity based expenditures and total amounts of activities. Critics of this type of model point out that market transactions, e.g. the cost of renting a canoe and number of canoes rented, do not capture the full value recreationists derive from paddling down a stream. The canoeist also enjoys the views, the observation of wildlife and other types of intangible natural goods. The more intangibles a site or trip has the more the 'real' value of the trip differs from the observed market value of the trip as measured by direct expenditures.

Willingness-to-pay models attempt to add the value of intangibles to the direct expenditures on activities to estimate the full value of the travel and recreation experience. Willingness-to-pay models are estimated by surveying travelers, tourists or

recreationists to determine how much they would be willing-to-pay to retain access to a particular natural characteristic or environment.

Travel cost models also attempt to adjust direct expenditures on travel, tourism and recreation, but in this case by measuring the opportunity cost of time. The essence of travel cost models is that the value of the time devoted to an activity undertaken in a particular environment or setting measures the value of the intangibles. The estimation of travel cost models requires data on age, income, distance traveled and other socio-economic and demographic characteristics of the traveler.

It was not possible to develop either a willingness-to-pay or a travel cost model for GVMA. Both of these require data which is not currently available and which was beyond the scope of this study to assemble. Therefore, in developing estimates of the value of water based travel, tourism and recreation for GVMA it was necessary to rely on a form of the activity model. The data available consisted of number of visitors, type of accommodations, length of stay and general estimates of expenditures per person.

The estimates of the number of travelers, tourists and recreationists and associated expenditures were used to produce estimates of the total or macroeconomic impact of water based activity in GVMA. The macroeconomic model employed to estimate the full impact of water based travel, tourism and recreation in GVMA was an input-output model.

The following section provides a basic description of input-output models. This is to assist in interpretation. The next section describes the step by step process used to calculate the economic value of travel, tourism and recreation in GVMA. The elaboration of the process is intended to provide other communities with a guide for replicating this study in other locations. Appendix 1A contains a listing and explanation of the various sources of data required for the study.

Understanding the Input-Output Model

An economic model of the GVMA has been constructed using the IMPLAN database and program.[6] IMPLAN provides an input-output model of Vermont and all of Vermont's Counties. The model for the GVMA has been derived from the Addison County input-output table. The purpose of the model is to identify the spill-over or multiplier effects of the different types of Lake related activities. The following discussion is a general overview of input-output models. This is provided to assist in the interpretation of the results of the model for GVMA.

Economists often view the economy as if it were a series of transactions that flowed in a circle. Diagram 1.1 provides a picture of the Circular Flow of Transactions in a simple economy.

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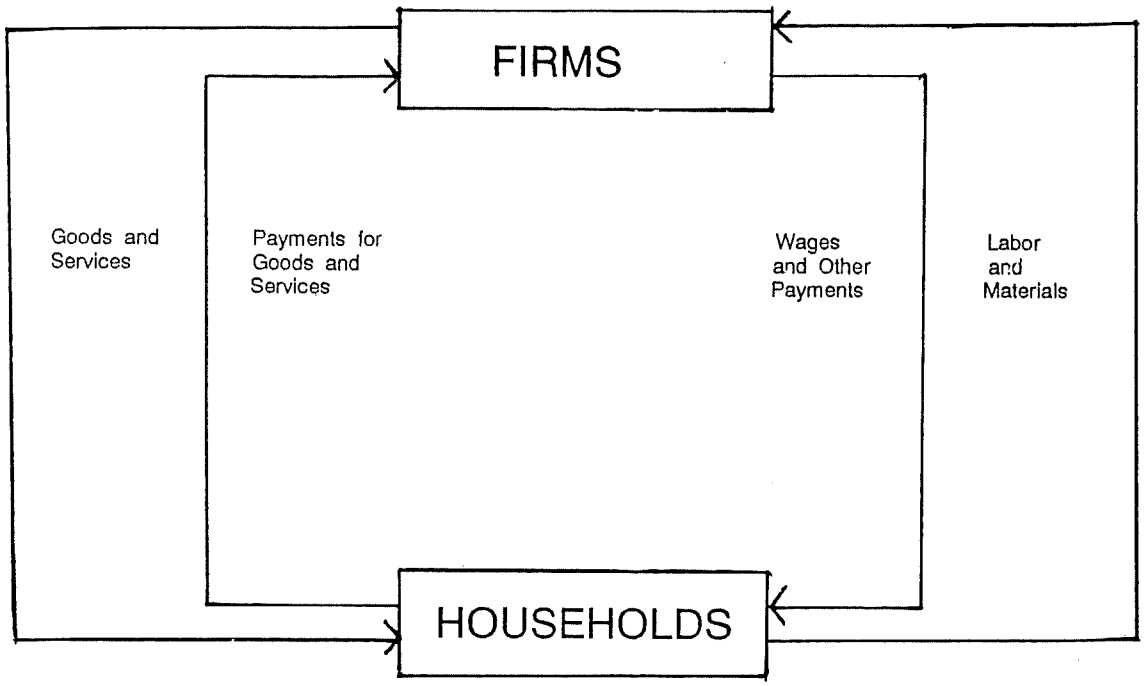
[6] IMPLAN is a program designed to carry out regional modeling. It is managed and maintained by the Minnesota IMPLAN Group, University of Minnesota, 248 Classroom Office Building, 1994 Buford Ave., St. Paul, MN 55108.

DIAGRAM 1.1
CIRCULAR FLOW OF TRANSACTIONS



The outside loop is the set of transactions that relate to things. The services to firms in the form of labor flow from the households to the firms. The goods provided by firms are sold to the households. The inside loop is the set of payments associated with the transactions of services and goods. These are the payments by firms to households for labor received and the payments by households to firms for goods received.

This simple economy in Diagram 1.1 will continue in balance as long as there are no leakages from the system. Leakages include savings, imports and taxes, all of which make the flow of payments back to the firms in the form of demand for their goods

less than the payments made to the households. When leakages occur the system is balanced by new spending injections, e.g.: 1) the firms invest the money saved, 2) consumers from outside buy the firm's goods, exports, and/or 3) the government purchases goods with the taxes it receives. As long as injections equal leakages the system continues in balance. When the injections exceed leakages the economy grows. When leakages exceed injections the economy shrinks.

Input-output models begin by simply assigning dollars to the flow of all transactions. These are recorded in a transactions table. A hypothetical Transactions Table is shown in Table 1.1.[7] Reading across a row, one is reading the transactions of things, goods and services. Reading down a column, one is reading the payments associated with the transactions. The system balances in that all injections and leakages are accounted for. Total Output (Expenditures) is equal to Total Payments (Income).

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[7] The illustrative table is provided because the actual transactions table for Addison County is too large to print. The illustration is from The Elements of Input-Output Analysis by William H. Miernyk, Random House, 1965.

TABLE 1.1

Hypothetical Transactions Table

Industry Purchasing

Inputs** (Processing / Payments)	Outputs* [1] A	[2] B	[3] C	[4] D	[5] E	[6] F	[7] Gross inventory accumulation (+)	[8] Exports to foreign countries	[9] Government purchases	[10] Gross private capital formation	[11] Households	[12] Total Gross Output
[1] Industry A	10	15	1	2	5	6	2	5	1	3	14	64
[2] Industry B	5	4	7	1	3	8	1	6	3	4	17	59
[3] Industry C	7	2	8	1	5	3	2	3	1	3	5	40
[4] Industry D	11	1	2	8	6	4	0	0	1	2	4	39
[5] Industry E	4	0	1	14	3	2	1	2	1	3	9	40
[6] Industry F	2	6	7	6	2	6	2	4	2	1	8	46
[7] Gross inventory depletion (-)	1	2	1	0	2	1	0	1	0	0	0	8
[8] Imports	2	1	3	0	3	2	0	0	0	0	2	13
[9] Payments to government	2	3	2	2	1	2	3	2	1	2	12	32
[10] Depreciation allowances	1	2	1	0	1	0	0	0	0	0	0	5
[11] Households	19	23	7	5	9	12	1	0	8	0	1	85
[12] Total Gross Outlays	64	59	40	39	40	46	12	23	18	18	72	431

*Sales to industries and sectors along the top of the table from the industry listed in each row at the left of the table.
**Purchases from industries and sectors at the left of the table by the industry listed at the top of each column.

The transactions table is more than just a system of recording what happens in the circular flow. The table is actually a set of equations describing the linkages between the final demand for goods and services and the payments and income associated with producing those goods and services. The mathematical manipulation required to solve the set of equations will not be discussed here.[8] From the solution of the system of equations one can derive a set of multipliers linking changes in demand, or purchases, to changes in output (income) and employment.

IMPLAN begins with 528 commodities in the processing sector of Addison County. These are provided in Appendix 1B. It was decided to aggregate some of the processing sectors so that it would possible to focus more clearly on those sectors of interest. A summary of the aggregation is also provided in Appendix 1B. On all subsequent references to industry groups, the abbreviation, agg., means aggregated according to the described scheme.

IMPLAN generates five separate impact measures in the form of multipliers. These are: 1) output multipliers, 2) personal income multipliers, 3) total income multipliers, 4) value-added multipliers, and 5) employment multipliers. For the purposes of this study the output multipliers and employment multipliers will be used.

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[8]A simple discussion of the mathematical processes for deriving multipliers is contained in Appendix E of the IMPLAN manual. A good general discussion is found in The Elements of Input-Output Analysis by William H. Miernyk. IMPLAN estimates Leontief Type I multipliers and a modified form of Miernyk's Type III multipliers.

There are two types of multipliers composed of several components or effects. These effects are denoted: 1) direct effects, 2) indirect effects, and 3) induced effects.

Direct Effects are changes in output or employment associated with the immediate effects of a change in final demand. For example, if a business is opened which charters boat tours of the Otter Creek and 100 people buy the package at $100 each, then new final demand has gone up by $10,000. This change in output (expenditures) is the direct effect from the new business.

Indirect Effects are changes in output or employment associated with 'backward linkages' in industry demand. In order to produce more output directly impacted industries increase the demand for inputs from supporting industries. As these input supplying industries (the linked industries) attempt to increase the output going to the directly impacted industries the supplying industries output and employment rise, the indirect effect. To extend the above example, in order to provide tours boats must be rented and serviced at the marina. The demand for these services provided by other businesses is linked to the demand for boat tours. If $5,000 is spent then final demand has gone up by an additional amount so that total demand is now $15,000. Of course the expansionary effect does not stop here. The marina must also buy additional goods and services. Each purchase in the local economy adds to final demand.

Induced Effects are the changes in demand caused by the changes in household income generated by the direct and indirect effects of expanding output or employment. Since the income the owner and employees at the marina has gone up they consume more, creating yet additional demand for all goods and services. Because of the new boat tours business there is additional employment. The new employees all spend their money locally and this creates demand for the goods and services not directly connected to the new boat tours business.

Type I multipliers show the combined impact of direct and indirect effects. Type III multipliers capture the full impact of the direct, indirect, and induced effects. Table 1.2 shows the output multipliers for Addison County and for Vermont. Table 1.3 shows the employment multipliers for Addison County and for Vermont.

TABLE 1.2

Addison County and Vermont: Output Multipliers					
Industry Group	Type I	Indirect	Induced	Type III	VT III
Agg. Dairy	1.1816	0.1816	0.2857	1.4673	1.6932
Other Agriculture	1.241	0.241	0.4892	1.7302	2.0463
Agg. Forestry	1.4257	0.4257	0.5922	2.0179	2.2857
Forestry, Fishery & Other Agriculture	1.2897	0.2897	0.6896	1.9793	2.56
Agg. Natural Resources	1.0607	0.0143	0.0613	1.122	1.2316
Agg. New Construction	1.1943	0.1943	0.2585	1.4528	1.7799
Agg. Maintenance Construction	1.1159	0.1159	0.4982	1.6141	1.864
Agg. Food Processing	1.3517	0.3517	0.1979	1.5496	1.5079
Agg. Dairy Food Processing	1.6963	0.6963	0.1598	1.8561	2.0208
Agg. Textiles and Apparel	1.1759	0.1759	0.2945	1.4704	1.7814
Agg. Milling and Logging	1.2695	0.2695	0.2765	1.546	1.6822
Agg. Wood Products	1.3498	0.3498	0.3366	1.6864	1.9782
Agg. Printing and Publishing	1.0871	0.0871	0.1841	1.2712	1.6056
Agg. Plastics and Other Chemicals	1.0831	0.0831	0.1285	1.2116	1.3404
Agg. Chemical and Petroleum Products	1.0692	0.0692	0.1939	1.2631	1.3982
Agg. Stone, Clay, Glass & Concrete	1.0842	0.0842	0.24	1.3242	1.5904
Agg. Fabricated Metal Products	1.0863	0.0863	0.1945	1.2808	1.6585

TABLE 1.2
continued

Agg. Electronic Components	1.0909	0.0909	0.159	1.2499	1.8359
Agg. Measuring Instruments	1.0714	0.0714	0.2247	1.2961	1.5467
Agg. Miscellaneous Manufacturing	1.1308	0.1308	0.3134	1.4442	1.7147
Agg. Transportation	1.1378	0.1378	0.3705	1.5083	1.7578
Travel Services	1.2099	0.2099	0.5847	1.7946	
Agg. Communications and Broadcasting	1.1719	0.1719	0.2618	1.4337	1.6312
Agg. Electric Services	1.1124	0.1124	0.1314	1.2438	1.4067
Wholesale Trade	1.0154	0.0154	0.4757	1.4911	1.5822
Building Materials & Gardening	1.0764	0.0764	0.6144	1.6908	2.0118
General Merchandise Stores	1.0824	0.0824	1.1413	2.2237	2.5207
Food Stores	1.0936	0.0936	0.8489	1.9425	2.351
Automotive Dealers & Service Stations	1.0876	0.0876	0.5275	1.6151	1.9583
Apparel & Accessory Stores	1.1118	0.1118	0.9414	2.0532	2.3565
Furniture & Home Furnishings Stores	1.0884	0.0884	0.776	1.8644	2.1859
Eating & Drinking	1.1252	0.1252	1.1776	2.3028	2.8085
Miscellaneous Retail	1.0929	0.0929	0.8929	1.9858	2.4157
Agg. Banking and Credit	1.1015	0.1015	0.3517	1.4532	1.7767
Agg. Insurance	1.369	0.369	0.4265	1.7955	1.9704
Real Estate	1.1281	0.1281	0.2076	1.3357	1.5025
Hotels and Lodging Places	1.1129	0.1129	0.6055	1.7184	2.0439

TABLE 1.2
continued

Miscellaneous Personal Services	1.1191	0.1191	0.7876	1.9067	2.3598
Advertising, Comm. Photo, and Other Business	1.147	0.147	0.7284	1.8754	2.2944
Janatorial Services, Equip. Rental and Lease	1.0602	0.0602	1.4775	2.5377	2.3771
Computer and Data Processing Services	1.0723	0.0723	0.3456	1.4179	1.7638
Detective and Protective Services	1.1063	0.1063	1.4423	2.5486	2.9306
Auto Parking, Washing, Repair, Service & Leas	1.1025	0.1025	0.4037	1.5062	1.8955
Electrical, Watch & Jewelry Repair, Misc. Rep	1.1305	0.1305	0.5071	1.6376	1.9192
Agg. Recreation	1.2213	0.2213	1.0173	2.2386	2.857
Agg. Health Services	1.1136	0.1136	0.6621	1.7757	2.063
Legal Services	1.0648	0.0648	0.4091	1.4739	1.6879
Agg. Educational Services	1.1808	0.1808	0.8166	1.9974	2.5381
Agg. Social Services, Associations & Organiza	1.1675	0.1675	0.8466	2.0141	2.3296
Engineering Services	1.1691	0.1691	0.5006	1.6697	2.1014
Accounting, Auditing & Bookkeeping	1.1174	0.1174	0.4507	1.5681	1.9477
Management and Consulting Services	1.0999	0.0999	0.615	1.7149	1.9684
Research, Development and Testing	1.1001	0.1001	0.6283	1.7284	2.1221
Other State and Local Government Ent.	1.2643	0.2643	0.2342	1.4985	1.5879
Federal Government	1.0157	0.0157	0.9499	1.9656	1.9534
State and Local Government	1	0	0.9484	1.9484	2.1329

TABLE 1.3

Addison County and Vermont: Employment Multipliers

	Addison County			State of Vermont		
	Total Employment			Total Employment		
Industry Group	Per Million $	Type I	Type III	Per Million $	Type I	Type III
Agg. Dairy	21.6	1.2941	1.8305	25.3	1.3967	2.1584
Other Agriculture	36.5	1.2506	1.779	41	1.3591	2.1002
Agg. Forestry	44.2	1.4307	2.0352	49.4	1.438	2.2223
Forestry, Fishery & Other Agriculture	51.5	1.2114	1.7233	69.7	1.2371	1.9189
Agg. Natural Resources	40.7	1.0492	1.4849	6.7	1.5381	2.3101
Agg. New Construction	22.3	1.5052	2.1292	28.1	1.8954	2.9156
Agg. Maintenance Construction	37.2	1.1147	1.5858	40.4	1.1687	1.8061
Agg. Food Processing	15	2.7339	3.8672	14.9	1.8393	2.8126
Agg. Dairy Food Processing	12.1	3.1892	4.5114	17.4	3.5292	5.3967
Agg. Textiles and Apparel	22.3	1.1465	1.6219	29	1.3207	2.041
Agg. Milling and Logging	20.9	1.3607	1.9249	18.2	1.656	2.5323
Agg. Wood Products	25.5	1.3904	1.9668	32.2	1.4247	2.2017
Agg. Printing and Publishing	13.9	1.2216	1.728	24.4	1.295	2.0012
Agg. Plastics and Other Chemicals	9.7	1.2248	1.7325	10.9	1.459	2.2311
Agg. Chemical and Petroleum Products	14.7	1.1141	1.5759	15.5	1.2278	1.8775
Agg. Stone, Clay, Glass & Concrete	18.2	1.137	1.6083	25.7	1.1715	1.8104

TABLE 1.3
continued

Agg. Fabricated Metal Products	14.7	1.1913	1.6851	20.6	1.4649	2.2401
Agg. Electronic Components	12	1.2277	1.7367	21.9	1.6593	2.5641
Agg. Measuring Instruments	17	1.1047	1.5627	19.7	1.3172	2.0142
Agg. Miscellaneous Manufacturing	23.7	1.166	1.6494	27.1	1.3203	2.0402
Agg. Transportation	33.1	1.1798	1.675	32.5	1.2232	1.8903
Travel Services						
Agg. Communications and Broadcasting	19.8	1.3701	1.938	20.1	1.8336	2.8038
Agg. Electric Services	9.9	1.5452	2.1857	12.7	1.8599	2.8441
Wholesale Trade	35.5	1.0128	1.4408	32.9	1.0292	1.5905
Building Materials & Gardening	45.9	1.0438	1.4849	52.9	1.068	1.6504
General Merchandise Stores	85.2	1.025	1.4581	82.1	1.0465	1.6232
Food Stores	63.4	1.0387	1.4776	71	1.0619	1.6472
Automotive Dealers & Service Stations	39.4	1.0594	1.507	48.7	1.0861	1.6783
Apparel & Accessory Stores	70.3	1.0418	1.482	69.6	1.0764	1.6697
Furniture & Home Furnishings Stores	57.9	1.04	1.4794	61.8	1.0676	1.6559
Eating & Drinking	87.9	1.0263	1.46	96.4	1.0446	1.6203
Miscellaneous Retail	66.6	1.0364	1.4743	74.9	1.058	1.6411
Agg. Banking and Credit	26.6	1.1391	1.6114	31.9	1.3039	2.015
Agg. Insurance	31.8	1.3962	1.9862	31.4	1.5059	2.327
Real Estate	27	1.2669	1.7977	31.4	1.3833	2.1377

TABLE 1.3
continued

Hotels and Lodging Places	45.2	1.0691	1.5208	49.9	1.1396	1.761
Miscellaneous Personal Services	58.8	1.075	1.5293	68.6	1.1012	1.7068
Advertising, Comm. Photo, and Other Business	74.4	1.0895	1.5498	57.1	1.1466	1.7734
Janatorial Services, Equip. Rental and Lease	169.9	1.0353	1.474	81.5	1.0784	1.6705
Computer and Data Processing Services	26.2	1.079	1.5263	32	1.2148	1.8772
Detective and Protective Services	107.2	1.057	1.5061	102.2	1.1129	1.7262
Auto Parking, Washing, Repair, Service & Leas	27.5	1.1578	1.6405	35.4	1.296	2.0028
Electrical, Watch & Jewelry Repair, Misc. Rep	38.1	1.2236	1.7335	35.9	1.4557	2.2496
Agg. Recreation	75.7	1.1492	1.6355	80.1	1.2519	1.9293
Agg. Health Services	49.5	1.0906	1.5515	50	1.1934	1.8465
Legal Services	30.5	1.0872	1.5465	32.4	1.18	1.8235
Agg. Educational Services	52.3	1.1117	1.5899	56.5	1.2738	1.9701
Agg. Social Services, Associations & Organiza	83	1.3528	1.9212	75	1.6206	2.507
Engineering Services	37.4	1.1732	1.6689	45	1.3995	2.1626
Accounting, Auditing & Bookkeeping	33.6	1.1205	1.594	41.2	1.2634	1.9524
Management and Consulting Services	45.9	1.0726	1.5258	43.3	1.2359	1.9099
Research, Development and Testing	46.9	1.0711	1.5236	51.5	1.2056	1.863
Other State and Local Government Ent.	17.7	1.7606	2.4904	22.3	2.0651	3.1913
Federal Government	70.9	1.0066	1.4319	56	1.0069	1.556
State and Local Government	70.8	1	1.4225	67.1	1	1.5453

Before focussing more narrowly on the Vergennes economy, it will be helpful to discuss briefly how to interpret the multipliers. Referring to banking and credit in Tables 1.2 and 1.3, one can note that the output multipliers are always in dollar units. The employment multipliers are in units of new jobs per million dollars of expenditures. So, for example, for every new dollar demand for banking and credit services, banks in turn increase their demand for supporting businesses by $.1015 or approximately 10 cents. However, as employee incomes in banking and in the supporting businesses go up, overall business demand increase by $.3517 or 35 cents. Therefore, the full impact of one additional dollar of demand for the services produced by banks is an expansion of the whole economy by $1.4532 or total demand rises by $1.45.

Looking at the employment multipliers for banking and credit, for every million dollars in the demand for their services employment goes up by 26.6 persons. The direct, indirect and induced effects (not shown separately in the table) are 16.5, 2.3, and 7.8 per million. That is, for every million dollars in the demand for banking and credit, 16.5 persons are employed directly by banks and other credit institutions. An additional 2.3 persons are employed in businesses which support banking, and 7.8 persons are employed by other businesses because more is consumed. The Type I employment multiplier of 1.1391 shows that for every job created in banking approximately 14% of another job is generated in supporting industries. The Type III multiplier shows that for every job created in banking an additional 61% of another job is created throughout the local economy.

A quick comparison of both tables indicates that the multipliers for the State tend to be larger than those for Addison County. This is consistent with what one generally expects. The larger the economy, the more the backward linkages are contained within the economy. Again as a simple example, consider banking and credit multipliers in Tables 1.2 and 1.3. Some of Addison County's banking needs are likely to be served by financial specialists outside of the County, but with a growing financial industry in Burlington more of the State-wide need can be met within the State, reducing the amount of special services "imported" from Boston or New York. In short, multipliers are smaller the more likely the region imports more than it exports. The smaller the region the more likely there are leakages from the region in the form of imports.

The Economy of the Greater Vergennes Market Area

The IMPLAN generated estimate the net commodity supply for Addison County, for 1990, is $958,900,000.[9] It is estimated that the net commodity supply for 1990 for (GVMA) is $122,739,200.[10] Total employment in Addison County for 1990 is

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[9] The 1990 IMPLAN database and program are used in this report. This is the most recent version of IMPLAN available.

[10] Using Vermont Department of Taxes data, EFCA computed gross sales in the GVMA as a percentage of gross sales in Addison County. The GVMA's sales are 12.8% of Addison County's net commodity supply for the GVMA. Net commodity supply in IMPLAN is total regional output less total imports in to the region.

estimated at 13,379. Total employment for 1990 in GVMA is estimated at 3,348, based on its proportion to County employment.[11]

In order to identify what portion of net commodity supply and what portion of employment are dependent on water-based travel, tourism, and recreation, several calculations must be made. First, one must determine the initial or direct expenditures tourists and recreationists make. In addition to how much, one must also know something about what types of expenditures are made.

To derive estimates of direct expenditures, travelers were classified into two groups: 1) general travelers, and 2) quasi-residents. The reason for this classification is that these groups are likely to have different spending patterns. For example, general travelers, those making day trips for recreation or brief vacation trips, are much more likely to spend money at eating and drinking establishments than those who are residing in a seasonal residence. Table 1.4 and 1.5 show the likely type and percent of travel dollar spent by each of the two groups.

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[11]EFCA has elsewhere documented that the Department of Employment and Training under-estimates total employment as computed by the Bureau of Economic Analysis by 18.8%. Since IMPLAN is cross-referenced to the Bureau of Economic Analysis database, EFCA adjusted DET's 1990 estimates by adding 18.8% to derive the estimates used in this study.

TABLE 1.4

DISTRIBUTION OF PERSONAL CONSUMPTION EXPENDITURES*

TYPE OF EXPENDITURES	PERCENT OF TOTAL EXPENDITURES %
Housing Related	20
Medical	16
Durable Goods	12
Non-Durable Goods	16
Food	15
Services	21
TOTAL	100

*Note, the purchase of a home is not considered a consumption expenditure but rather is included in investment. The above distribution is developed by the Bureau of Economic Analysis and reflects the typical distribution of household expenditures.

TABLE 1.5
DISTRIBUTION OF EXPENDITURES BY TRAVELERS TO NON-METROPOLITAN AREAS*

TYPE OF EXPENDITURES	PERCENT OF TOTAL EXPENDITURES %
Transportation**	48
Lodging	12
Food Services	30.8
Entertainment	2.2
General Retail	7
TOTAL	100

*U.S. Travel Data Center
**The U.S. Travel Data Center reported public transportation and auto transportation separately. These have been combined here with public transportation at 8.5% and auto transportation at 39.5%.

Two groups are included in the quasi-resident category: residents staying in seasonal homes and those staying at full-service private campgrounds. The groups included in the general travel category included: 1) day visitors at local state parks, 2) camping visitors at local state parks, and 3) overnight visitors cabins, motels, bed and breakfasts, resorts, and boats visiting the Vergennes City Basin.

Of the two groups in the quasi-resident category, residents of seasonal homes and residents at full-time service private campgrounds, the largest component is the seasonal homes population. It is estimated that this group represents 404 full-time population equivalents. Table 1.6 shows the total capacity based on the number of seasonal units by town in the GVMA.

TABLE 1.6
QUASI-RESIDENT CAPACITY OF SEASONAL HOMES

	Persons per House	Seasonal Homes	Persons in Seasonal Homes
Addison	2.92	108	315
Ferrisburgh	2.81	264	742
Panton	2.77	7	19
Vergennes	2.51	5	13
Waltham	2.73	1	3

If each residence is occupied for 135[12] days in a season, then the unit produces 37% of a year-round resident. Therefore, on average it takes approximately three seasonal residences to produce the same population equivalent of a year-round residency. Table 1.7 shows the full-time seasonal equivalent by town in GVMA.

TABLE 1.7
FULL TIME POPULATION EQUIVALENT[13]

	Persons in Seasonal Homes	Full-Time Equivalent Persons
Addison	315	116.6
Ferrisburgh	742	274.5
Panton	19	7.0
Vergennes	13	4.8
Waltham	3	1.1
		404.0 full-time equivalents

[12] The use of 135 days is based on an estimated season of between four and five months. EFCA has conducted other studies that put the range at between 90 and 180 days depending on the type of traveler market, e.g. skiing, lake shore, rural camp or water front camp on interior pond or lake.

[13] The estimate of per capita income was derived from data provided by the Vermont Department of Taxes, printout on Personal Income and Taxes by Town. Since there is no socio-economic profile of seasonal residents a conservative assumption is that their incomes are like those of the Town's permanent residences.

The spending capacity of this group was estimated based on each town's 1990 per capita income. This is shown in Table 1.8. In total, this group is assumed to generate $4,984,307 in demand.

TABLE 1.8
PER CAPITA INCOME

	1990 Per Capita Income	Population	Gross Income
Addison	$10,280	116.6	$1,198,648
Ferrisburgh	$13,277	274.5	$3,644,537
Panton	$9,277	7.0	$64,939
Vergennes	$13,356	4.8	$64,109
Waltham	$10,977	1.1	$12,075
TOTAL			$4,984,307

There are three long-term occupancy, private campgrounds in the GVMA. They have a total of 120 spaces available. It is estimated that they have an average occupancy of 50% for a season which is assumed to be approximately 135 days long. Further, this group caters to a combined clientele of families and retirees so it is assumed that the average number of persons per campsite is approximately 3.[14] Using these assumptions, this group would generate 24,300 visitor days. Assuming an average expenditure of $75.00 per person on utilities, food, rental fees, etc., this group would generate $1,822,500 in demand.

[14]These estimates are based on conversations with the management at each of the camp grounds.

The total visitor days from all sources for the general travelers category is 111,562. As stated, different occupancy rates were assumed for the different types of accommodations. For example, rooms in motels, cottages, and bed and breakfasts were assumed to have an occupancy rate of 30% with two persons occupying the rented rooms. Estimates for resorts were built from another set of assumptions because of the seasonal nature of their business and because the business is targeted to destination travelers as opposed to passerby travelers. Similarly, different rates of daily expenditures were assumed for different types of general travelers. The weighted average daily expenditure is approximately $70.83.[15]

The two categories of travelers are estimated to have total direct expenditures of $14,708,687. However, the impact on the GVMA will exceed this direct effect by the amounts associated with the multipliers that are specific to the different sectors in which the expenditures take place. Tables 1.9 and 1.10 show the output and employment effects of the expenditures made by the quasi-residents. Tables 1.11 and 1.12 show the output and employment effects associated with the expenditures made by the general travelers.

[15]Because of the presence of a single large resort EFCA cannot detail the exact calculations used to generate general traveler visitor days or the expected expenditures.

TABLE 1.9
DIRECT AND FULL-IMPACT OF EXPENDITURES BY QUASI-RESIDENTS

Total Direct Expenditures

$6,806,807

Type of Expenditure	Direct Expenditure ($)	Multiplier	Full-Impact ($)
Housing Related	$1,361,361	1.5281	$2,080,296
Medical	$1,089,089	1.7757	$1,933,896
Durable Goods	$ 816,817	1.7398	$1,421,098
Non-Durable Goods	$1,089,089	2.0976	$2,284,473
Food	$1,021,021	2.1227	$2,167,321
Services	$1,429,429	2.0166	$2,882,587
			$12,769,672

TABLE 1.10
DIRECT AND FULL-IMPACT EMPLOYMENT FROM QUASI-RESIDENT'S EXPENDITURES

Type of Expenditure	Direct Employment	Employment Multiplier	Full-Impact
Housing Related	39	1.7984	70
Medical	54	1.5515	84
Durable Goods	40	1.4932	59
Non-Durable Goods	81	1.4715	119
Food	77	1.4688	114
Services	108	1.6355	177
			622

TABLE 1.11
DIRECT AND FULL-IMPACT OF EXPENDITURES BY GENERAL TRAVELERS

Total Direct
Expenditures

$7,901,936

Type of Expenditure	Direct Expenditure ($)	Multiplier	Full-Impact ($)
Transportation	$3,792,902	1.5083	$5,720,835
Lodging	$ 948,226	1.7184	$1,629,431
Food Services	$2,433,779	2.3028	$5,604,506
Entertainment	$ 173,841	2.2386	$ 389,161
General Retail	$ 553,132	2.0513	$1,134,639
			$14,478,572

TABLE 1.12
DIRECT AND FULL-IMPACT EMPLOYMENT FROM GENERAL TRAVELER'S EXPENDITURES

Type of Expenditure	Direct Employment	Employment Multiplier	Full-Impact
Transportation	126	1.6750	210
Lodging	43	1.5208	65
Food Service	214	1.4600	312
Entertainment	13	1.6355	22
General Retail	39	1.4730	58
			668

Summary of the Key Results of the Economic Analyses
Table 1.13 shows a summary of the estimated impacts of water-based travel and recreation on the GVMA.

TABLE 1.13
ESTIMATED IMPACTS OF WATER-BASED TRAVEL AND RECREATION

	Full-Impact Expenditures	Full-Impact Employment
General Travelers	$14,478,572	668
Quasi-Residents	$12,769,672	662
TOTAL	$27,248,244	1,290

The estimated full-impact of expenditures of $27,248,244 is 22% of the GVMA's net commodity supply. The estimated full-impact on employment of the expenditures is 1,290 persons employed. This is 39% of the GVMA's total employment.

The economic model provides a means of describing the full impact of direct expenditures. Direct expenditures by water based travelers, tourists and recreationists are estimated at $14,708,687. The full impact is estimated at approximately $27,248,244.

It is estimated that 834 jobs are directly dependent on the expenditures generated by water based travel, tourism and recreation. The employment impact is estimated at 1,290 jobs.

The estimates as presented do leave some major sources of water based travel, tourism and recreation under valued. The under estimation problem is most notable for recreation. For example, fishing and special events like the Basin Harbor Boat Show are under stated to the extent that visitors make only day trips. Also left out are the wide range of scenic based activities such as cycling and eco-tourism. Unfortunately there is inadequate data to estimate the economic value of these.

SURVEY OF BUSINESSES

Introduction

A survey of local businesses was conducted for two purposes. One, the information provided by firms on the type of business activity, annual revenues by type of business activity, and number of employees was used as a way of gauging the results of the economic model. Second, the information provided by the firms was used to identify the businesses community's perceptions about how the Otter Creek's and Lake Champlain's water resources contribute to the area economy.

Business Survey

A total of one hundred-five (105) questionnaires were given to businesses in GVMA. Of the one hundred-five (105) questionnaires, sixty-three (63) were returned. Three (3) of the sixty-three (63) questionnaires which were returned were not sufficiently complete to be included in the analysis. The sample of sixty (60) valid returns represents fifty-seven percent (57%) of the known population of area businesses. This is an extremely high rate of return.

The three controlling characteristics are: 1) years in business in GVMA, 2) the type of business activity, and 3) the size of firm measured by annual sales revenue and number of employees. The analysis of the survey is divided into four sections. The first section presents a general overview of the survey results based on only the three

characteristics. The profile of the business community provided by the survey is compared to the profile from such sources as the Department of Employment and Training (DET) and the Department of Taxes. The remaining three sections present the results of the relationship of business characteristics to perceptions about the importance of water quality.

Profile of the Business Community

A copy of the questionnaire is included in Appendix 2. There are twenty-eight (28) items on the questionnaire. This section reviews the survey results to provide a profile of the businesses in GVMA.

Item two (2) on the questionnaire focuses on the length of time that firms have been in business in GVMA.

How many years have you had a business in Vergennes or the immediate area?

(1) 0-1	*(2) 1-2*
(3) 3-5	*(4) 5-10*
(5) 10 or more	*(9) It is not my business.*

Only ten percent (10%) of the respondents indicated that they were responding on behalf of a business that they did not own. Twenty-five (25) businesses or approximately forty-two percent (42%) of the respondents have been in business in the GVMA for ten (10) or more years. An additional eighteen percent (18%) or eleven (11) firms have been in business in GVMA five (5) to ten (10) years.

Extrapolating to the population of businesses in GVMA approximately sixty-three (63) firms have been operating for more than five (5) years. This high longevity of firms is a good indicator that there is a stable economic base from which the City of Vergennes can build.

However, there are fewer new firms than expected. The small number of start-ups and new businesses has several possible interpretations. On the one hand it could simply reflect that the current recession has meant that few entrepreneurs have been willing to embark on new ventures. It could also mean that the GVMA is not viewed as a healthy market for growth. No conclusion can be drawn from this survey, but the City of Vergennes may wish to investigate the issue further in conjunction with the Chamber of Commerce and the Addison County Industrial Development Corporation.

Item four (4) on the questionnaire focuses on the firm's type of business activity.

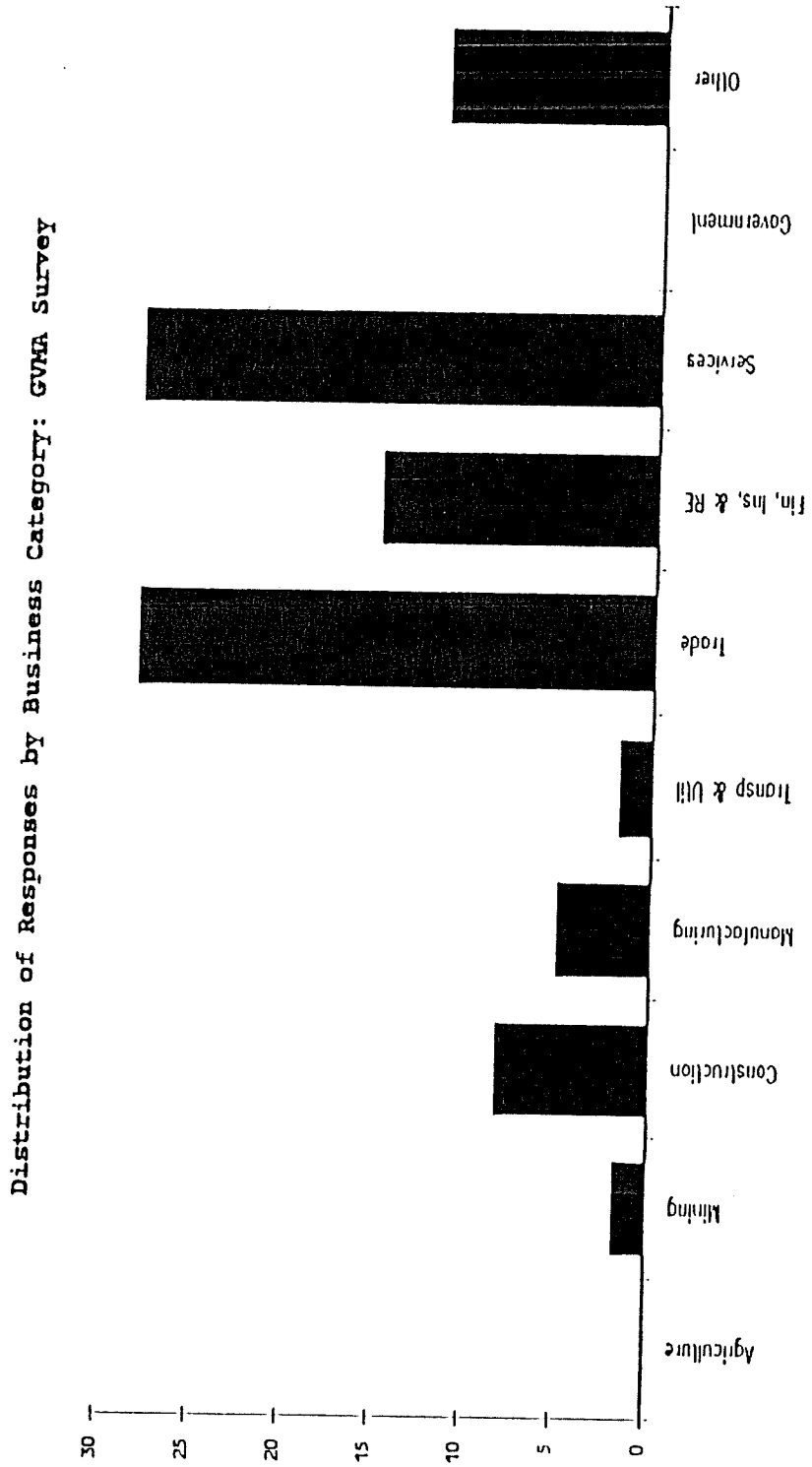
What category best describes the type of business that you have?

(1) Wholesale or Retail Trade
(2) Agriculture, Forestry or Fishing
(3) Services
(4) Mining
(5) Finance, Insurance, or Real Estate
(6) Manufacturing
(7) Construction
(8) Transportation
*(9) Other*_____

Graph 2.1 shows the distribution of responses by type of business activity. Of the responses approximately fifty-seven percent (57%) are involved in Trade (Wholesale or Retail) and Services. The next largest category of business activity is Finance, Insurance, and Real Estate (FIRE). This concentration of businesses in the basic support sectors of Trade, Services and Finance, Insurance and Real Estate is consistent with the City of Vergennes providing those business services common to a center for the towns in its market area.

Table 2.1 shows the distribution of businesses by type for Addison County based on the number of reporting units surveyed by the Department of Employment and Training (DET). The table also shows the distribution of businesses by type based on

GRAPH 2.1


Distribution of Responses by Business Category: GVMA Survey
30
25
20
15
10
5
0
Agriculture
Mining
Construction
Manufacturing
Transp & Util
Trade
Fin, Ins, & RE
Services
Government
Other

the GVMA survey. The two distributions are similar. This suggests that it is reasonable to use the County as a bench-mark for the economic model of the City of Vergennes. Further, it is expected that the City would have fewer farms than the County.[16] The only areas where there are any significant differences between the City and the County are in Construction and Transportation/Utilities, both of which are lower than the County. Finance, Insurance and Real Estate is present at a significantly higher level than in the County.

TABLE 2.1
DISTRIBUTION OF FIRMS BY TYPE OF BUSINESS ACTIVITY

	Addison County (%)	Greater Vergennes Market Area (%)
Agriculture	5.3	NR
Mining	0.5	1.7
Construction	15.5	8.3
Manufacturing	7.4	5.0
Transportation and Utilities	4.4	1.7
Trade	26.4	28.3
Finance, Insurance and Real Estate	5.0	15.0
Services	25.6	28.3
Government	9.9	NR
Other	NA	11.7

The term NA means not applicable. The term NR means no response in this category. The distribution for Addison County is based on the number of reporting units as tabulated by the Vermont Department of Employment and Training, Employment and Wages, for 1991. This is the most recent data available from DET.

[16] There are two farms in the City, but neither of these are fully operated as farms.

Item five (5) on the questionnaire focuses on the size of firm based on annual revenue. This question was optional.

(Optional !) What is the annual sales revenue of your business?

(1) 0 - $50,000
(2) $50,000 - $100,000
(3) $100,000 - $250,000
(4) $250,000 - $500,000
(5) $500,000 - $1,000,000
(6) $1,000,000 - $5,000,000
(7) $5,000,000 or more

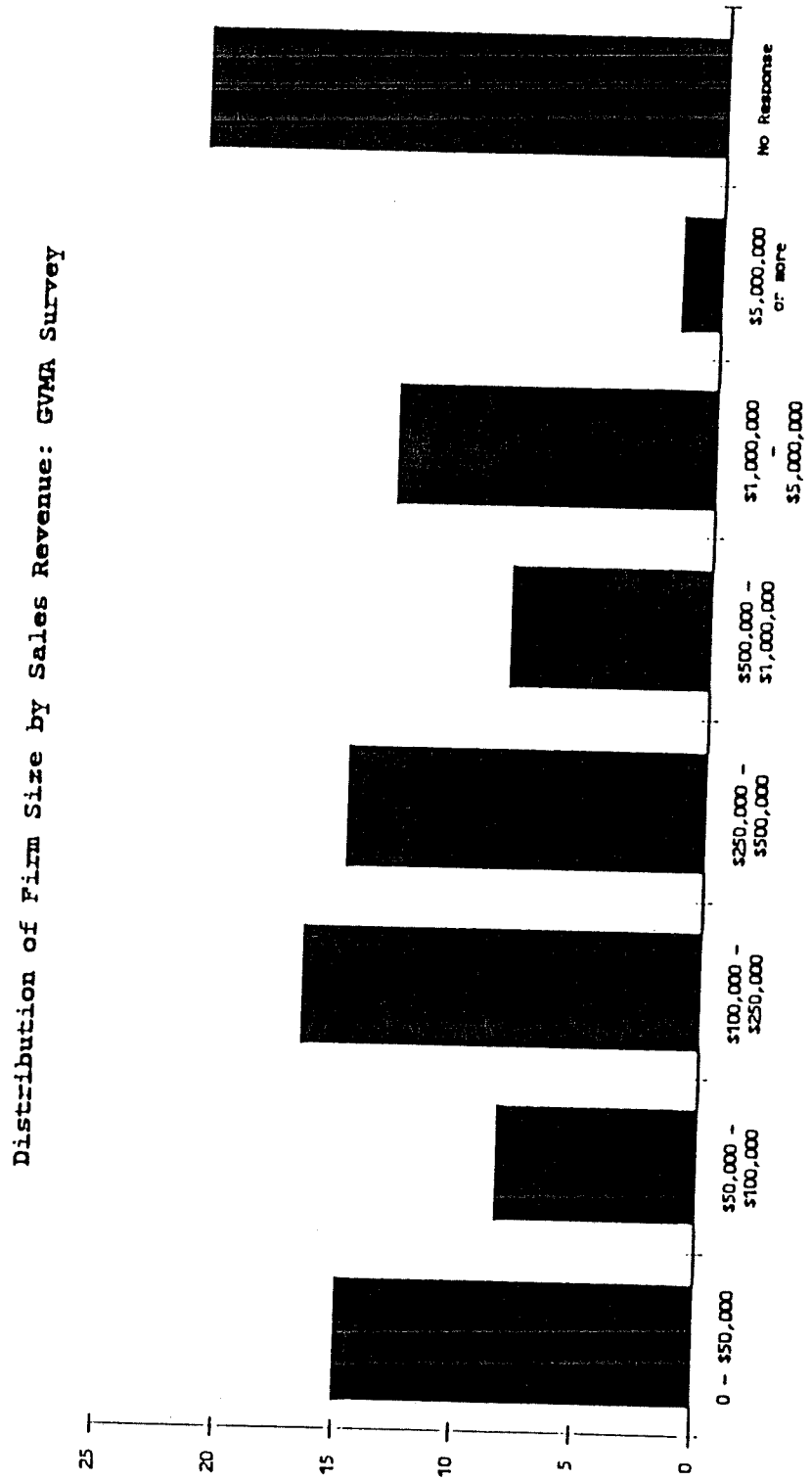
Only 22% of the respondents chose not to answer the question on annual sales revenue. Graph 2.2 shows the distribution of firms by annual revenue. The typical business as measured by median revenue has revenues of approximately $243,000 per year.[17,18] The weighted average annual revenue is $882,447. The extremely large mean value relative to the median is due to the presence of responses by several firms which are significantly larger than the typical business. Because of the presence

[17] Rank ordering the firms which actually responded to the question, the twenty-third (23rd) firm was the median firm. This firm falls into the third class or the $100,000 to $250,000 range. The twenty-third (23rd) firm falls ninety-five percent (95%) of the way through this class. The dollar value associated with this position is approximately $240,000.

[18] For the balance of this chapter, point estimates are made using interval data. This is done to development of explanatory hypotheses and not part of a formal statistical analysis. Since no other data are available to make statistically valid conclusions, this approach was selected as the best alternative.

of several large establishments in the survey, the median is a more accurate measure of the typical size of a business.

GRAPH 2.2


Distribution of Firm Size by Sales Revenue: GVMA Survey
25
20
15
10
5
0
0 - $50,000
$50,000 - $100,000
$100,000 - $250,000
$250,000 - $500,000
$500,000 - $1,000,000
$1,000,000 - $5,000,000
$5,000,000 or more
No Response

The average gross sales revenue for those firms in GVMA submitting sales tax reports to the State is much smaller than that reported by the survey respondents. The average gross sales revenue for firms in the Town of Addison is approximately $18,000. The average gross sales revenue for firms in the Town of Ferrisburgh is approximately $36,000. The average gross sales revenue for firms in the Town of Panton is approximately $11,500. The average gross sales revenue for firms in the City of Vergennes is approximately $39,500. The average gross sales revenue for firms in the Town of Waltham is approximately $4,200.

The discrepancy between the size of firm based on revenue as reported by the Vermont Department of Taxes and the size of firm as derived from the survey has several explanations. First, the estimate of firm size using gross taxable receipts underestimates total sales since many items are not covered by the sales tax. Second there may be a large number of self-employed and/or home occupation businesses within GVMA that may not appear on the City's mailing list. On average an 18.8% adjustment to total employment as reported by DET is required to capture these micro-businesses. Additionally, a number of the businesses responding to the survey pay no sales taxes, e.g. services. These service firms turned out to be some of the larger firms in the sample. This tends to emphasize the deviation of the survey results from those of the Department of Taxes.

Even given the inexactness in the estimates of average firm size based on the sales database the findings suggest that the larger firms in GVMA tend to be located in

the City of Vergennes. Again this supports the view that the City is serving a larger market and is a regional growth center for the towns included in the GVMA.

The only way in which gross sales based on sales tax reports were used in the economic model analyses was to determine what portion of Addison County's net commodity supply was likely to be generated within the City of Vergennes. The GVMA represents approximately 12.8% of the County's gross sales. In preparing the economic model, it was assumed that gross sales as derived from the taxable receipts understate firm size in other towns within the County the same way it understates firm size in the City of Vergennes. The acceptability of this assumption is supported by the previous finding from the survey that the distribution of firms by type of business is approximately the same in the City as in the County.

Items six (6) and seven (7) focused on the size of firms based on the number of employees.

6. *How many full time employees (on average) do you have[19]?*

(1) 1	*(2) 2 - 5*
(3) 6 - 10	*(4) 11 - 25*
(5) 26 - 50	*(6) 51 - 100*
(7) 101 or greater	
(8) Don't know	
(9) Not Applicable	

[19] Full time is defined as an employee who is paid regularly by the company, and who works thirty (30) or more hours per week. Owner(s) are full time if they work thirty (30) or more hours per week, regardless of pay.

7. How many part time employees (on average) do you have?

(1) 1	*(2) 2 - 5*
(3) 6 - 10	*(4) 11 - 25*
(5) 26 - 50	*(6) 51 - 100*
(7) 101 or greater	
(8) Don't know	
(9) Not Applicable	

Graph 2.3 shows the distribution of firms based on the number of full time and part time employees. The median number of employees per firm is four (4) full time employees. The average number of employees per firm is six (6). The average number of employees per firm for Addison County based on the data published by DET is 9.6.[20] Again, this suggests that it is reasonable to use the County as a benchmark for the economic model of the City.

[20] This is based on total private employment and excludes government employers such as schools.

GRAPH 2.3

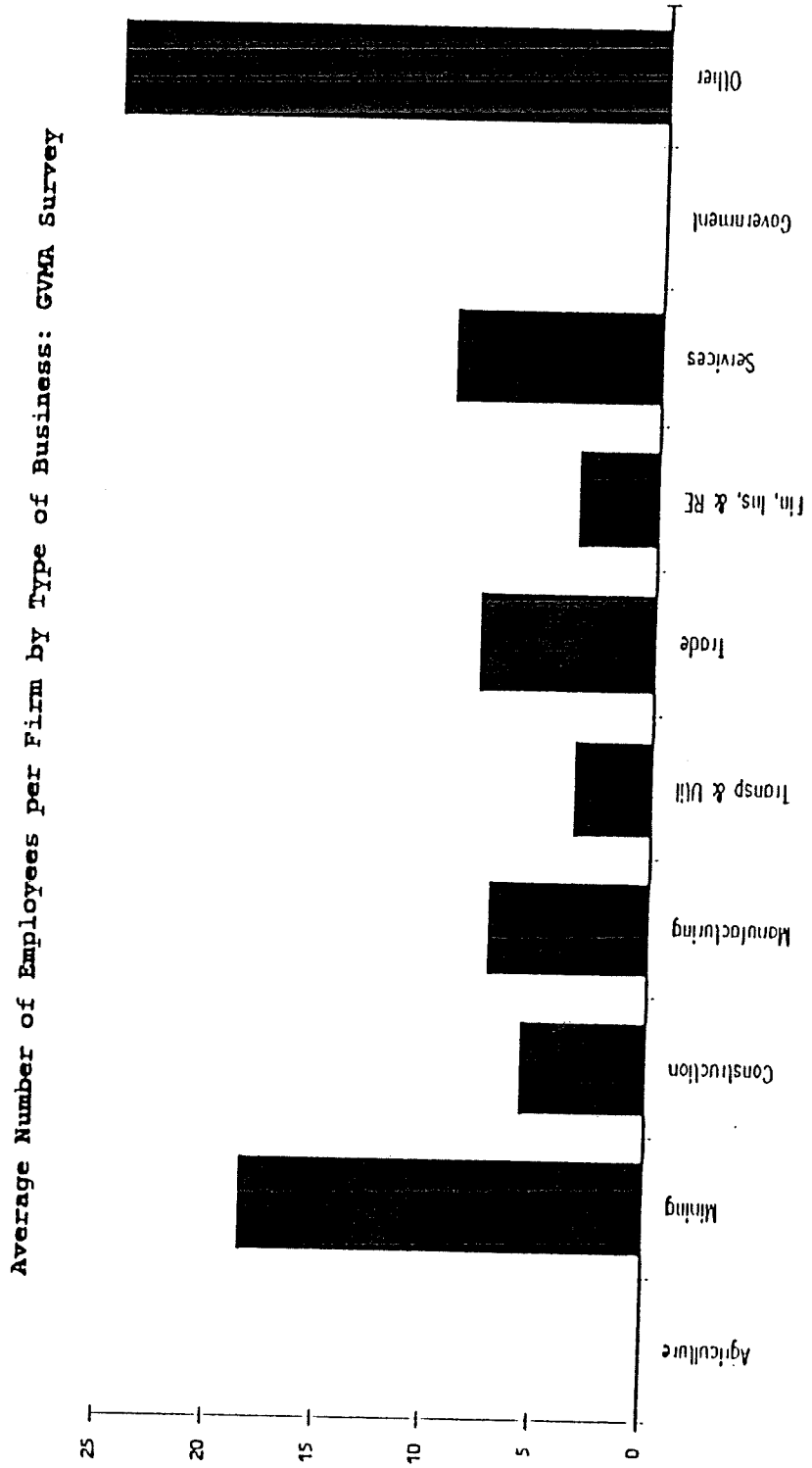

Average Number of Employees per Firm by Type of Business: GVMA Survey
25
20
15
10
5
0
Agriculture
Mining
Construction
Manufacturing
Transp & Util
Trade
Fin, Ins, & RE
Services
Government
Other

Table 2.2 shows the average firm size based on number of employees by type of business activity.

TABLE 2.2
AVERAGE NUMBER OF EMPLOYEES PER FIRM BY TYPE OF BUSINESS

	Addison County (#)	Greater Vergennes Market Area Full Time (#)	Greater Vergennes Market Area Part Time (#)
Agriculture	5.4	NR	NR
Mining	3.4	18	.5
Construction	3.6	5	.7
Manufacturing*	28.7	5	2.3
Transportation and Utilities	7.6	3.5	NA
Trade	8.5	5.4	2.6
Finance, Insurance and Real Estate	5.6	2.4	1.2
Services	10.9	5.3	4.1
Government	14.8	NR	NR
Other	NA	15.7	9.3

*For GVMA the average number of employees in manufacturing is clearly too low. This indicates that Simmonds Precision is not one of the respondents to the survey.

Like the overall size of firm as measured by number of employees, the average number of employees per firm by type of business is generally smaller in GVMA than for the County as a whole. Adding in the number of part time employees nearly closes the gap between the average for the County and the average for the GVMA. There was no significant variation in employment by season, with the exception or a

large increase, from one (1) to eight (8), in the average number of part time employees in Transportation and Utilities.

All of the evidence from the profile of the businesses in GVMA suggests that it was reasonable to use the county as a bench-mark in developing the economic model of the City. The distribution of firms by type of business in GVMA is sufficiently similar to the County and the size of firm as measured by the number of employees is not significantly different from that of the County.

Perceptions of the Importance of Water-Based Activity and Water Quality: Length of Time in GVMA

In general, the longer a firm has been in business in GVMA the more likely the respondent states that their business will grow in proportion to an increase in tourists, residents and passersby.[21] Firms in business for only a year said yes to the question of growth thirty-three percent (33%) of the time. Firms in business for up to two years said yes twice as frequently or sixty-six (66%) of the time. For all other cases including those who responded not as owners but as managers, respondents said yes to the growth question at least eighty percent (80%) of the time. Extrapolating this

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[21] This is item eleven (11) on the questionnaire.
Would your business grow in proportion to an increase in tourists, residents, and passersby?

(1) Yes (2) No
(3) Don't know (4) Not applicable

to the known number of area businesses, one can infer that eighty-four of the one hundred and five (105) businesses will expect to prosper with an increase in tourism and passersby.

Thirty-three percent (33%) of all businesses responded that their business will improve if the water-quality in Lake Champlain improves.[22] Another thirty-two (32%) said they did not know. Only twenty-five percent (25%) of the respondents answered no, their business will not improve if the water-quality in Lake Champlain improves.

However, the older a business the more likely the respondent affirmed that his/her business will improve if water-quality improves. Fifty-five percent (55%) of the firms five (5) to ten (10) years of age responded that their business will improve if the water-quality in the Lake improves. This response rate is six times greater than the rate at which firms in this age group said no. For firms ten (10) or more years old the yes respondents made up forty-four percent (44%) of the respondents, more than twice the rate of no responses for firms in this age group.

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[22] This is item twenty-seven (27).
If the water-quality of Lake Champlain improves, will your business improve?
(1) Yes (2) No
(3) Don't know (4) Not Applicable

If the water-quality of Lake Champlain gets worse, forty-three percent (43%) of the survey respondents expect that their business will also get worse.[23] An additional twenty-eight percent (28%) responded that they did not know if a decrease in water-quality will reduce their business. Only eighteen percent (18%) felt that a reduction in water quality will not hurt their business.

Again, the age of the firm has a significant effect on the extent to which firms believe reduced water quality will effect their business. For firms between the age of five (5) and ten (10) years, the perception that a decrease in water quality will make their business worse is seven (7) times that of firms responding no. For firms more than ten (10) years old, fifty-six (56%) said a reduction in water-quality will make business worse. This response rate is more than twice that of the firms of the same age that said no.

There is a positive relationship between the length of time that firms have been in GVMA and the extent to which they believe that improvements in water quality will improve business. There is also a strong relationship between the length of time a firm has been in GVMA and the extent to which they believe that a reduction in water-quality will have a negative effect on business. Further, irrespective of age, a

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[23] This is item twenty-eight (28) of the questionnaire. *If the water-quality of Lake Champlain gets worse, will your business get worse?*
(1) Yes (2) No
(3) Don't know (4) Not applicable

majority of firms believe that improved water-quality will improve business and a reduction in water-quality will reduce business.

Perceptions of the Importance of Water-Based Activity and Water Quality: Type of Business Activity

Item eleven (11) on the questionnaire asked about business growth.

> *Would your business grow in proportion to an increase in tourists, residents, and passersby?*
>
> *(1) Yes* *(2) No*
> *(3) Don't know* *(4) Not applicable*

An overwhelming majority, eighty percent (80%), of firms responded yes irrespective of the type of business activity. Only manufacturing respondents answered either no or not applicable one hundred percent (100%) of the time. For the other types of business activities the no responses were eighteen percent (18%) for Service firms, twenty-two percent (22%) for Finance, Insurance, and Real Estate, and twenty-nine percent (29%) for firms which classified themselves as Other.

When asked how much the Lake contributes to the City's economy[24] the median

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[24] Item seventeen (17) of the questionnaire asks:
How much does Lake Champlain contribute to the economy of Vergennes?
(1) 0 - 5% *(2) 5% - 10%*
(3) 10% - 20% *(3) 20% - 50%*

response indicates that firms believe that 30.4% of the City's economy depends on Lake Champlain. The median response for firms involved in Trade indicates that 25.4% of the respondents believe the City's economy depends on the Lake related activities. Firms involved in Finance, Insurance, and Real Estate indicate that they believe that 27.5% of the City's economy depends on the Lake. The median response for Service firms and firms engaged in Construction indicate that they believe respectively that 32.5% and 35% of the City's economy depends on the Lake. Firms which classified their activity as Other indicate that 60% of the City's economy depends on the Lake.

Interestingly, firms' perceptions about the importance of the Lake to the City's economy is not merely a reflection of their own business experience. For example, while firms engaged in Trade think that approximately 25% of the City's economy depends on the Lake, firms in the Trade sector estimate that only 17.5% of their own revenues are a result of Lake related activities.[25] Firms engaged in providing Services

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(4) 50% - 75% *(5) 75% - 100%*
(8) Don't know *(9) Not applicable*

[25] Item fourteen (14) of the questionnaire asks about the importance of the Lake to firm's revenue.

How much of your annual revenue is related to Lake Champlain?

(1) 0 - 5% *(2) 5% - 10%*
(3) 10% - 20% *(4) 20% - 50%*
(5) 50% - 75% *(6) 75% - 100%*
(8) Don't know *(9) Not applicable*

estimate that only 12.5% of their revenue comes from Lake related business while as a whole they estimate that 32.5% of the City's economy depends on the Lake. Similar differences are present for each type of business activity indicating that firms attribute a greater importance of the Lake to the City's economy than they perceive relative to their own firm's revenue.

Items twenty-seven (27) and twenty-eight (28) ask firms about the relationship between changes in water quality and changes in their business.

27. If the water quality of Lake Champlain improves, will your business improve?

(1) Yes *(2) No*
(3) Don't know *(4) Not applicable*

28. If the water quality of Lake Champlain gets worse, will your business get worse?

(1) Yes *(2) No*
(3) Don't know *(4) Not applicable*

In terms of improvements of business, Trade, Services, and Finance, Insurance, and Real Estate answered that business will improve if water quality improves, 41%, 35%, and 44% respectively. The response, "don't know" is the next most common response for Trade and Service firms. The response, "don't know", is the most common response for Manufacturing and Construction firms with "don't know" rates of 67% and 60%. Firms classifying themselves as Other have the highest "no" response rate indicating that business will not improve if water quality improves.

With respect to a reduction in water quality producing a corresponding reduction in business, again firms in Trade, Services, and Finance, Insurance, and Real Estate a majority responded "yes". Fifty-three percent (53%) of the firms engaged in Trade indicate that business will get worse if water quality decreases. Forty-seven percent (47%) of the Service firms and seventy-eight percent (78%) of the Finance, Insurance, and Real Estate firms indicate that business will get worse if water quality gets worse. Overall the principal sectors which indicate the greatest sensitivity of business to changes in water quality are Trade, Service and Finance, Insurance, and Real Estate.

As reported previously there is a much stronger feeling that a decrease in water quality will decrease business than there is a feeling that an improvement in water quality will improve business. This pattern of responses is consistent with the perspective of resource based businesses. A single business acting on its own has little control over the quality of the environment. Damage to the quality is an externality that a single firm cannot overcome on its own. It therefore is at the mercy of its neighbors. However, even if there is improvement in the quality of the resource, businesses are not assured of success unless they are able to meet the other competitive forces in the market place.

Perceptions of the Importance of Water-Based Activity and Water Quality: Size of Firm

Only the size of firm as measured by annual sales revenue is used to discuss the relationship between firm size and water quality. Since there is a direct relationship

between the number of employees and sales revenue it is unnecessary to discuss the impact of both measures of firm size on the firm's perception of the Lake and water quality.

Irrespective of size, thirty-five percent (35%) of the businesses attribute up to 5% of their revenue to the Lake. In general the larger the firm the more likely it attributes more than 5% of its revenue to Lake related activity. For example for those firms with sales of $250,000 to $500,000, forty-four percent (44%) attribute between ten percent (10%) and fifty (50%) of their annual sales revenue to the Lake. Of the firms whose annual sales range from $500,000 to $5,000,000, sixty-three percent 63% of the firms believe they earn between zero percent (0%) and ten percent (10%) of their revenues from Lake related business. The other thirty-seven percent (37%) with revenues ranging from $500,000 to $5,000,000 estimate that they earn between ten percent (10%) and fifty percent (50%) of their revenue from Lake related business.

The information on annual sales revenue and on the percent of revenue attributable to the Lake when combined provides an estimate of the annual revenue generated by Lake related activities. Since both the annual sales revenue and percent attributable to the Lake are given in intervals, it was assumed that the midpoint of the interval represented the typical firm in each category. For example firms indicating that their annual sales are between $50,000 and $100,000 are assumed to make $75,000 on average. For firms indicating that between 5% and 10% of their revenues come from Lake related business, it is assumed that on average 8% of their revenues are

generated by Lake related activities. Firms which indicated both that their annual revenue is between $50,000 and $100,000 and that between 5% and 10% of their revenues are based on activity related to the Lake therefore on average make $6,000 from Lake related business. Repeating this calculation for all forty-seven (47) firms responding to the question about annual sales revenues it is estimated that the average firm in GVMA makes $140,300 annually from Lake related business. Extrapolating this to the known population of 105 businesses, it is estimated that Lake related activity generates approximately $14,732,000 per year.

Summary of the Key Results of the Survey

The results of the survey of businesses in GVMA are used for two purposes. The first is to determine the extent to which it is acceptable to use information from the County as a bench-mark for the development of the economy model of the City of Vergennes. The second purpose of the survey is to learn how the business community views the economic importance of the Lake and the business community's expectation about the impact of changes in water quality on the economy.

With respect to the first issue, the survey results indicate that the County can serve as a bench-mark for the development of an economic model of the City. Using the economic model the estimated direct effect of water based travel, tourism and recreation was $14,708,687. Based on the survey of the business community, it is estimated that Lake related activities generate approximately $14,732,000 in direct expenditures.

With respect to perceptions, the general findings are that the business community attributes great importance to the role of the Lake in the City's economy. Further, there is significant agreement that improvements in water quality will improve business. However, there is even more agreement that a decrease in water quality will decrease business.

Specific highlights of the findings are:

- The survey results indicate that the average firm in GVMA makes $140,300 annually from Lake related business activity.

- Extrapolating from the survey results to the known population of 105 businesses in GVMA, it is estimated that Lake related activity generates approximately $14,732,000 per year in business revenue.

- Forty-four percent (44%) of the firms with revenues between $250,000 and $500,000 estimate that they earn between ten percent (10%) and fifty (50%) of their revenues from Lake related business. Thirty-seven percent (37%) of the firms with revenues between $500,000 and $5,000,000 estimate that they earn between ten percent (10%) and fifty percent (50%) of their revenue from Lake related activity.

- Approximately forty-two percent (42%) of the firms responding to the survey have been in business in GVMA for ten (10) or more years, but there appear to be few new firms in the market area.

- The distribution of firms by type of business activity for GVMA and the County are substantially the same.

- Based on the survey the typical business has median annual sales of approximately $243,000 per year.

- Average gross sales for firms in the City of Vergennes are substantially higher than the average gross sale of firms in the other towns in GVMA.

- Average gross sales for firms in GVMA are substantially lower than the average gross sales for other urbanized areas of the County.

- The average number of employees per firm in GVMA is six (6). The average number of employees per firm for the County is 9.6.

- The older the firm the more likely the firm to feel that their business will be significantly changed by changes in water quality.

- Overall, irrespective of age, size or type of business, firms believe that decreases in water quality will have a significant negative impact on their business.

- Firms estimate that 30.4% of the City's economy depends on activities related to Lake Champlain.

- The types of businesses which indicate the greatest sensitivity to changes in water quality are Trade, Services, and Finance, Insurance, and Real Estate.

- The larger the firm the more likely it attributed more than five percent (5%) of its revenue to Lake related business.

WATER QUALITY IMPROVEMENTS, FISCAL IMPACTS AND FINANCIAL OPTIONS

Introduction

This chapter begins with an overview of the water quality along the lower Otter Creek. It then provides an overview of the City's current capacity and the expected future capacity required for its wastewater treatment facility. This is followed by an analysis of the potential fiscal/financial impact of the cost of infrastructure investment in improved water quality. The chapter closes with a discussion of the financial options available for investing in the improvement of water quality.

Water Quality Along the Lower Otter Creek[26]

The water quality and the resulting options for the use of the Otter Creek's water resources by the City of Vergennes are partially determined by the upstream users of the Otter Creek. However, since one of the major economic values of the Otter Creek is its use for transportation between Lake Champlain and the Vergennes City Basin, the water quality below the City also impacts the economic potential of the Otter Creek's water resource.

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[26] Some of this material is replicated in Appendix 5A. The discussion there is more extensive.

The Vermont Agency of Natural Resources, Water Quality Division monitors and/or tests samples from approximately 5,264 miles of rivers and streams. The majority of the water quality evaluations are based on qualitative assessments conducted by field personnel from a variety of departments, agencies and programs. These assessments are compiled and cross-referenced to create a single summary analysis. Map One shows the relative water quality of the Otter Creek in the Vergennes area based on the Division of Water Quality's assessment.[27] The map also shows the water quality of the major tributaries to the lower portion of the Otter Creek. Appendix 3 contains the summary reports for the lower portion of the Otter Creek and its tributaries.

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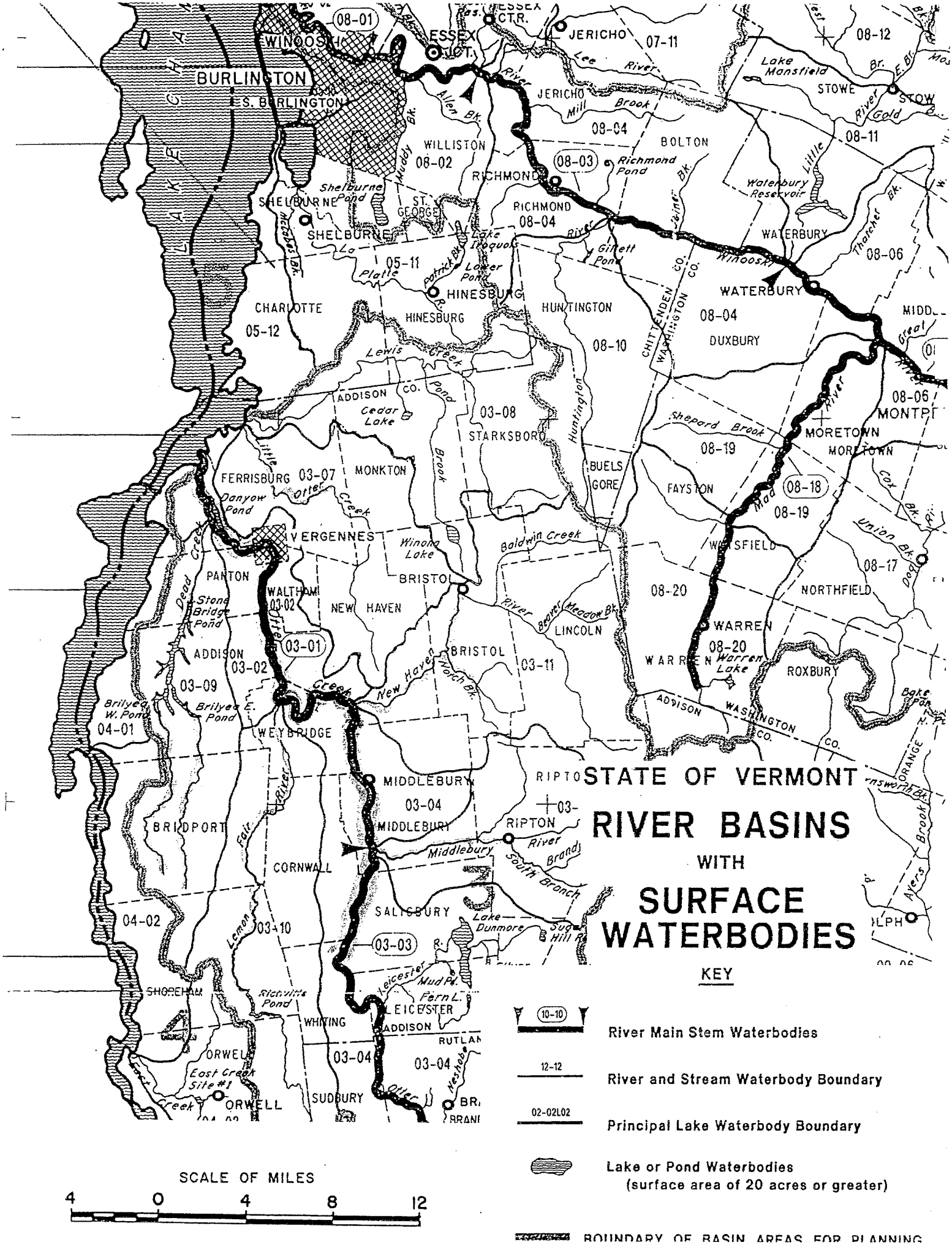
[27] The map is based on "River and Stream Use Support Status". 1992 Water Quality Assessment: 305(b) Report. Agency of Natural Resources, Water Quality Division. State of Vermont. December, 1992, page 16c.


STATE OF VERMONT
RIVER BASINS
WITH
SURFACE
WATERBODIES
KEY
River Main Stem Waterbodies
River and Stream Waterbody Boundary
Principal Lake Waterbody Boundary
Lake or Pond Waterbodies
(surface area of 20 acres or greater)
BOUNDARY OF BASIN AREAS FOR PLANNING
SCALE OF MILES
4 0 4 8 12
LAKE CHAMPLAIN
BURLINGTON
WINOOSKI
ESSEX JCT.
ESSEX CTR.
JERICHO
STOWE
WILLISTON
RICHMOND
SHELBURNE
ST. GEORGE
BOLTON
WATERBURY
HINESBURG
CHARLOTTE
HUNTINGTON
DUXBURY
MORETOWN
STARKSBORO
BUELS GORE
FAYSTON
FERRISBURG
MONKTON
VERGENNES
BRISTOL
NEW HAVEN
LINCOLN
WARREN
NORTHFIELD
ROXBURY
PANTON
WALTHAM
ADDISON
WEYBRIDGE
MIDDLEBURY
RIPTON
BRIDPORT
CORNWALL
SALISBURY
SHOREHAM
WHITING
LEICESTER
ORWELL
SUDBURY
Lake Champlain
Lake Iroquois
Lake Dunmore
Lake Monstanslet
Waterbury Reservoir
Richmond Pond
Gilett Pond
Lower Pond
Cedar Lake
Winona Lake
Danyow Pond
Stone Bridge Pond
Brilyea W. Pond
Brilyea E. Pond
Richville Pond
East Creek Site #1
Warren Lake
Lee River
Mill Brook
Allen Bk.
Muddy Bk.
Platte R.
Patrick Bk.
Lewis Creek
Little Otter Creek
Dead Creek
Baldwin Creek
Beaver Meadow Bk.
New Haven River
Worth Bk.
Middlebury River
South Branch
Lemon Fair
Leicester
Mud Pd.
Fern L.
Neshobe
Otter Creek
Little River
Gold River
Shepard Brook
Mad River
Great
Little
Thatcher Bk.
Union Bk.
Cox Bk.
Brandy
Ayers Brook
Ainsworth Bk.
Shelburne Pond
CHITTENDEN CO.
WASHINGTON CO.
ADDISON CO.
ADDISON
WASHINGTON CO.
ORANGE
08-01
08-02
08-03
08-04
08-06
08-11
08-12
08-17
08-18
08-19
08-20
07-11
05-11
05-12
03-01
03-02
03-03
03-04
03-07
03-08
03-09
03-10
03-11
04-01
04-02

The map shows the presence of three water quality levels. Green denotes the highest level of water quality, called "fully supported". Blue denotes a level of water quality termed "partially supported". Red denotes a level of water quality called "not supported".

Uses are fully supported, labeled green, "if all water uses are not impaired". Uses include aesthetics, drinking water supply, boating and swimming. These uses are considered partially supported, labeled blue, when "one or more uses is (are) impaired part of the time". Uses are not supported, labeled red, when "one or more uses is (are) impaired all of the time".[28] Appendix 5A contains a table detailing the criteria for support classifications.

Upstream of Vergennes the Lemon Fair River and portions of the Otter Creek in Weybridge and New Haven are designated as not supporting of uses. Downstream of Vergennes the Dead Creek and the Otter Creek from their confluence to Lake Champlain are designated as not supporting of uses. However, a major portion of the lower Otter Creek in and around the City of Vergennes is designated as partially supporting.

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[28] op. cit. page 1.

The uses not supported for both the Dead Creek and the Lemon Fair River are swimming, aesthetics, and drinking: all categories except boating. In both cases the prime cause of the poor quality is cropland erosion, poor management of agricultural waste, and stream bank erosion resulting from grazing and tillage practices which eliminate vegetative buffer strips. The result of these practices is turbidity, suspended solids, nutrient enrichment and excessive algal production. Both the Dead Creek and the Lemon Fair River contain high levels of pathogens from agricultural land uses. Further, there is a noted concern that aerial spraying of herbicides presents a problem along the Lemon Fair River.

The Otter Creek from its mouth to the confluence with the Middlebury River is 29.7 miles long. Fishing is supported along the full 29.7 miles. However, only 18.2 miles are considered swimmable. In the remaining 11.5 miles, swimming is not supported for 3.5 miles and support is considered not attainable for 8 miles.

As with the Lemon Fair River and the Dead Creek, the majority of the water quality problems originate with agricultural land uses. However, additional stress is placed on the water quality by hydroelectric facilities in Middlebury, Weybridge and Vergennes. Urban land uses also have an impact on this portion of the Otter Creek. These land use impacts include waste water treatment facilities, land development and urban runoff.

Hydroelectric projects slow the normal flow of water. The effect of reduced flow is similar to impoundment. It tends to raise water temperature. This combined with high nutrient levels leads to algal production. Further, the reduced flow decreases the aeration of the water. This can lead to depleted levels of oxygen which has an impact on the health of the fish population.

The development of urban land uses is typically accompanied by increases in the paved surface area. This creates increased loads on storm water catchment systems. Storm water runoff has two impacts on water quality. The first is that it can create "combined sewer overflows" (CSO). The presence of CSO problems is noted in the assessments in Appendix 5A. However, the citations are not specific.[29,30]

The second impact of urban runoff is that storm water carries both oils and salts from road surfaces into the water. The oils and salts occur in more concentrated

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[29] Dubois & King, Inc. prepared a "Wastewater Treatment Plant Expansion Study" for the City of Vergennes in November of 1993. They note that "any increase in plant capacity will require [that] lagoon overflows be addressed....The City is under State of Vermont, Agency of Natural Resources orders to complete an investigation of infiltration and inflow into the wastewater system by June, 1993." page 4.

[30] With respect to the wastewater treatment system, the City Plan notes that projects will be focused on areas of high maintenance and major sources of infiltration. The five year plan call for improvements in and the upgrading of the collection system at four specific sites: 1) Bombard, Cataract, and White Street, 2) the Easterly side of Otter Creek, 3) the south side of South Main Street, and 4) New Haven Road.

forms in urban storm water runoff because pollutants there are not buffered by soil and vegetation.

The combined rural, urban, public and private land uses of the Otter Creek produce varying levels of water quality. Looking at the quality of the water near the City of Vergennes, one finds ratings in the intermediate category of quality: partially supported uses. However, from the perspective of boaters traveling[31] to the City from Lake Champlain via the Otter Creek, this gateway to the City is unattractive with water quality not supporting at least some uses all of the time.

Wastewater Treatment Capacity

In November, 1992 Dubois & King, Inc. completed an evaluation of the wastewater treatment facility in the City of Vergennes. The study entitled "Wastewater Treatment Plant Expansion Study: City of Vergennes" noted two current deficiencies. First, the Wastewater treatment plant requires additional aeration. Second, the City of Vergennes is under a State of Vermont, Agency of Natural Resources order to

[31] Between 400 and 500 pleasure boaters a year travel between Lake Champlain and the City of Vergennes via the Otter Creek. This number accounts only for those boaters who make the complete seven mile trip and actually anchor in the City's basin at the falls.

complete an investigation of infiltration and inflow into the wastewater treatment system by June, 1993.[32]

According to Dubois & King, Inc. the wastewater treatment plant is currently designed for 660,000 gpd (gallons per day). The uncommitted reserve as of 1992 was between 140,000 gpd and 91,000 gpd.[33] Demand for a share of any current and future capacity comes from two sources: growth within the City and requests for extension of services to areas outside the City. Historically, extension of services to areas outside the City have not been permitted.[34]

Future residential demand within the City will require, according to current estimates, additional flow capacity of about 230,000 gpd. The 1992, twelve month average flow

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[32] The current five year capital plan for the City calls for improvements in and the upgrading of the collection system at four specific sites: 1) Bombard, Cataract and White Streets, 2) the easterly side of Otter Creek, 3) the south side of South Main Street and 4) New Haven Road.

[33] "Wastewater Treatment Plant Expansion Study for the City of Vergennes", Dubois & King, Inc., November, 1992, page 1.

[34] According to the City Plan, "the City Council has adopted a policy to not allow the collection system to serve buildings outside the City limits so that the availability of sewer capacity is not jeopardized for future development of Vergennes properties (page 30)". There have been renewed requests by commercial developers in the Town of Ferrisburgh in recent years to access the City's plant. The subject remains controversial and it is not clear whether the City Council will consider future requests on a case by case basis.

was approximately 499,000 gpd. Therefore, according to Dubois & King, Inc. expected future flow requirements are 730,000 gpd.

The Dubois & King, Inc. report also provided an estimate of a maximum capacity of 880,000 gpd for wastewater treatment based on the limitations of the Otter Creek.[35] Building for maximum capacity would leave an expected excess capacity of 150,000 gpd after all City needs were met.[36]

As noted previously by Dubois & King, Inc., the 1992 uncommitted reserve was between 140,000 gpd and 91,000 gpd. That report makes no note however of the potential increase in the uncommitted reserve from two sources. First, the uncommitted reserve should increase as the City continues its program of improvements in the collection system. The reduction of infiltration into the collection system should add to the uncommitted reserve. Second, the City has one major industrial employer, the Simmonds Precision Plant, a Division of BF Goodrich. In order to cut costs in the mid-1980's the plant began a plant wide program to

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[35] op. cit., page 5. This upper bound on capacity is based on Dubois & King, Inc's estimate that the Otter Creek is limited to 1200 ppd (pounds per day) Ultimate Oxygen Demand (UOD).

[36] Dubois & King, Inc. note that 150,000 gpd will serve 400 homes, or it will serve 6,000 students in group quarters, or it will serve 5,000 restaurant seats, or it will serve 4,300 professional office employees, or it will serve approximately 1,900,000 square feet of shopping center. It should be further noted that the addition of 400 homes would represent approximately a 30% increase in the total housing stock in the City of Vergennes.

conserve water. The net result of this was that the level of nickel[37] in the sludge from the wastewater treatment plant in the City of Vergennes became too concentrated to meet safety standards for normal disposal. Because of this problem, Simmonds initiated the development of a closed-loop system in their plating operation and upgraded their pre-treatment system. The overall result of the renovation is an expected 90% reduction in wastewater generated by the plating operation. This should add substantially to the City's uncommitted reserve.[38,39]

With as much as 21% of the wastewater treatment plant's capacity uncommitted, each rate payer or property owner in the City must pay a share of the capital cost of the uncommitted reserve in addition to their own share of the plant's capacity. User costs would be lower if spread over more customers. However, as noted, the City remains reluctant to provide services to customers outside the City. In fact, this is not a unique phenomenon in Vermont. This same process has been observed in several City/Town relationships in Vermont and EFCA has speculated that it is related to attempts by Cities to control development, especially commercial development, in neighboring towns. In short, Cities appear to use control of water

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[37] The plant engages in nickel plating for BF Goodrich aerospace.

[38] Additional information on Simmonds and the implications of this type of technological improvement are discussed in Appendix 5B.

[39] It should be noted that some of this capacity may be represented by the approximately 70,000 gpd noted by Dubois & King, Inc., op. cit., page 1.

and wastewater systems as defensive moves designed to slow down the erosion of central business districts.

In the case of the City of Vergennes, the policy of reserving capacity for use exclusively within this City may be a particularly questionable strategy. First, the economic model indicates that the growth in the surrounding communities is likely to have a substantial positive effect on the City's economy. Slowing the growth in the surrounding communities only slows the economic growth in the City. Second, there are not only mutual benefits to growth but there are mutual costs. Since the City and the surrounding communities jointly impact the water quality of the Otter Creek, the overall capacity for regional development would be expanded if wastewater were managed in a central facility as opposed to in-ground or mound septic systems.[40]

Analysis of Fiscal and Financial Impacts

The economic model and the business survey both indicate that the water resources of the Otter Creek and Lake Champlain contribute significantly to the local economy. What this study is unable to answer is, how much the economy will grow if water

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[40] According to the census there was an increase in the total housing stock in GVMA of 466 unit between 1980 and 1990. Of that increase only 34% was within the City of Vergennes, so 66% of the new residences were required to rely on on-site septic systems. In 1990 EFCA conducted a survey on housing costs which concluded that the cost of on-site septic systems added between $3,000 and $8,000 depending on the soils and type of system. Those homes not on the City's system paid between $927,000 and $2,472,000 in costs which could have been applied to the costs of any required modification of the City's plant.

quality is improved. However, using the information about the relationship between travel, recreation and the GVMA economy, it is possible to determine how much a given investment would have to return in order to break-even. This is accomplished through analysis of extreme cases. First, one extreme is to assume that cost of the investment in water quality improvements is passed on entirely to general travelers. The second extreme is to assume that the entire cost is paid for by property owners.[41]

Assume that the GVMA decides to invest $1,000,000[42] per year in improvements in water quality and that the entire cost is paid by general travelers. One can calculate how many additional general travelers must visit to pay the full $1,000,000 or how much additional money each traveler would have to spend if the number of general travelers remained constant.[43] If there were no change in the level of expenditure, $1,000,000 in water quality improvements would require increasing the number of visitor days by approximately 7200. This would produce approximately $500,000 in additional direct expenditures, and with an average multiplier of 2, the total impact

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[41] The only authorized taxing power for Vermont municipalities is the property tax.

[42] The same analysis would hold if the proposed implementation cost for GVMA were $1,000,000 for the water quality improvements resulting from pollution control and prevention in the Lake Champlain Basin.

[43] Note, general travelers included both overnight and day visitors to area parks, visitors to area resorts and those staying in public accommodations. For the purposes of the calculations total visitor days have been rounded to 112,000 and expenditure per visitor has been rounded to $70.

would be additional revenues of $1,000,000. Alternatively, if the number of visitor days remained at 112,000, each visitor would have to spend an additional $4.50 per day to generate additional direct expenditures of approximately $500,000. Again with an average multiplier of 2, the total revenue would increase to the required $1,000,000. Finally, for every additional dollar above $70 per visitor day for the current number of visitors, the need to increase visitor days is reduced by approximately 1700 visitor days.

If the assumed $1,000,000 per year in water quality improvements were to be paid by property owners in GVMA, then the municipal services property tax rate would have to increase. In 1990[44] the average tax rate for municipal services in GVMA was 2.01, based on a combined Grand List of $3,528,733.[45] Total taxes assessed for municipal services in GVMA were $7,100,965 in 1990. With an additional $1,000,000 for water quality improvements, the $8,100,965 would have raised the average tax rate from 2.01 to 2.30. For a property valued at $100,000 the tax burden would have increased by $290. However, between 1990 and 1991 the value of the Grand List in Addison

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[44] The information for this analysis was derived from the Annual Report, prepared by the Vermont Department of Taxes, Division of Property Valuation and Review, 1991 edition. The estimates are only illustrative and the actual rate would be lower if more of the towns in GVMA were at 80% of common appraisal. Only two of the six towns are at the 80% level of common appraisal. The other six have listed values substantially below fair market value.

[45] The average municipal tax rate is the total tax for municipal services divided by the total value of the Grand List. The municipal tax rate does not include schools.

county grew by 9%. With the growth in the Grand List during the year the impact of the $1,000,000 expenditure is reduced significantly. A $100,000 property would pay only an additional $100.

Neither of the extreme cases provides the true picture of the impact of an additional $1,000,000 expenditure per year. It is more likely that a portion of the cost would be borne by general travelers and a portion by the property owners in GVMA.

Options for Financing Infrastructure Improvements for Water Quality Management

Municipalities in Vermont are extremely limited in their fiscal authority. Traditionally, they have been granted only the power to tax on the basis of property. They could also charge fees for some services, but these fees could only cover costs. However, Act 200, the Vermont Municipal and Regional Planning and Development Act, passed in 1988, contained an amendment to 24 V.S.A., Chapter 131 which enabled municipalities[46] to levy impact fees.

Unlike exactions under Act 250, impact fees are pre-scheduled fees tied to the per unit cost of new infrastructure required to accommodate growth at the current level of public service. There is no specific information at this time as to the number of

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[46] 'Municipalities' was defined to mean, towns, cities, incorporated villages, and unorganized towns and gores. Act 200 did not extend the authority to other municipal corporations like school boards, school districts, planning commissions or fire districts (which elsewhere would be called water districts).

municipalities in Vermont that have developed impact fees. Compared to implementation in other states the rate at which the use of impact fees has been adopted appears to be slow.

Nationwide it is estimated that approximately 35% of communities use impact fees to finance a portion of water and wastewater treatment capacity. This method of financing wastewater treatment facilities is a viable option for the City of Vergennes and/or surrounding communities. However, discussions with the City indicate opposition to the use of impact fees on two grounds. Some appear to have a philosophical objection based on questions of fairness. Others appear to oppose impact fees based on perceptions about administrative difficulties and associated legal and fund management requirements.[47]

Summary

Across the nation, Federal and State financial support for infrastructure has been shrinking since the early 1970's. Government capital financing decreased from 3.4% of Gross National Product in 1965 to 1.3% in 1984. In 1972 dollars, government capital financing for 1965 was $31.3 billion. By 1984 government spending on capital financing had dropped to $20.5 billion, adjusted for inflation to 1972 dollars.[48] By the

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[47] In EFCA's experience problems associated with administrative difficulties and/or costs are not substantial.

[48] Development Impact Fees: Policy Rationale, Practice, Theory and Issues. Arthur C. Nelson, ed. Planners Press, 1988.

1990's economists were referring to the under-investment in infrastructure as the third deficit.[49] While there appears to be some attempt to rearrange priorities for government expenditures, the continued federal budget deficit combined with the recession and slow recovery indicate that communities should expect little assistance in efforts to finance new capital expenditures.

Communities do have options for generating capital. Impact fees are one source of capital for financing expansions of infrastructure. Other options include developing greater efficiencies in existing facilities. Finally, communities can re-evaluate the strategies about how they independently and collectively provide public services.

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[49] The so called twin deficits were the budget deficit and the trade deficit.

THE IMPACT OF INDUSTRIAL MIX AND LAND USE ON WATER QUALITY

Introduction

This chapter begins with a discussion of the Otter Creek as a working resource in the production of power. This economic activity has great value regionally, but provides limited returns to the City of Vergennes. Further, there is an intangible cost for which the towns in GVMA are uncompensated. That cost is reduced water quality and limits on the region's growth. Recommendations for financial remediation are proposed.

The second section of the chapter examines the impact on water quality of the various types of land use both within the City and along the Otter Creek from the City to Lake Champlain. Here the discussion centers on the economic costs that each land use imposes on adjacent uses.[50] Recommendations for institutional and financial remedies are outlined.

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[50] The theoretical basis for this discussion is contained in Appendix 5C.

The Economics of the Otter Creek as a Source of Power

The waterfalls on the Otter Creek in the City of Vergennes has been used as a site of either mechanical or hydroelectric power since 1807.[51] The City of Vergennes formally purchased the property and rights to the hydropower in 1866, establishing the Vergennes Water Company to promote the industrial resource. In 1922 the site was sold to the Burlington Traction Company for the purpose of developing hydroelectric potential of the waterfalls. Today Green Mountain Power leases the site from the City to produce electricity.

In 1992 the City re-negotiated a portion of the original 1941 lease with Green Mountain Power.[52,53] The portion of the lease which was revised provides for annual compensation of $11,500 for rights to Pumphouse Island.[54] Green Mountain Power also agreed to provide $9,500 in matching funds to assist in the stabilization of the Pumphouse and the eventual restoration as a historic site.

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[51] An economic history of the City of Vergennes in provided in Appendix 5B.

[52] Between 1941 and 1992 compensation for the lease of two islands on top of the falls and the associated water rights remained unchanged.

[53] "Report of the City Manager", Annual Report for 1992: Vergennes, Vermont, pp 9-10.

[54] Pumphouse Island is so named because the City of Vergennes at one time operated its own hydroelectric plant on the island. The facility provided enough power to light Main Street.

In terms of impact on water quality, hydroelectric facilities slow the normal flow of water. The effect of reduced flow is similar to impoundment. Impoundment results in an increase in water temperature. This combined with high levels of nutrients leads to algal production. Further, the reduced flow decreases the aeration of the water. This leads to depleted levels of oxygen which reduces the assimilative capacity.[55]

The economic trade-off of the use of the Otter Creek to produce hydroelectric power is the impact of reduced assimilative capacity on the region's capacity for growth. A large number of electric customers receive the benefits of lower electric rates while the City and surrounding communities bear an ultimate cost in the form of a cap on growth.

In 1995 Green Mountain Power must seek re-licensing for the hydroelectric plant in the City of Vergennes. Under the Federal Energy Regulatory Commission's (FERC) re-licensing the City of Vergennes and other users of the Otter Creek may request a share of the utility's profits from the site to provide for improved opportunities for use.

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[55] Under current State of Vermont regulations, the definition of assimilative capacity is a measure based on fish habitat. Current guidelines do not adequately account for competing uses of the assimilative capacity.

Beyond a share of the profits from the site, the City of Vergennes may want to request additional compensation for losses. For example, an impact exaction or other specific compensation could be negotiated to offset the losses associated with the cap on growth created by reduced assimilative capacity.

There is limited evidence of the cost to rate payers of the effect of FERC's profit sharing provisions. However, Green Mountain Power is currently seeking re-licensing for its Essex Junction plant on the Winooski River. It is estimated that an additional $1.00 per rate payer will cover the combined costs increasing streamflow and improving public access.

The Vermont Agency of Natural Resources has also estimated the cost to rate payers of a user impact fee on hydroelectric facilities. The estimated impact per $100,000 in cost is an annual increase of $.08 per household.[56]

Changing Industrial Mix and Land Use Patterns Along the Otter Creek

The early dependence of manufacturing and transportation on water resources meant that most urban areas grew up with these activities consuming the communities' waterfronts. Wholesale and retail activities tended to grow up in belts around the industrial core of cities. Residential areas were concentrated in the outer belt of

[56] Issue paper prepared by the Vermont Agency of Natural Resources for the Conference on to Establish a Streamflow Policy, August, 1993.

urban centers. However, the high cost of transportation meant that all of the land uses were concentrated in close proximity to each other.

As transportation became more flexible and lower in cost, the effect on land use was to increase the distances between the noise, dirt, heat and pollution of manufacturing activities and the retail and residential areas. Further, as the economy became more complex, the retail centers also became the financial and commercial centers of the city.

As manufacturing came to depend less and less on the direct use of water power, the industrial decay began to appear along the nation's waterfronts. Nation-wide this process led to limited access to water resources for alternative uses. Beginning in the 1960's with major downtown reclamation efforts, many waterfronts were gradually reclaimed.

The current land use pattern in the City of Vergennes indicates that this reclamation process has not yet begun. The land use pattern around the City's basin continues to reflect its early industrial history. The central business district in the City of Vergennes is north of the waterfalls along Route 22-A. From the central business district there is no visual contact with the Otter Creek or the waterfalls. The City's basin is currently the site of mixed industrial and warehouse activities. The area immediately above the waterfalls is undeveloped and unattractive. A warehouse blocks the use of the waterfront on the south side and creates hazardous

transportation to the south side of the Otter Creek. The north side of the basin is undeveloped woodlands with a small public boat launch.

In 1984 the City of Vergennes approved the sale of the Vergennes watershed and municipal forest. The parcel has 640 acres with a 22 acre open reservoir. The City Council set a price $550,000. To date the property remains for sale. However, in anticipation of a sale the City began a study of potential uses for the proceeds if devoted to improvements in the historic district at the base of the waterfalls. The principal focus of proposed improvements has been on reducing the visual and physical barriers connecting the Central Business District to the waterfalls and the basin.

It was recommended that, as a possible alternative to sale, the City might pursue a land swap. The Northland Job Corps Center is located on property along the Otter Creek just south of the present historic district. Additionally, the Agency of Transportation has been 'land banking' property to use in land swaps for acquisition of new rights of way. Both options would provide flexibility for moving forward with proposals for re-development of the basin area.

As one leaves the City of Vergennes and travels along the Otter Creek toward Lake Champlain, emerging changes in GVMA's economic base are clearly observable. Along the Otter Creek agricultural activity has given way to the development of cottage enterprises supporting fishing and boating. Agriculture has also been replaced

by a growing number of full-service campgrounds, all providing access to the Otter Creek.

As one approaches the lake shore, one sees that agriculture has been replaced by enclaves of seasonal homes. Throughout the decade of the 1980's there was a decline in the number of seasonal homes as these residences were converted to year-round residential uses. The seasonal enclaves along the lake shore exhibit a growing pattern of mixed seasonal and year-round occupancy.

Moving away from the Otter Creek to inland areas, agriculture continues to be the dominant land use, except for the lake shore. However, what had been lake shore farms have largely been converted to residential development. The majority of this development has occurred in the typical Vermont 'spaghetti lot' subdivision pattern: long, narrow lots running from the road to the lake shore.

The shifting industrial mix and its impact on land uses presents three major concerns. First, the current pattern of development suggests that access to the Otter Creek and the lake shore is rapidly being reduced. Second, the current pattern of development is likely to reduce the aesthetic quality of water recreation along the Otter Creek and the lake front. Third, the concentration of development along the Otter Creek with wastewater treatment accomplished through large number of septic systems is likely to degrade water quality.

For reasons explained in detail in Appendix 5C, the City of Vergennes can only manage these problems in conjunction with the other communities that share the benefits of the region's economic growth and contribute to the joint costs of that growth. Appendix 5C describes the establishment of an Estuary Management District (EMD) composed of the towns in GVMA. There is a precedent for this type of a planning district in Vermont. One example is the Mad River Planning District, which is a joint planning district coordinating a three town effort to manage issues relating to the development of the area's ski resorts.

An EMD could be charged with the responsibility of coordinating member town's planning efforts as they relate to the management and development of the Otter Creek's water resources. Such a district could be funded in part by a share of the profits from Green Mountain Power's hydroelectric facility in the City. The EMD could address such issues as:

- zoning along the Otter Creek
- policies relating to set-backs from the bank and aesthetics for developments along the Otter Creek,
- maintaining public access to the Otter Creek, and
- density bonuses and other inducements to encourage more efficient use of land.

Summary

This chapter provides an overview of some of the issues generated by the dynamics of growth and changes in the economic base of GVMA. The principal recommendation focuses on institutional issues related to the management of the planning process.

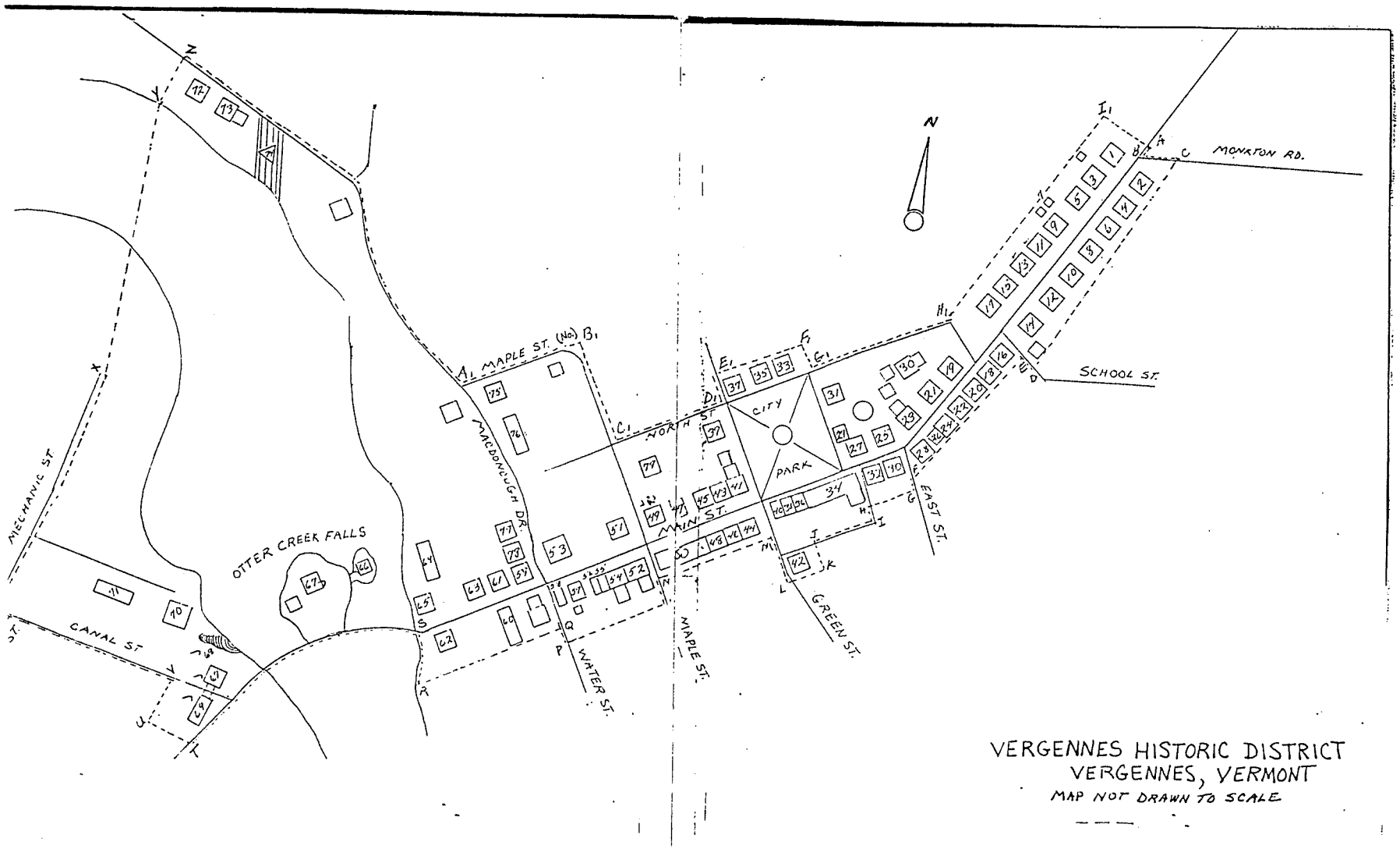
The recommendation is supported by proposed financing for the region's planning efforts related to its water resources.

COMMENTS ON VERGENNES DEMONSTRATION REPORT

Memo to Lee Steppacher, EPA
From Giovanna Peebles

Memo to Mary Watzin & John Banta
From David Clough

Final Report Approval Form From EPA



VERGENNES HISTORIC DISTRICT
VERGENNES, VERMONT
MAP NOT DRAWN TO SCALE

Agency of Natural Resources
Department of Environmental Conservation

Water Quality Division
Building 10 North, 2nd Floor
802-241-3770
Fax #:802-241-3287

MEMORANDUM

To: Mary Watzin, TAC Chair
John Banta, Economics Subcommittee Chair

From: David L. Clough, P.E., Director
Eutrophication Subcommittee Chair

Date: November 5, 1993

Subject: Economic Case Study Report - Vergennes

The executive summary of this case study by EFCA on page 6 contains the following statements in the third paragraph:

> "... However, growth in the communities surrounding the City reduces the potential assimilative capacity of the Otter Creek when expansion rests on the development of in-ground and mound septic systems. A higher level of water quality for a higher level of growth could be achieved if the communities in GVMA jointly developed a plan for central wastewater treatment."

This theme is repeated on pages 77 and 89 and perhaps elsewhere in the report and is patently untrue and misleading. In fact, off-stream disposal of wastewater will have no effect on the assimilative capacity (ASCAP) of Otter Creek since there would be no discharge to the river. I can only guess that there is some presumption of failure of these land systems by the author and that such failures would then result in discharges. That assumption is not necessarily valid from our perspective - we would certainly require re-design and reconstruction or perhaps require development of other "municipal" facilities. Depending on location and treatment requirements, ASCAP might or might not be reduced relative to Vergennes. It is true that the ASCAP for Otter Creek is finite but meeting that value depends on a variety of potential options regarding facility design, location, and treatment efficiencies. The conclusions reached in this report are simply wrong and misleading and should be deleted.