AN ARCHITECTURAL VISION OF MARYSVILLE, KANSAS: COMMUNITY ENERGY PLANNING AND DESIGN - A PROCESS TO ACHIEVE A SELF RELIANT, SUSTAINABLE FUTURE

by

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Dedication

--To my son Joshua--
May his future be as bright as the one envisioned here.

Acknowledgements

First and foremost, I would like to thank my wife Marianne, and son Joshua for their enduring patience and never-ending support, without which this document would not have reached completion.

"An Architectural Vision of Marysville, Kansas" represents the work of many individuals. The good citizens of Marysville who participated in the energy survey, and contributed endless hours in discussion seminars should be recognized for their contribution to this project. Many people helped in the collection of information for the Marysville Energy Demand Assessment, including 16 architectural design students in Professor Gary Coates' fall semester of 1982 Urban Design Studio. Alan Edgar worked hard on the design of the survey, and on preliminary data analysis.

Special recognition should go to Steve Ernst who spent countless hours compiling the energy data and assembling the information into a workable document - The Marysville Energy Study, Steps Toward a Sustainable Community Energy Future. His report was the basis for numerous projects related to Marysville's energy future, including this thesis.

Professors Tony Barnes, Eugene McGraw, and Ray Weisenburger provided intellectual support throughout the writing and design of this thesis. Also, Wayne Bower and Ralph Balaun of Marysville provided critical review of the design in progress.

And finally, a special note of thanks to my Major Advisor in this project, Professor Gary Coates, for it was the philosophies of sustainability and self-reliance held so dear to him which sparked my return to Kansas State in the fall of 1982, and set the stage for my embarking upon such a thought provoking and revolutionary design process.

(Numerous photos and sketches appear throughout this report; acknowledgements for these works are contained in the List Of Tables)

Table of Contents

List of Figures

List of Tables

Summary of Report

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As utility customers are forced to spend a higher portion of their budgets for basic energy needs, they will have fewer dollars for other goods and services. Local businesses will thus receive fewer consumer dollars at the same time their own expenses for energy are increasing. Businesses will pass on their utility costs to their customers in the form of higher prices, further eroding consumer purchasing power. Municipal governments will raise taxes to cover their increased costs. Household income will thus be cut even more, further depressing the local business economy and the economic stability of the community. Thus, Community Energy problems are also community economic problems.

Richard J. Anderson, a consulting geologist, retained by Battelle Memorial Institute to participate in a study of our nations energy problem states:

"One of the fallacies abroad in this land is that there is a single national solution to the energy problem. In actuality, there is no one formula that is going to fit the needs of all the regions of this vast country.

The case for a single national energy policy has been repeated endlessly - by government officials, by the media, and even by the executives of energy companies. But one formula is not going to solve our problems. What we need is not one national energy policy but a series of community and regional energy plans."(1)

Community Energy Planning can be defined as a locally-based process of describing existing energy patterns, envisioning a future state of energy supply and consumption and implementing appropriate measures to achieve it. This thesis develops an approach to solving the energy/economic problem through a community energy planning process which can be initiated by small town and rural area communities. This report focuses on small town and rural area energy planning for several reasons:

1) The current approach to energy decision making is a top-down process of expert dominated decision making by large scale, distant and often unaccountable corporate and government organizations. It would seem desirable for energy decisions to be made at the local level, by those most affected by those decisions.

2) In small towns, the local community retains the level of government at which participation in the democratic process is most accessible and, potentially, most meaningful. In small towns, the people <u>are</u> the government, not full time employed politicians. Usually the mayor, city council, and city commission are all volunteers maintaining full time employment in the private sector. This setting provides an atmosphere conducive to greater cooperation and achievement of goals for local self-reliance.

3) Small towns are large enough to contain all the ingredients of a viable community such as social, political, and economic structures, yet they are small enough to be manageable and to initiate and realize goals within reasonable time periods.

4) Change tends to be recognized by persons familiar with their surroundings; thus changes are more apt to be recognized in small towns, creating the possibility of a self-generating process of change toward increased energy/economic self-reliance.
5) Unlike large cities where newspapers serve tens of thousands and even millions of persons, small town newspapers can be the pulse of a local energy movement. This source of communication has tremendous potential for the dissemination of information which can help to keep the goals, ideals, and aspirations of an energy conscious movement in the forefront of citizens' minds.
6) Small towns and rural areas are ideal settings for the application of soft technologies. Purely in a technical sense they could become pioneers for the integral use of decentralized renewable technologies and conservation practices. Small towns and rural areas have the potential to be leaders in a national movement toward self-reliance.
7) And finally, in general, while the opportunities for increased self-reliance are great, small towns do not have resident expertise to do the kind of energy and architectural studies documented in this report. Thus, there is a tremendous need for professionals to focus on the energy problem at the local level. Perhaps studies such as this can provide the catalyst necessary to lead to energy action.

Marysville, Kansas was selected for this and other energy related studies which began in the fall semester of 1982 at Kansas State University. It was chosen not only for its small town character, but for several other reasons as well. Marysville is an very active community and its residents tend to get involved in worthwhile projects which benefit the community. Citizen and business groups are well established. Marysville has a history of cooperation with University sponsored projects, which then becomes a learning exchange mutually beneficial to all parties involved. In many ways, Marysville is typical of the best in small town and rural America.

This report is comprised of three main components:
1) A summary of the <u>Marysville Energy Study</u> [conducted in 1981-2 under the direction of Professor Gary J. Coates and documented by Steve Ernst for a Masters report(2)]
2) A summary of alternative energy futures (Business-As-Usual and the Soft Energy Path), also originally developed in the <u>The Marysville Energy Study</u>.
3) Based on the findings of the energy study, this report develops a visually illustrated design scenario of what Marysville would look like if it moved toward greater energy/economic self reliance. Included in this proposal is a comprehensive land use plan, and proposals for commercial, residential, industrial, and municipal development.

The Marysville Energy Study

The energy study is based on actual energy demand data collected both in surveys and directly from the utilities. Energy use and cost figures are determined for the entire community. The 1982 Total Community Energy Costs were estimated to be $2,491,965. The Average Household Share of the Total Community Energy Cost is $1,642 which is 10.3 percent of median household income. Based on estimates of the amount of energy expenditures retained in the local economy, $2,165,644 (87 percent) of the total community energy payments directly left the local economy in 1982.

Projections

Based on the 1982 energy demand assessment, two scenarios for the future (2002) are developed:
1) Business As Usual (BAU) - In this approach it is assumed that little is done to change the basic structure of existing energy demand and supply systems; per capita energy demand is assumed to increase by one percent. Under these assumptions, Average Household Share of Total Community Energy Costs are projected to be $5,494 or 27.6 percent of the projected median income.
2) Soft Path - Two strategies are outlined that would reduce the nonrenewable energy demand by 70 percent from the BAU level, and reduce household share of total community energy costs to $1,920 or 9.6 percent of projected median income.
a) Soft Path Strategy One concentrates on reducing energy demand through energy conservation, improving end use energy efficiency, and solar thermal applications.
b) Soft Path Strategy Two relies on the utilization of renewable energy technologies to replace a portion of the nonrenewable energy supply system.

The economic impact of the BAU scenario is staggering: $7,369,463 would leave the community in the form of energy dollars vs. $2,165,644 in the 1982 base year, and $1,366,401 under the Soft Path scenario; 27.6 percent of median household income would be spent on energy in the BAU scenario, compared to 10.3 percent in the 1982 base year, and 9.6 percent in the Soft Path scenario.

The argument for adoption of a Soft Path approach is a strong one, suggesting the importance of further research and development in this area.

Visual Design Scenario

Relying on assumptions projected in the Soft Path energy future, a physical plan for community development is proposed. Following is a summary of the steps recommended in this report:

1) LAND USE - Based on an analysis of the historical pattern of development within the community, a general land use plan is developed with special attention directed toward the floodplain (approximately 16 percent of Marysville's housing stock, 202 dwelling units, lies within the 100 year floodplain). The land use proposal contains 5 major concentrations:
a) A proposal is made to relocate the floodplain population, as well as a portion of businesses located in the floodplain.
b) It is argued that the floodplain be developed into a food, fuel, and fiber shelterbelt system.
c) Industrial development is proposed to be concentrated at the community's edge along the railroad line.
d) Residential development is suggested to take place through

in-fill of existing neighborhoods, and development of a new solar subdivision in the southeast area of the city.

e) Commercial relocation and expansion is recommended to occur through in-fill, and extension of the central business district to the east. Also to occur, would be the regeneration of the 'neighborhood grocery' concept to allow cottage industries to develop.

f) Circulation patterns are proposed to place emphasis on pedestrian and bicycle travel while still allowing complete auto access to all parts of the city.

2) **RESIDENTIAL** - Studies are conducted in three areas:

a) Proposals for existing neighborhoods focus on improving the micro-climate and lowering the ambient summer air temperature through increased vegetation, and resurfacing streets with brick pavers (where they do not exist). The introduction of bike lanes throughout the neighborhoods is proposed. Solar retrofit is to take place on existing structures where applicable, further reducing the community energy demand.

b) A new solar subdivision is proposed to provide housing for a portion of the relocated floodplain residents, and also for future expansion of the Marysville housing market. Solar ordinances and stringent building codes are proposed for new housing (as well as existing housing undergoing renovation) to ensure energy efficient design.

c) Renovation of unused second story space in the downtown area is proposed to provide a portion of the housing needs for relocated floodplain residents, elderly, and younger households just entering the housing market. This proposal is also intended to aid in revitalizing the downtown as well as lowering energy bills of businesses due to the efficiencies that can be achieved by sharing party walls and floors.

3) **COMMERCIAL** - Three general areas are addressed in the commercial portion of this study:

a) Relocation out of the floodplain is proposed to occur by in-fill of vacant lots in the downtown area and further expansion of the central business district.

b) Existing businesses are to undergo solar retrofit and historical renovation as applicable. Second story renovation is to occur for reasons described in Residential item c.

c) Streetscaping (through increased vegetation, moveable canvas awnings, and reduced auto access) is proposed to control sun and wind, leading to a more benign year-round micro-climate, and also improving the visual character of the downtown.

4) **INDUSTRIAL** - Because of the move toward self-reliance, it is anticipated there will be a need for a variety of solar and energy conservation products. In keeping with the concept of retaining the energy dollar in the local economy, it is proposed that solar-related enterprises be encouraged to develop. Plans for the expansion of the industrial sector in this direction are outlined

5) **COMMUNITY IMAGE** - As part of an overall community development package, the general appearance of Marysville could be improved while at the same time, aiding in the amelioration of year-round ambient air temperatures throughout the community. A vigorous planting scheme is proposed to increase the number of deciduous trees along all circulation paths.

6) **ENERGY SYSTEMS** - Most proposals throughout this report are intended to reduce the energy demand in the community. However, there will always be a need for some type of energy production system. Explored in this report are the following proposals for locally based renewable energy production:

a) Providing a portion of the community electrical supply through the rehabilitation of the existing Marysville hydroelectric plant.

b) A woodlot shelterbelt to assist in control of northwest winter winds as well as provide wood for space heating in the Residential sector (thus reducing demand for natural gas in that sector).

c) Development of a wind farm in conjunction with the shelterbelt proposal.

d) Extensive use of photovoltaic systems in the downtown area, and a significant number of systems installed in the residential sector.

e) Municipal waste treatment system to convert solid waste into a biogas to supply a portion of community's petroleum needs.

SUMMARY

This study concludes that there is both the need and the opportunity for increased local self-reliance. In Marysville, the Soft Path approach to community energy planning can create communities which are economically stable and environmentally safe. By moving in the direction outlined in this report Marysville, as well as other communities, can become better places in which to live. What is needed now is the foresight, courage and will necessary to create this possibility. It is hoped that this report will inspire the citizens of Marysville to seriously consider how they could create a desirable energy/economic future.

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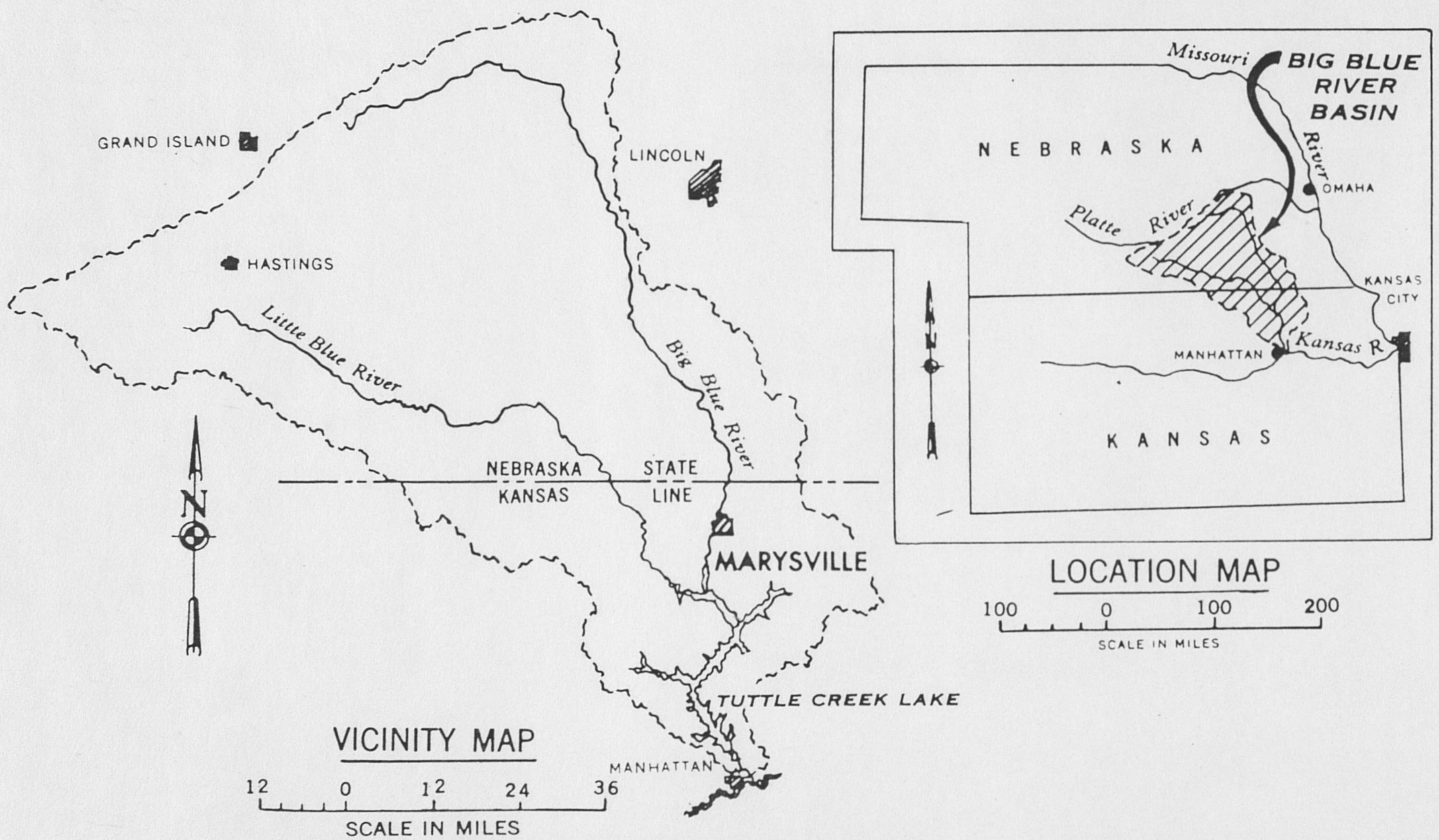
1. Richard J. Anderson, "The Fallacies of a National Energy Program - An Overview of our Energy Situation", Integrated Community Energy Systems Planning: A State-of-the-Art Report, Battelle, Columbus Laboratories; Columbus, Ohio. March 1978. pp. A-1
2. Steve Ernst, "The Marysville Energy Study - Steps Toward a Sustainable Community Energy Future". (Masters Thesis. Kansas State University, 1984)

The Marysville Energy Study

MARYSVILLE , KANSAS



Introduction

In order to explore the possibilities of community energy planning, Marysville, Kansas was selected for a detailed case study. It is felt that in conducting a study of this nature, that the community would benefit most by participating in the study as much as possible.

Thus, in the spring of 1982, through a series of formal and informal meetings the ground work was laid for conducting the Marysville Energy Study. Following acceptance of a formal proposal to the Mayor and City Council, an Energy Advisory Board was established in Spring 1982. Membership on the Energy Advisory Board includes members of the City Council as well as representatives from youth and elderly service organizations and local financial institutions. With this community-based structure in place the stage was set for work to begin with the start of fall classes at Kansas State.

As part of the Fall 1982 Community/Urban Design Studio under the direction of Professor Gary Coates of the College of Architecture and Design at Kansas State University, students met with interested citizens from Marysville to initiate a survey of existing energy use patterns and projection of alternative energy futures. The results of the survey appear in "The Marysville Energy Study: Steps Toward A Sustainable Community Energy Future".(3)

Since that time students have undertaken a variety of studies exploring the architectural and community design implications of the Soft Energy Path eventually recommended by the energy study.

3. Ibid.

The Marysville Energy Study

In order to facilitate data collection the energy study was broken down into five manageable sectors: Residential, Commercial, Municipal, Schools, and Transportation. In four of the five sectors, actual fuel use figures for a twelve month period were obtained through release forms provided to Marysville residents, merchants, municipal authorities, and the school district. In the Residential and Commercial sectors, a cross section of the community was examined and results were extrapolated to cover the remaining portions of the sectors. In the Municipal and Schools sectors, fuel use and cost for all buildings and vehicles was obtained. The Transportation sector was the most difficult area to obtain accurate information. Rather than attempt to identify fuel consumption on an individual basis, county records were obtained to provide a vehicle inventory for Marysville. Vehicle miles traveled and vehicle fuel efficiency data was then determined through information supplied in documents developed by the Kansas Department of transportation.(4)

In 1982 Marysville spent a total of $2,491,965 on the three basic forms of purchased energy - petroleum, natural gas, and electricity.

The Average Residential Energy Costs are $819 (dividing the Residential sector total energy cost by the number of households). The Average Household Energy Cost is $1,221 (Average Residential Energy Cost plus Average Household Transportation Cost). The Average Household Share of the Total Community Energy Cost was $1,642. Included in this figure are the energy costs from all sectors. This is a more realistic number to use, (rather than using only direct household fuel use) because all other community energy costs are paid for through goods or services purchased or through local taxes.

The median income in Marysville in 1982 was $16,000.

Marysville Energy Cost by Sector and by Energy Type - 1982

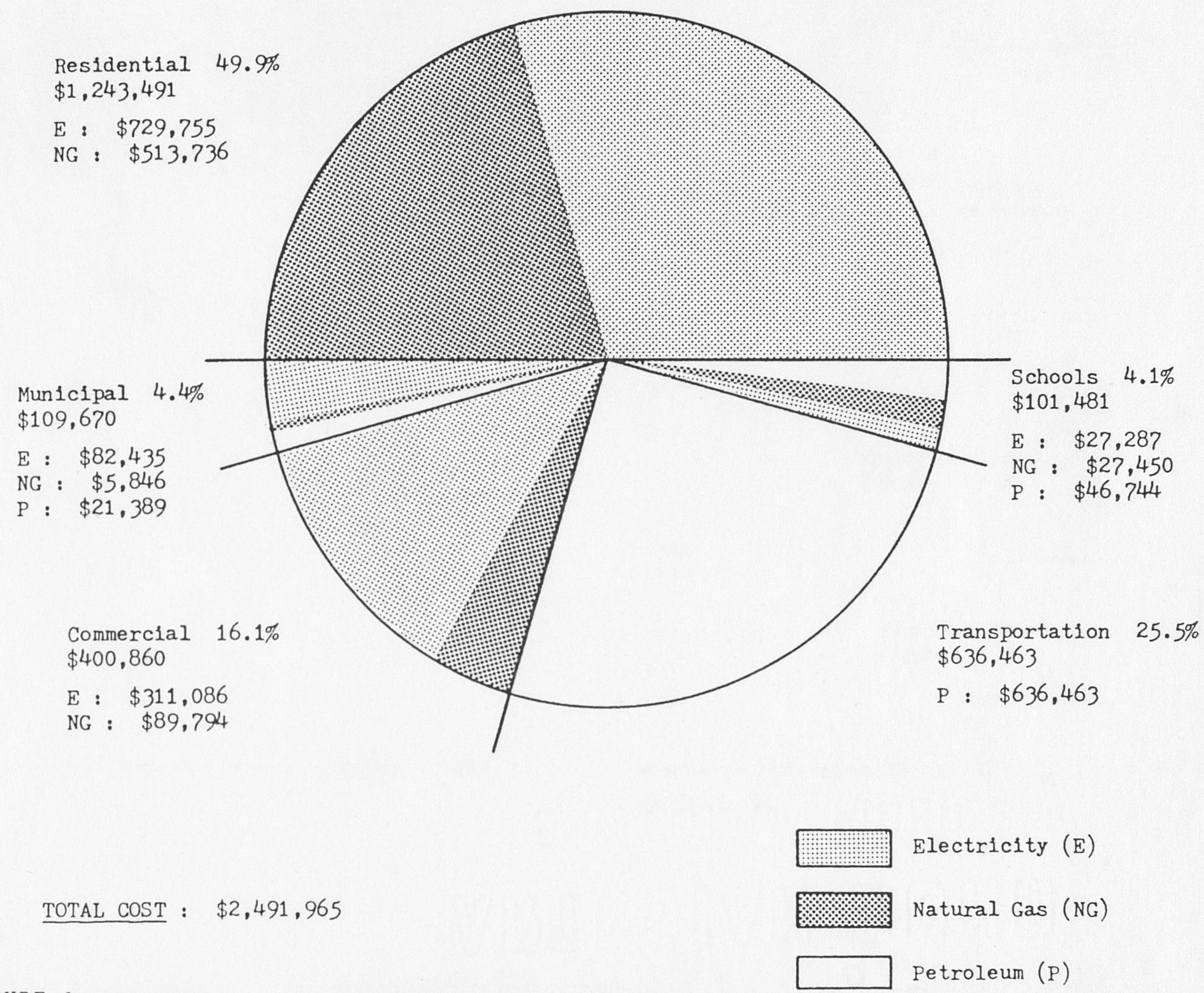


FIGURE 1.

Average Household Energy costs accounted for 10.3 percent of gross income. If one considers that at least 15 percent of gross income was paid in federal, state and local taxes. Net median income was $13,600 of which energy expenditures accounted for 12.1 percent.

In the energy study, only in-town travel was considered when estimating the Transportation Sector energy costs. If statewide transportation figures are used in the calculations, the Average Household Energy Cost would rise to $2,488, or 15.6 percent of gross income and 18.8 percent of after tax income.

The bottom line is that Marysville residents pay an enormous amount of money for energy and these costs are continuing to rise. (In 1982 the cost of electricity was 6.16 cents per kilowatt-hour and, in 1984 the cost was 7.64 cents, a 19 percent increase in just two years.) To get a better understanding of how the energy use and costs are distributed within the community, each sector is looked at in brief here. (A complete detailed look at all sectors can be found in the <u>Marysville Energy Study</u>.)(5)

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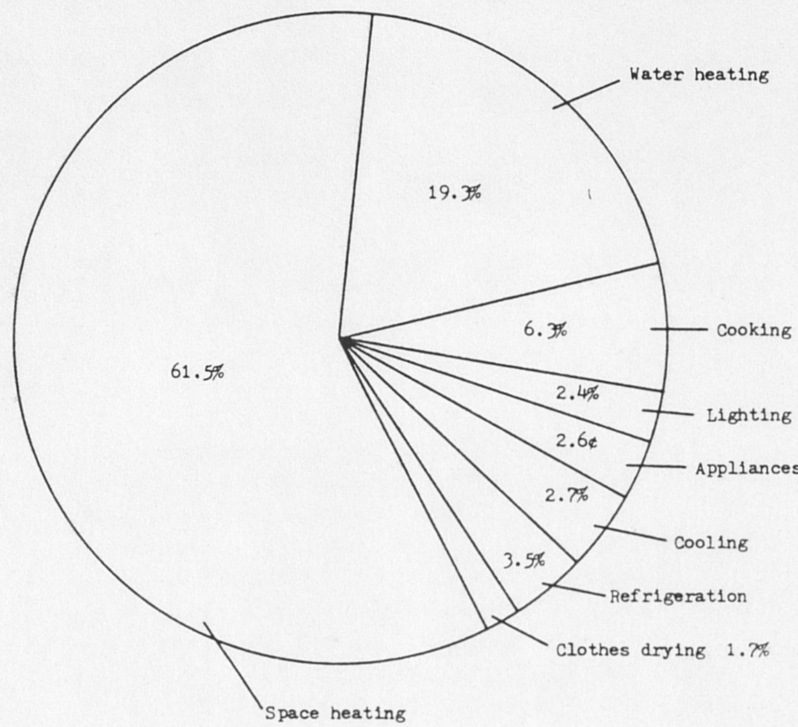
4. Ibid.
5. Ibid.

Residential

The Residential sector includes single family detached, (84.4 percent of housing stock) multi-family (12.5 percent), and mobile home dwelling units (3.4 percent).

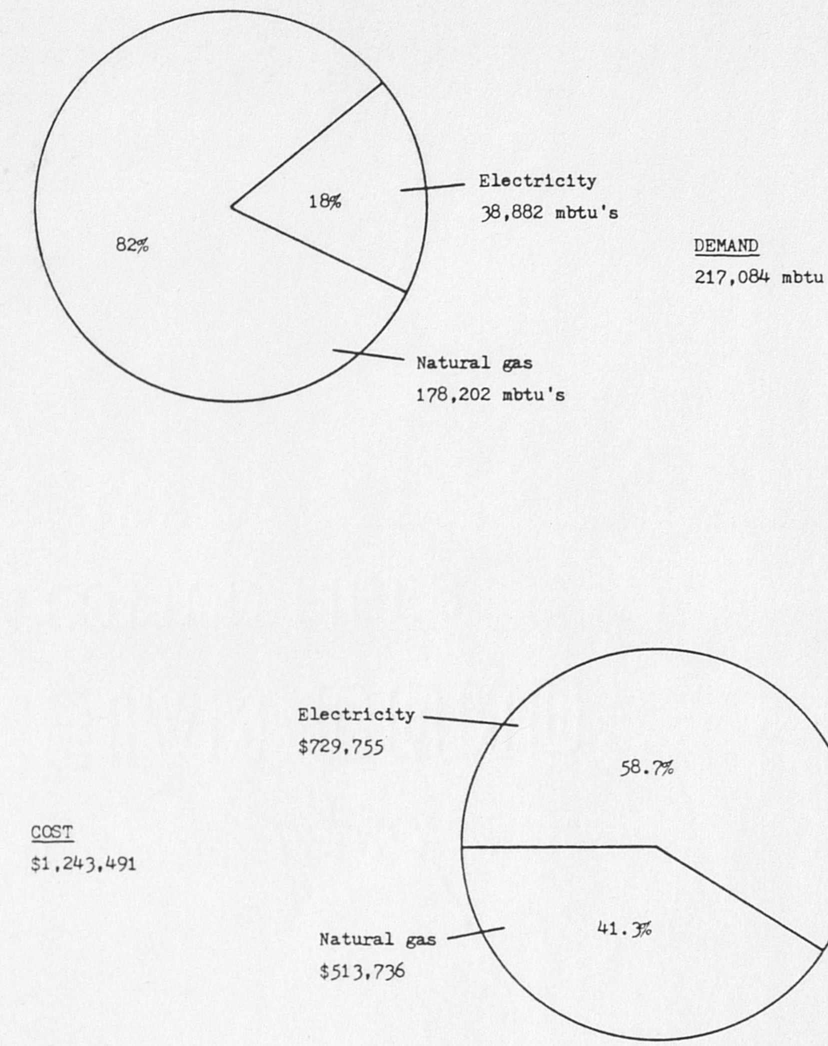
Single family detached, and mobile home energy demand and cost figures were obtained from the 'Marysville Energy Use Survey' conducted during the energy study. For multi-family housing energy demand and cost figures (this dwelling type was not surveyed), average energy demand figures from the Riley County Energy Project Report were used in estimating Marysville multi-family housing energy demand.(6)

The sample houses in the survey were selected according to when and where they were built. It was felt that this would allow the best representation of different house types from all parts of town. The distribution of the sample houses by year built is shown in Table 1. The sample houses were selected from a complete list of housing structures in Marysville by age group that was obtained through the County Assessor's office.(7) The 56 survey responses represent 3.7 percent of the 1518 occupied dwelling units reported for Marysville in the 1980 U.S. Census.



Marysville Residential End Use Energy Demand - 1982

FIGURE 2.



Marysville Residential Energy Demand and Cost - 1982

FIGURE 3.

Residential Population and Survey Sample Distribution

Year Built	Sample Number	Sample Percent	Population Number	Population Percent
1860-1879	0	0 %	19	1.4%
1880-1899	4	7.5	124	9.3
1900-1919	17	32.1	413	30.8
1920-1939	12	22.6	337	25.2
1940-1959	9	17.0	237	17.7
1960-1982	11	20.8	209	15.6
Not reported	(3)	-	-	-
Total	56	100%	1,339	100%

TABLE 1.

It is also recognized that personal habits and lifestyles influence energy use habits, and though a recent study attempted to determine these factors, as of this date there is no reliable method to incorporate such data into energy studies on a general basis.(8)

Actual fuel use and cost figures were obtained for the selected sample and the results were extrapolated to complete the sector estimate. The Residential sector had the highest energy use and cost figures of any sector studied. Energy cost was $1,243,491 or 49.9 percent of total community energy expenditures ($819 per household). Energy use was 58.5 percent of total energy use.

It is important to look at how much and where energy is used within the household so that in the future one could determine which would be the most cost effective measures to undertake to reduce the need for energy. In this sector space heating accounted for 61.5 percent of the total energy demand for the average gas heated residence and 31.5 percent of the total household energy cost. Other energy demand figures can be seen in the accompanying chart.

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6. Manhattan Area Energy Alliance, Riley County Energy Project Report (Manhattan, Kansas: n.p. October 1982), pp.5-4
7. Leah Caldwell, "Historical Development of Marysville", (list of residential buildings by location and when they were built; unpublished material collected summer 1982)
8. Allan R.Edgar, "Occupant / Dwelling Disposition Factor as Predictor of Residential Energy Consumption", (Masters Thesis, Kansas State University, May 1983).

Also important to look at in this sector is the housing type and the percentage of the total energy consumption for the sector. In Marysville single family units comprise 84.4 percent of all dwelling units and consume 87.6 percent of the energy in the residential sector.

Since single family units comprise the great majority of the housing stock, further analysis was carried out in this area. By comparing the size of the dwelling units (square footage) and seasonal heating and cooling demand for these structures, the energy efficiency of each sample residence was determined. An analysis of the sample residences by date of construction revealed that energy efficiency gradually improved from the late 1890's until the late 1950's and early 1960's when energy efficiency of residences reversed and grew worse. The residences in the study group built between 1960 and 1973 had efficiency levels as low as (high energy use per square foot) some homes 50 to 60 years old.(9)

When trying to understand this drop in efficiency, one must note that energy prices were also dropping and that electricity for instance, hit its lowest price level in 1973. In 1973 electricity was 2.6 cents per kilowatt hour, but over the past 11 years the price has risen to 7.64 cents per kilowatt hour, a price Marysville has not seen since 1929.

Residential Survey Sample Of End Use Energy Demand, 1982

Dwelling Type/Primary Heating Fuel	No. of Units	Total Energy Demand Elec. MBTU	Total Energy Demand N. Gas MBTU	Total Energy Demand Total MBTU	Average Energy Demand Elec. MBTU	Average Energy Demand N. Gas MBTU	Average Energy Demand Totals MBTU
Single Family							
gas heat	45	1069.8	5860.4	6930.4	23.7	130.2	153.9
electric	2	179.5	-	179.5	89.7	-	89.7
wood	1	35.2	72.1	144.2	35.2	72.1	144.2
Mobile Homes	3	46.4	300.0	346.2	15.5	100.0	115.5
Total	51	1330.9	6232.5	7600.3	26.1	122.2	149.0

TABLE 2.

Expanded Residential Energy Demand and Cost, 1982

Dwelling Type/Prim. Heat. Fuel	Number of Units	Total Energy Demand Elec. MBTU	Total Energy Demand N. Gas MBTU	Total Energy Demand Total MBTU	Average Energy Demand Elec. MBTU	Average Energy Demand N. Gas MBTU	Average Energy Demand Total MBTU
Single Fam.							
gas heat	1160	27,492	151,032	178,524	23.7	130.2	153.9
electric	73	6,548	-	6,548	89.7	-	89.7
wood	49	1,161	3,533	4,694	23.7	72.1	95.8
Multi-fam.							
gas heat	172	2,511	18,524	21,035	14.6	107.7	122.3
electric	10	340	-	340	34.0	-	34.0
wood	7	102	413	515	14.6	59.0	73.6
Mobile H.							
gas heat	47	728	4,700	5,428	15.5	100.0	115.5
T. Demand	1,518	38,882	178,202	217,084	25.6	117.4	143.0
T. Cost $	-	729,755	513,736	1,243,491	480	338	819

TABLE 3.

Characteristics which determine existing residential energy efficiency were also studied. It was found that attic insulation for the housing stock averaged less than half of today's standard of R-38. Adequate caulking and weatherstrippinng was in place on only about half of the units studied. These two aspects of energy conservation are generally low in cost and have a relatively short pay-back time, and represent a major opportunity for conservation.

Another aspect of single family dwellings which was studied (although it had no direct bearing on the energy statistics complied other than in the units heat gain and heat loss characteristics) was the solar suitability of the housing stock. This information was compiled to indicate the potential for future solar retrofit applications for space heating and water heating. Each home received a solar suitability rating based on wall and roof areas available for solar access during heating periods. The results of that survey indicate that 63.3 percent of the existing housing stock has a high potential for employing solar retrofit systems to reduce energy demand, and that 73.3 percent has a high potential for solar water heating.(10)

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9. The Marysville Energy Study, pp.165
10. Ibid., pp.167

Commercial

Because of the diverse range of businesses in Marysville (as as in any community), this sector was divided into eleven subcategories by business-type for analysis. As in the residential sector a representative sample of business types was selected for the study. In this sector, 20.1 percent of the 139 businesses were sampled. Actual fuel use and cost figures were obtained for the sample. A breakdown of the categories and use and cost figures can be seen in the Figures provided below.

The Commercial sector represents 15.7 percent of Marysville's total energy use, and the estimated cost of $400,800 is 16 percent of the total cost. The cost figures are very significant in that virtually all of this sector's energy costs are paid for through goods and services purchased by the consumer.

Any increase in energy prices, especially electricity, which accounted for 77.6 percent of this sector's energy cost, can only result in higher prices for commodities purchased within the community. It is worth noting again here that since the energy study was completed electricity costs have risen 19 percent, well above the inflation rate for the same period.

In December of 1982, the Kansas Department of Economic Development conducted a 'Merchants Attitude Survey' in which, among other items, energy issues were addressed.(11) The survey included approximately 93 percent of the businesses in Marysville. The study indicated that a majority (56 percent) felt that increased cost of energy has affected their business operations and that thirty-nine percent had some plan to reduce energy costs in the following year. It is also interesting to note that forty percent were interested in forming a cooperative with others to reduce energy costs. This attitude indicates a willingness within the community to work together to solve the energy problem.(12)

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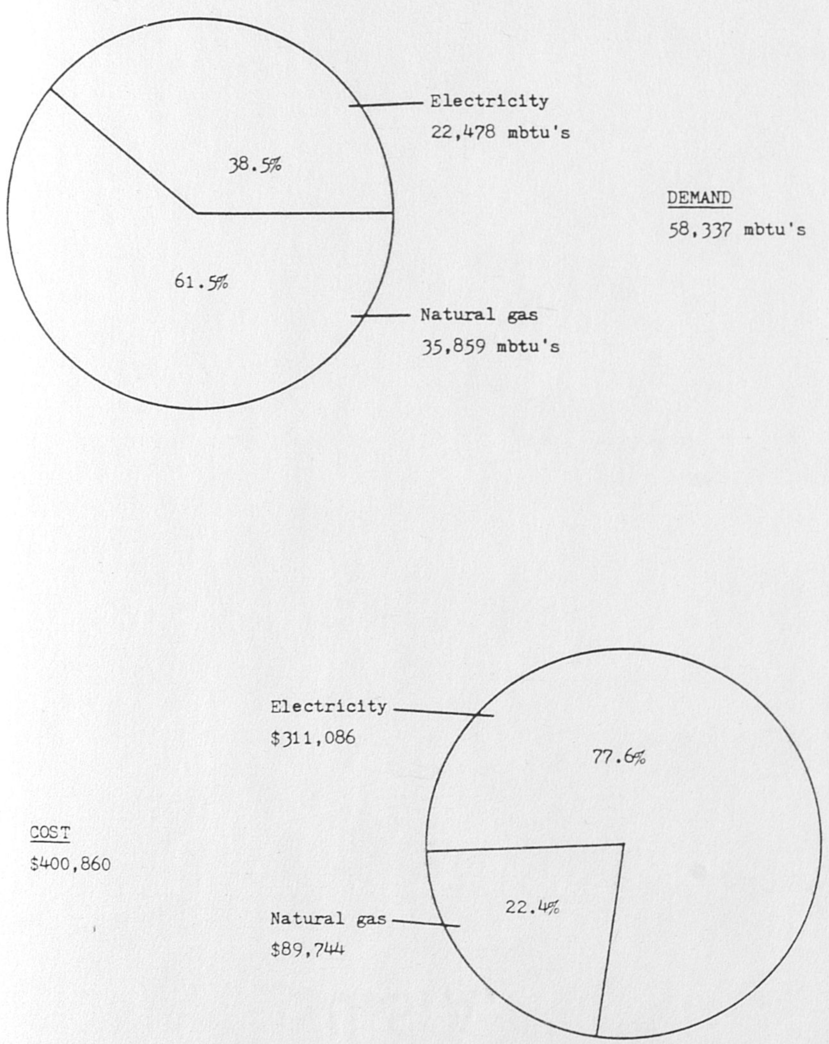
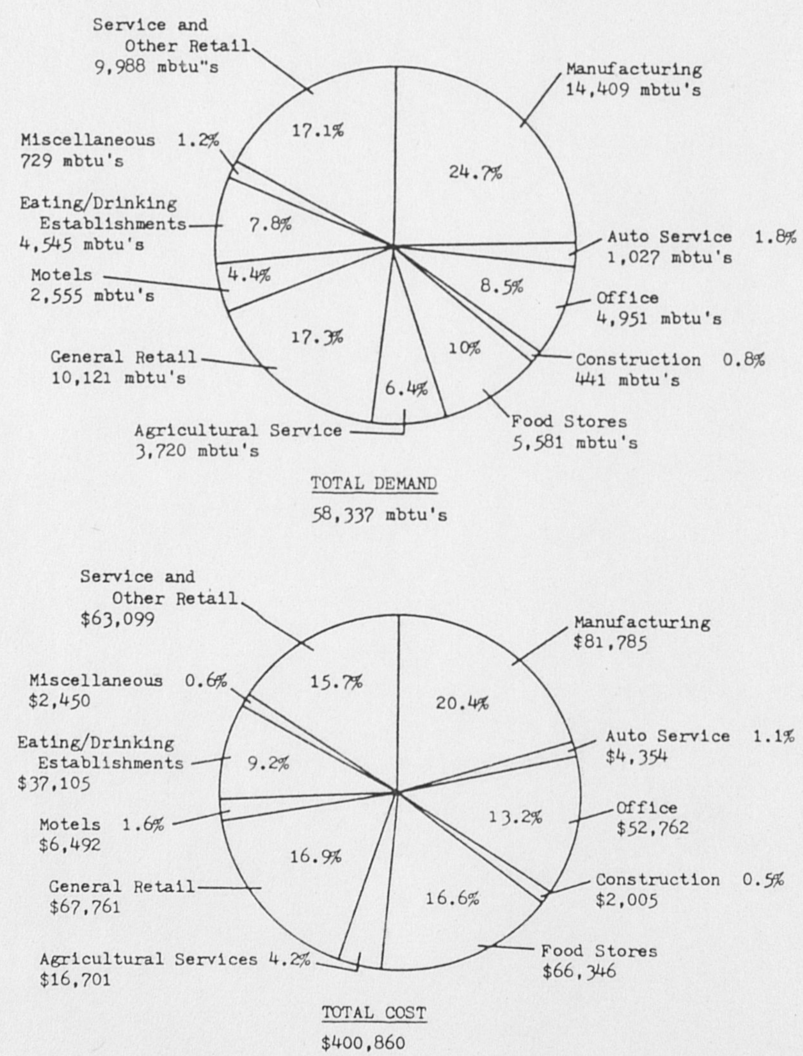
11. "Marysville Merchants Attitude Survey", Kansas Department of Economic Development; Topeka, Kansas. December, 1982.
12. For the complete survey results see: The Marysville Energy Study, Appendix C



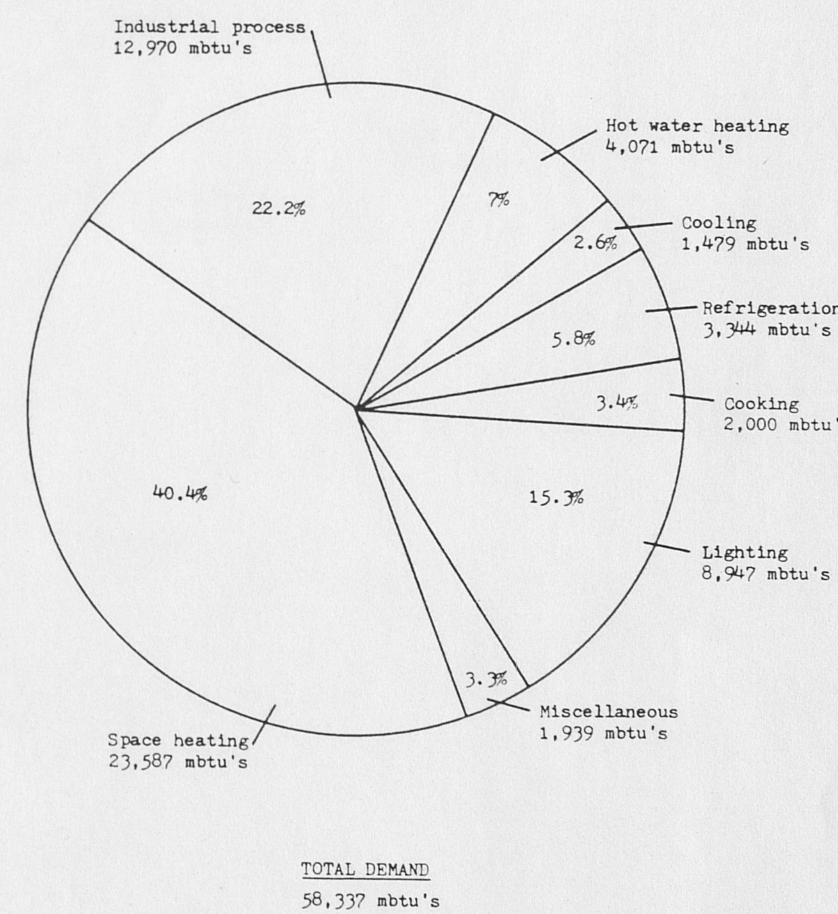
Marysville Commercial Energy Demand and Cost - 1982

FIGURE 4.



Marysville Commercial Energy Demand and Cost by Subcategory - 1982

FIGURE 5.



Marysville Commercial End Use Energy Demand - 1982

FIGURE 6.

Schools

Four schools of the Marysville Unified School District 364 were included in the study. As with the Municipal Sector, all energy fuel use and cost information for all buildings and operations were obtained for the study. Energy costs for 1982 were $101,481 ,or 4.1 percent of the Total Community Energy Expenditure.

Although energy costs accounted for only 3.1 percent of the school district's budget, resources for schools are constantly coming under pressure from a variety of directions all of which express legitimate concerns, as in the case of teachers salaries and the need to modernize teaching tools (eg. adding computers), providing teaching aids and so on.

Petroleum costs were $46,744 in 1982 (46 percent of energy expenditures). Increased bussing which will be the result of the recent demolition of Central School for example, will only place more pressure on the energy budget. Sometimes centralization of operations is not the optimum choice, especially when one also considers the loss to the neighborhood, and the resulting bussing or forced crossing of major streets by young children.

A study of building efficiency was also conducted. The Junior High and Senior High buildings fared better than the Lincoln and Central schools. However it was noted that the Junior and Senior High buildings were much newer and have been maintained with greater care, as evidenced by recently introduced energy conservation measures. The Lincoln and Central schools were in need of systematic weatherization programs and possibly the installation of more efficient heating systems.

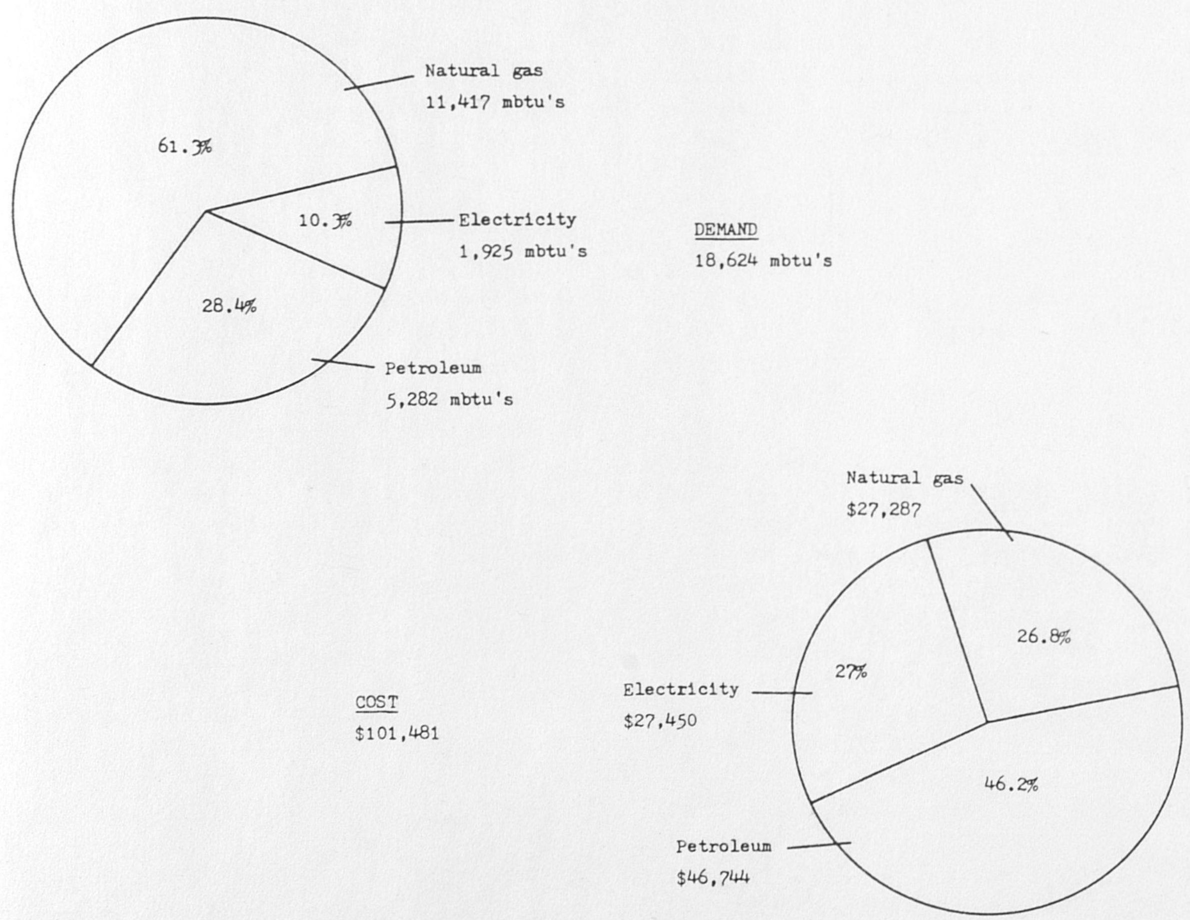


FIGURE 9. **Marysville Schools Energy Demand and Cost - 1982**

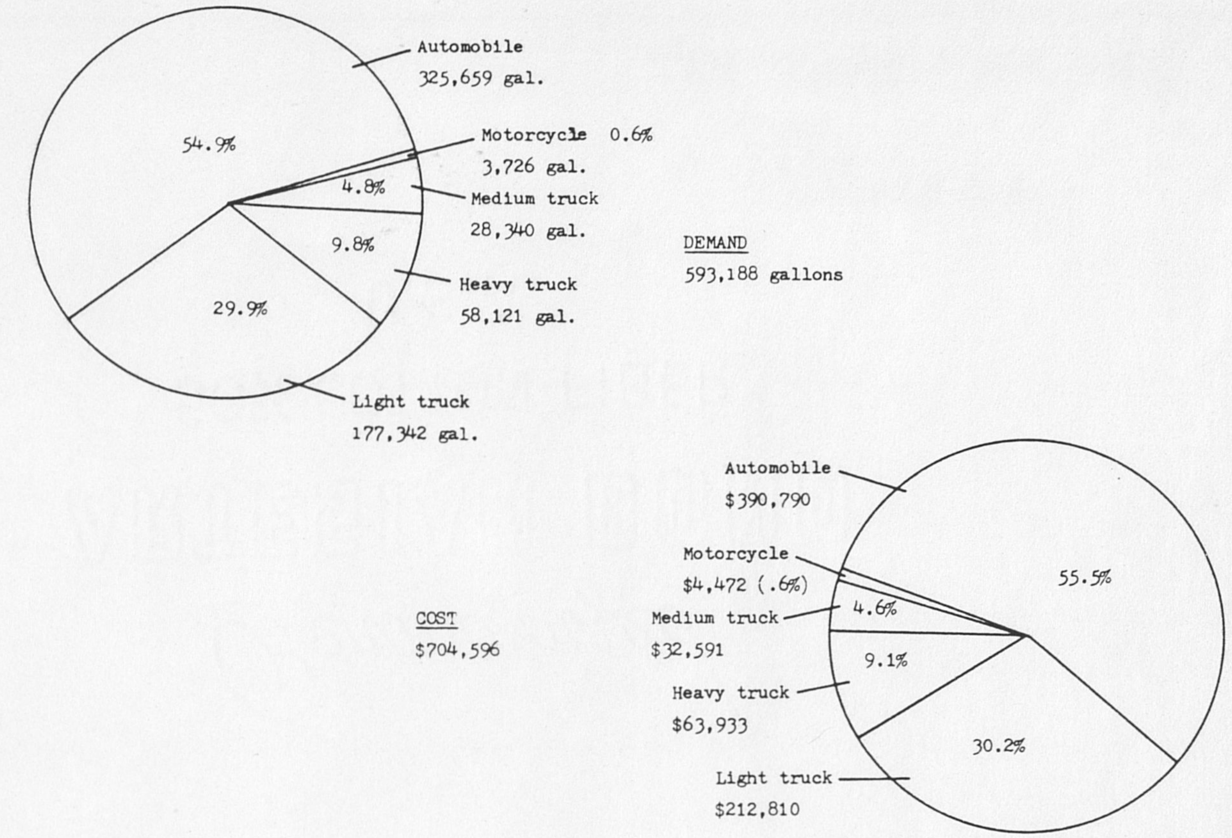


FIGURE 10. **Marysville Transportation Energy Demand and Cost by Vehicle Type - 1982**

Transportation

Transportation energy demand is a function of vehicle miles of travel (VMT) and vehicle fuel efficiency (MPG). For the purposes of this study only VMT within the city was considered. Since age and type of vehicle directly affects fuel use, a vehicle inventory including age and type was obtained through county records.

Using in-town vehicle miles traveled only, Marysville's energy expenditures for this sector amounted to $704,596 (25.5 percent of the Total Community Energy Cost). This figure may be somewhat misleading in that Marysville, like any rural community, depends heavily on travel outside the community not only for goods and services but also for various forms of recreational and personal needs. In addition, many citizens of Marysville commute daily to Kansas State University in Manhattan, a round trip of some 120 miles.

An alternate method of determining energy use and cost was also included in the study. Using total vehicle miles traveled for Marysville, the energy cost escalates to $1,990,608. This increases the Total Community Energy Expenditure to $3,777,977 or $2,488 per household instead of the $1,642 reported earlier. This also increases the cost of energy as a percentage of gross income from 10.3 to 15.6 percent, and 18.8 percent of net income.

Although this alternate method of calculating transportation costs may be a more realistic estimate of actual energy expenditures, it is more vulnerable to debate and therefore is not used in the final statistics reported.

Conclusion

The facts and figures reported in the Marysville Energy Study are based upon actual 1981-82 energy use and cost data. Since that time energy prices have continued to rise; for example electricity has risen 19 percent in two years since the study was completed, and natural gas price has risen 35 percent.

A recent report published in Small Town indicates that for a Midwestern town of approximately 4,000 (Winterset, Iowa), energy expenditures were close to 7.5 million dollars, and that 85 percent of that amount left the community to pay for nonrenewable energy supplies.(13) This report further supports the notion that small towns across rural America are spending tremendous amounts of money for nonrenewable energy, and that it is becoming an economic burden that needs to be addressed.

The monetary drain on the local economy is a concept that only recently has begun to attract attention, and in many cases it is an idea that is not yet considered in the planning process. The Kansas Department of Economic Development, which is charged with the responsibility of assisting communities and towns with their economic development and helping to stabilize their economy, is one entity which should become actively involved in developing approaches to address the economic problems related to energy. Other states, Nebraska for example, have begun to incorporate the energy planning concept on a statewide basis.(14)

To put into perspective just how important energy issues are to a community, Marysville spent $2,491,965 for various forms of energy in 1982. Of that amount, only $326,321 (13.1 percent) remained in the community, mostly in in the form of the salaries of workers in energy service companies located in the community. What this means is that $2,165,644 left the community immediately and forever; this is the equivalent of 72 payroll jobs leaving Marysville every year.(15) Another way to look at the situation is that if the energy money that now leaves the community could be retained, through multiplier effects it could create 180 new jobs.(16)

Naturally, not all money spent on energy could be retained; the cost to implement systems to accomplish total self-reliance would not be economically feasible. However, there are a wide range of means available to begin to reverse this spiraling cycle, and begin to bring under control the outrageous prices of energy and gain more freedom from outside forces which literally have a stranglehold on communities and towns today.

Something must be done to reverse this trend or in the very near future many communities will be facing even greater economic crises than they are today. As in the case of communities which are in the Kansas Gas & Electric district (immediately adjacent to KP&L's district) that future is only several months away. KG&E recently completed Wolf Creek nuclear plant and rate hearings have been underway since May 18, 1985. These hearings and the outcome will determine the fate of many communities. Several towns have testified that they will be facing immediate bankruptcy if the proposed 100 percent rate increases are granted.

Marysville is not totally immune to the problems associated with Wolf Creek. In a recent edition of The Kansas City Times it was reported that "KPL may pursue one of the Wolf Creek utilities". (17). If this happens, Marysville will be forced to absorb some of the costs of Wolf Creek.

With Federal Revenue Sharing being phased out, the economic burden is already being shifted to the local government, yet taxes paid by the citizens will remain the same or increase.

It is obvious that there are no simple solutions for our energy problems. The only obvious thing about this whole situation is that something needs to be done, and it needs to be started now. Change will not come easily, nor will it come quickly. The only thing guaranteed is that change will come. Whether communities elect to take control, and direct change or sit back and let outside forces control the direction of their future, will determine the fate of rural America.

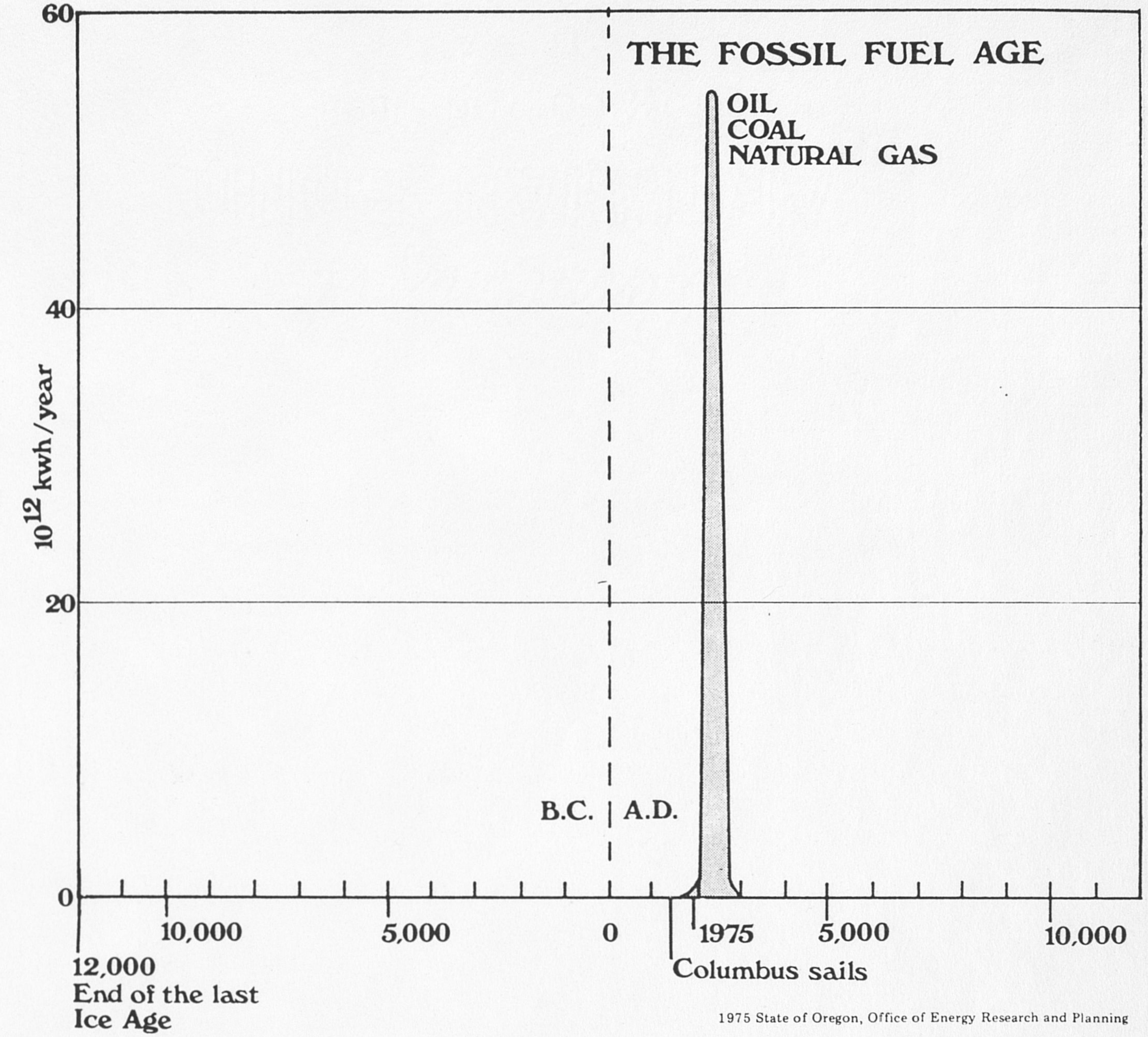


FIGURE 11.

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13. Betty L. Wells, "Energy Conservation - A Development Strategy for All Communities", Small Town, Vol 15 November-December 1984, pp.20
14. In the fall of 1984, the State of Nebraska held a colloquium dealing specifically with energy planning. The conference was entitled: "Community Energy Planning as an Economic Development Strategy".
15. Marysville Energy Study pp.63
16. Ibid. pp.63
17. The Kansas City Times, Thursday, June 4, 1985, pp.D-1

Options Available

Marysville, as well as any other small town or rural area, has within its means the methods to control its own future. There are basically two directions or alternatives which Marysville can take. One option is to continue in with Business-As-Usual and continue to let outside forces control its energy supply and economic future, an alternative described as the `Hard Path'. The other choice is to opt to take control of the energy future and develop resources which will enhance the community's physical and economic growth and stability, an option termed the `Soft Path'.

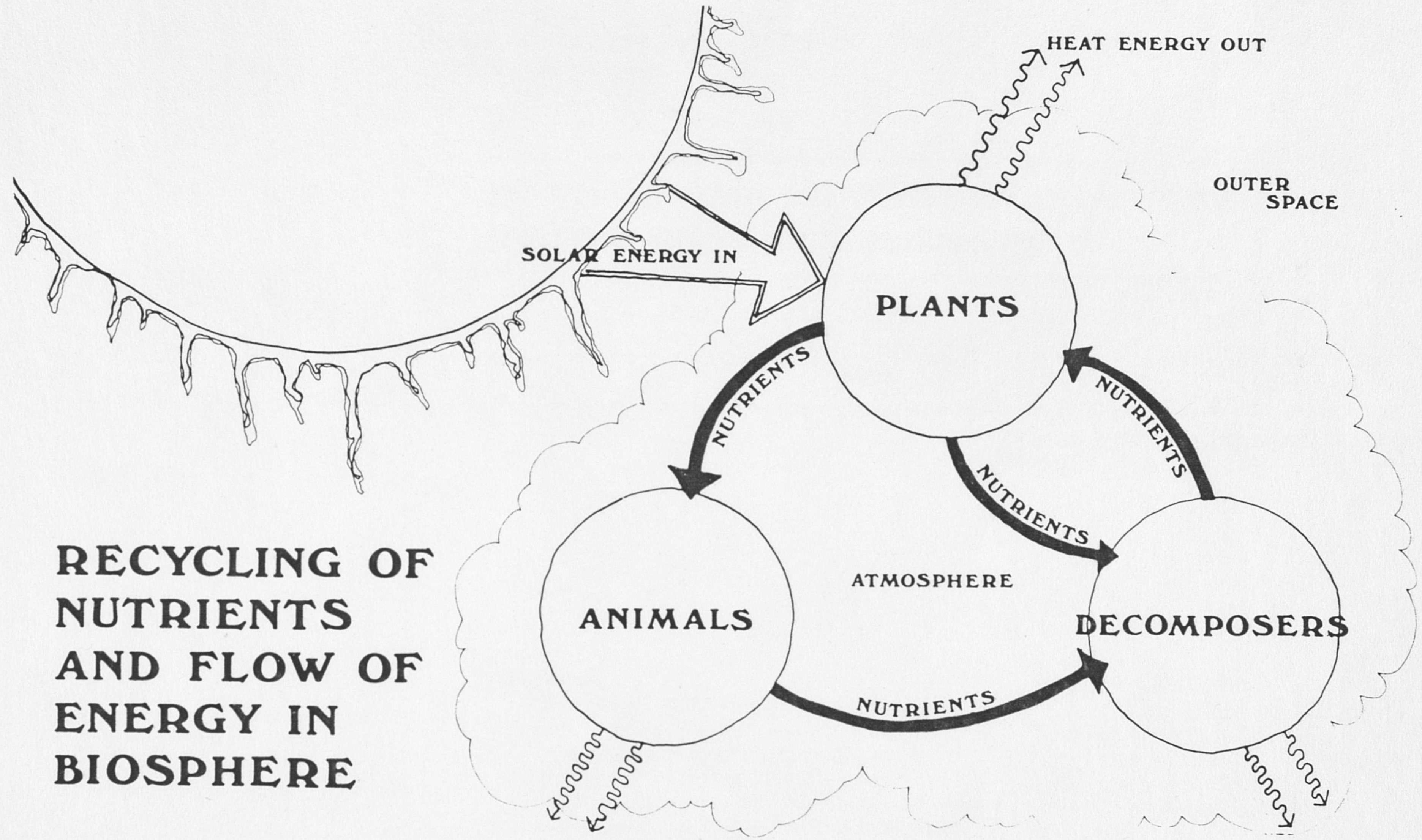
`Hard Path' and `Soft Path' are terms first articulated by Amory Lovins(18) to describe alternatives with which our nation is faced. The `Hard path' implies continued reliance on and expansion of conventional nonrenewable energy resources such as coal, petroleum, natural gas and nuclear power.

The `Soft Path' relies on two basic approaches to reduce energy demand and still provide the needed energy services. First, is to improve the efficiency of energy consuming commodities and systems, such as buildings, automobiles, appliances, and the infrastructure and support systems of our communities (waste treatment, water supply etc.).

Second is to rapidly deploy soft or "appropriate" technologies. These technologies include solar heating and cooling, organic waste conversion, wind power, hydroelectric power, and geothermal power. `Soft' energy systems can be described by five basic characteristics:

1. They rely on renewable energy flows.
2. They are diverse, each designed for maximum effectiveness in a particular circumstance.
3. They are flexible and are a relatively low technology - which does not mean unsophisticated, but rather easy to understand and use.

1974 Portola Institute



RECYCLING OF NUTRIENTS AND FLOW OF ENERGY IN BIOSPHERE

FIGURE 12.

4. They are matched in scale and in geographic distribution to end-use needs.
5. They are matched in energy quality (form and temperature) to end use needs. The energy consumption/economic growth link is assumed to be flexible, allowing sustained economic growth with zero or negative energy consumption growth. (19)

The Soft Energy Path, which relies on conservation and solar technologies, is perhaps the only alternative we have to achieve energy/economic stability, and it could also turn out to be the most affordable and effective approach in a move toward self-reliance.

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18. The two energy `paths' were first published in "Energy Strategy: The Road Not Taken" in Foreign Affairs October 1976, by Amory Lovins. Lovins expanded and strengthened the `Soft +ath' argument in <u>Soft Energy Paths: Toward A Durable Peace</u> (San Francisco: Friends of the Earth, 1979) and most recently in <u>Brittle Power: Energy Strategy For National Security</u> (Andover, Mass.: Brick House, 1982).
19. Ibid

Business-As-Usual (Hard Path)

When considering change it is important to look at what might happen if one were to opt for continuing without any change in direction. In the Marysville Energy Study, one component of the report looked at such a scenario. The results are not necessarily ones that would be favorable to the economic stability of Marysville's future.

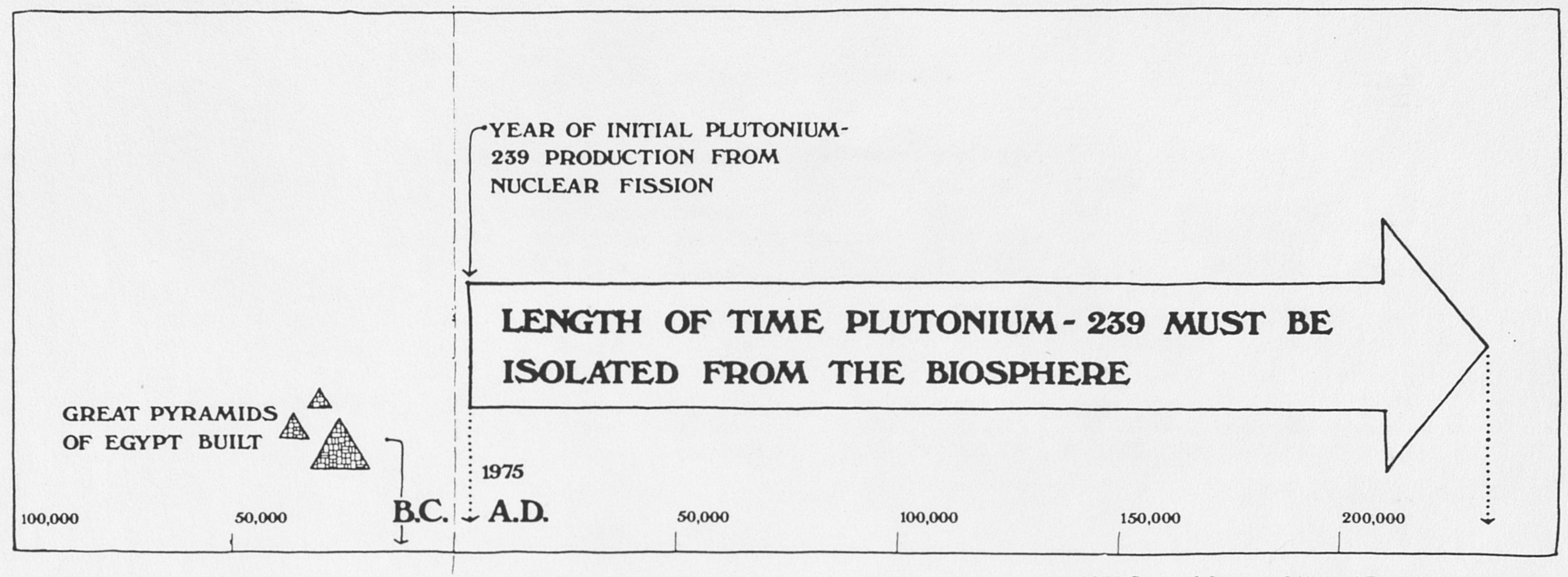
The year 2002 was selected to provide a time frame within which to develop scenarios. It was felt that 20 years would allow for the development and implementation of realistic proposals. The Business-As-Usual scenario assumes little change in energy demand intensities and energy efficiency levels from the 1982 base year.(20)

Population and housing projections were made for Marysville, and are the basis for projections in all scenarios, including the `Soft Path'.

Population was projected to reach 4,500 in the year 2002. This was estimated by using a cohort survival projection model, and was based on the assumption that Marysville will continue to be a desirable place to live.(21)

Based on these population estimates, a net increase of 357 dwelling units was projected. A turnover in some housing stock was also included (202 dwelling units are in the flood plain and it is assumed that not all of these will be relocated).(22)

Following is a sector by sector summary of the Business-As-Usual scenario.



1975 State of Oregon, Office of Energy Research and Planning

FIGURE 13.

RESIDENTIAL

The Business-As-Usual scenario assumes a continuation of current efficiency levels for existing housing projected to the year 2002. Energy demand averages by dwelling type are the same as for the 1982 base year, except for new construction. Energy demand for new construction is based on the average energy use for houses built between 1960 and 1982.(23) (In general, new homes are larger and consume more energy that the older housing stock.)(24) Total Energy Demand for this sector is projected to increase by 26.1 percent, and average household energy use would increase by 5 percent.(25)

COMMERCIAL

Based on net growth figures and historical trends of businesses in Marysville, 85 percent of the 1982 base year commercial building stock is projected to be in use in the year 2002. The 15 percent balance is assumed to be replaced by new commercial space. In addition, a net increase of 15 percent (through growth) is estimated to be added to the to the total commercial building space.(26) It is assumed that there will be a 15 percent increase in Total Energy Demand over the 1982 base year.(27)

MUNICIPAL

Because the infrastructure of the community is in place (water and waste treatment) and most buildings are relatively new, future energy demand in this sector is projected to only have a slight increase.(28)

SCHOOLS

The existing schools are assumed to have sufficient capacity for projected increases in enrollment, and the Business-As-Usual scenario assumes the same energy demand as the 1982 base year.(29) (It is recognized that since the 1982 energy study was completed Central School has been demolished. However, it is assumed that this one building will have no significant impact on the energy demand pattern for the sector.)

TRANSPORTATION

The Business-As-Usual projection assumes continuation of current trends in travel behavior and vehicle fuel efficiencies. State wide per capita vehicle mile traveled is increasing at about 2.4 percent per year; a 2 percent increase per year is used for this scenario. Fuel use is projected to be reduced by .05 percent.(30)

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20. The Marysville Energy Study, pp.65
21. Ibid., pp.67
22. Ibid., pp.67
23. Ibid.. pp.70
24. Ibid., pp.165
25. Ibid., pp.70
26. Ibid., pp.91
27. Ibid., pp.92
28. Ibid., pp.95
29. Ibid., pp.98
30. Ibid., pp.103

ENERGY PRICE PROJECTIONS

U.S. Department of Energy projections were used for estimating future fuel costs. Commercial rates were not available; for this sector, rate increases were assumed to be a mid-range between residential and industrial.(31) (See Table 4.)

MARYSVILLE ENERGY COST PROJECTIONS

Community energy costs were calculated by using the energy price projections and future demand projections. (See Table 5.)

HOUSEHOLD ENERGY COSTS

Real household income is projected to increase at a rate of one-percent annually.(32) This would amount to an increase from $16,000 to &19,525 in the year 2002.(33)

Under the Business-As-Usual scenario, community energy costs are $8,470,647, and the Average Household Share is $4,718 family income. This amounts to 24.2 percent of gross family income; the 1982 base year was 10.3 percent of gross family income.

This scenario is based on the in-town transportation estimate. Using the more realistic alternative transportation estimate, the Household Share of Total Community Energy costs increases to $5494; or 28.1 percent of family income in the year 2002.

Clearly, under the Business-As-Usual scenario, the would be a drastic erosion in discretionary income which would have a tremendous impact on the local economy. With considerably less income available for purchase of goods and services, it could very well lead to an economic crisis of staggering proportions.

Energy Price Projections

Sector	D.O.E. 1979 Prices $/MBTU	D.O.E. 1995 Midrange Project. $/MBTU	D.O.E. Annual Percent Incr.	Marysville 1982 Prices $/MBTU	Marysville 2002 Prices $/MBTU	2002 Price Per Unit $	Ave. Wt. 1982/2002 Projected Price/MBTU $/MBTU
Residential							
Elec.	13.27	18.42	2.4%	18.76	30.95	.107/Kwh	24.86
Nat. Gas	3.03	8.73	7.8%	2.88	12.00	12.19/Mcf	7.44
(Commercial)							
Elec.	-	-	(3%)	13.84	24.91	.85/Kwh	19.38
Nat. Gas	-	-	(8.5%)	2.50	12.85	13.00/Mcf	7.65
Industrial							
Nat. Gas	1.94	7.65	9.5%	-	-		
Transport							
Gasoline	7.36	17.56	6.1%	9.59	31.34	3.92/gal	20.47

TABLE 4.

Summary of Year 2002 Projected Energy Costs

	B.A.U. Elec.	Nat.Gas	Oil	Total
Residential	$1,713,454	$2,780,196	-	$7,218,242
Commercial	742,318	539,622	-	1,646,552
Municipal	137,356	31,539	-	197,108
Schools	47,952	146,138	-	324,814
Transport.	-	-	3,710,926	3,710,962
Total	$2,641,080	$3,497,495	$2,332,072	$8,470,647

TABLE 5.

31. Ibid., pp.108
32. The assumed rate of increase for household income is based on a review of personal income data several publications including Kansas Economic Report prepared by Kansas State University and the University of Kansas, and Kansas Annual Planning Information, 1983 prepared by the Kansas Department of Human Resources.
33. The Marysville Energy Study, pp.125

COMMUNITY ENERGY DOLLAR DRAIN

The amount of money a community spends on energy and the economic impact of this cost is directly related to the amount of this expenditure which remains in the local economy. In small towns and rural areas this is largely in the form of salaries of local citizens employed by the energy companies which serve the community. (Also included in this are local utility franchise taxes.)

In the 1982 base year of the energy study, $327,321 of energy expenditures was retained in the local economy. The remaining $2,491,965 left the community immediately, and forever. This amounts to 87 percent of the total community energy cost. If this current trend continues, the Business-As-Usual scenario projects that in the year 2002, $7,369,463 would leave the community in the form of energy dollars.

SUMMARY

The Business-As-Usual scenario does not present an optimistic forecast of the Marysville energy future. The effects on the individual households (especially those individuals and families on fixed incomes), and on the local economy would be severe. A major decrease in household purchasing power and the collective loss of total community economic activity brought about the dollar drain would ripple throughout the entire business community. Clearly, a number of local businesses might not survive the loss in trade associated with the energy dollar drain.

Because of continued reliance on outside sources of nonrenewable energy supplies, further erosion of personal income, further deterioration of local community economic stability , and more jobs lost from the community are all very real possibilities. Clearly, this scenario argues for a serious consideration of the Soft Path alternative, the results of which are now presented.

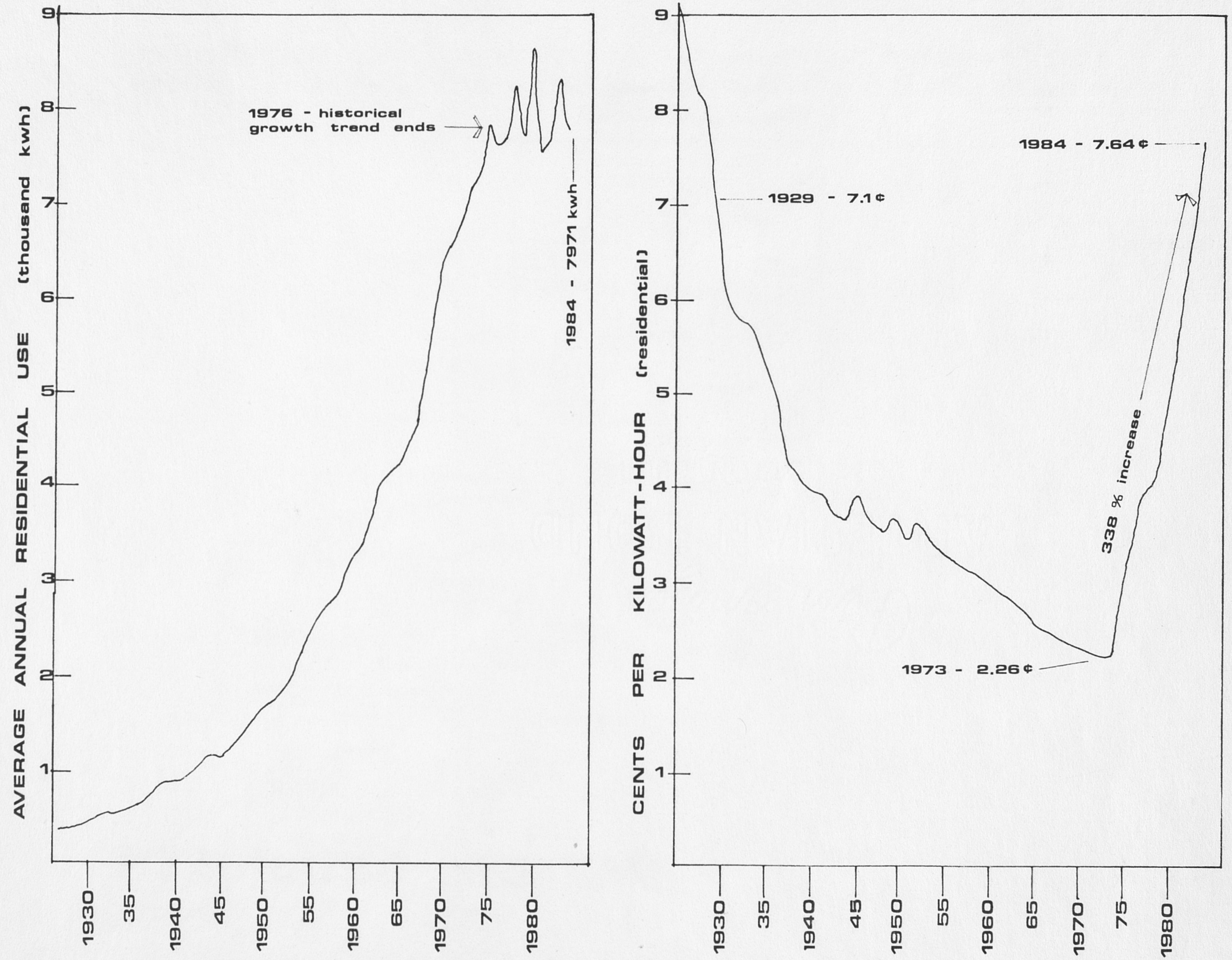


FIGURE 14. Kansas Power & Light Electric Rate History

Several projections were developed in the Marysville Energy Study using the 'soft path' approach, all of which were based on the same basic philosophy; the only variation was the level of implementation or participation.

In the Business-As-Usual approach no participation assumption is needed, because decisions are left to those outside the community who control the existing energy system; one just has to accept and live with those decisions. In a 'Soft Path' approach to the energy situation some participation could be mandatory, such as in the case of codes or ordinances, while a great majority of the desired actions would be voluntary and left up to the good judgement and common sense of the citizens within the community.

For the purposes of this report, only the optimum conditions of participation are included to show the vast difference between the two scenarios ('Soft Path' vs. 'Hard Path'), and also to illustrate the tremendous potential of a positive and logical approach to energy planning. The two basic scenarios developed in the 'Soft Path' are entitled 'Soft Path Strategy One', and 'Soft Path Strategy Two'.

Soft Path Strategy One reduces energy use in two ways: a) Conservation - reduces energy demand by improving end use energy efficiency (adding insulation, more efficient replacement equipment, and so on); b) Solar - energy demand for space heating and water heating are reduced by the use of solar thermal measures (active and passive solar thermal collection).

Strategy Two includes projections developed in Strategy One, and then develops a scenario which involves the utilization of renewable energy technologies to supply a portion of the remaining energy demand.(34)

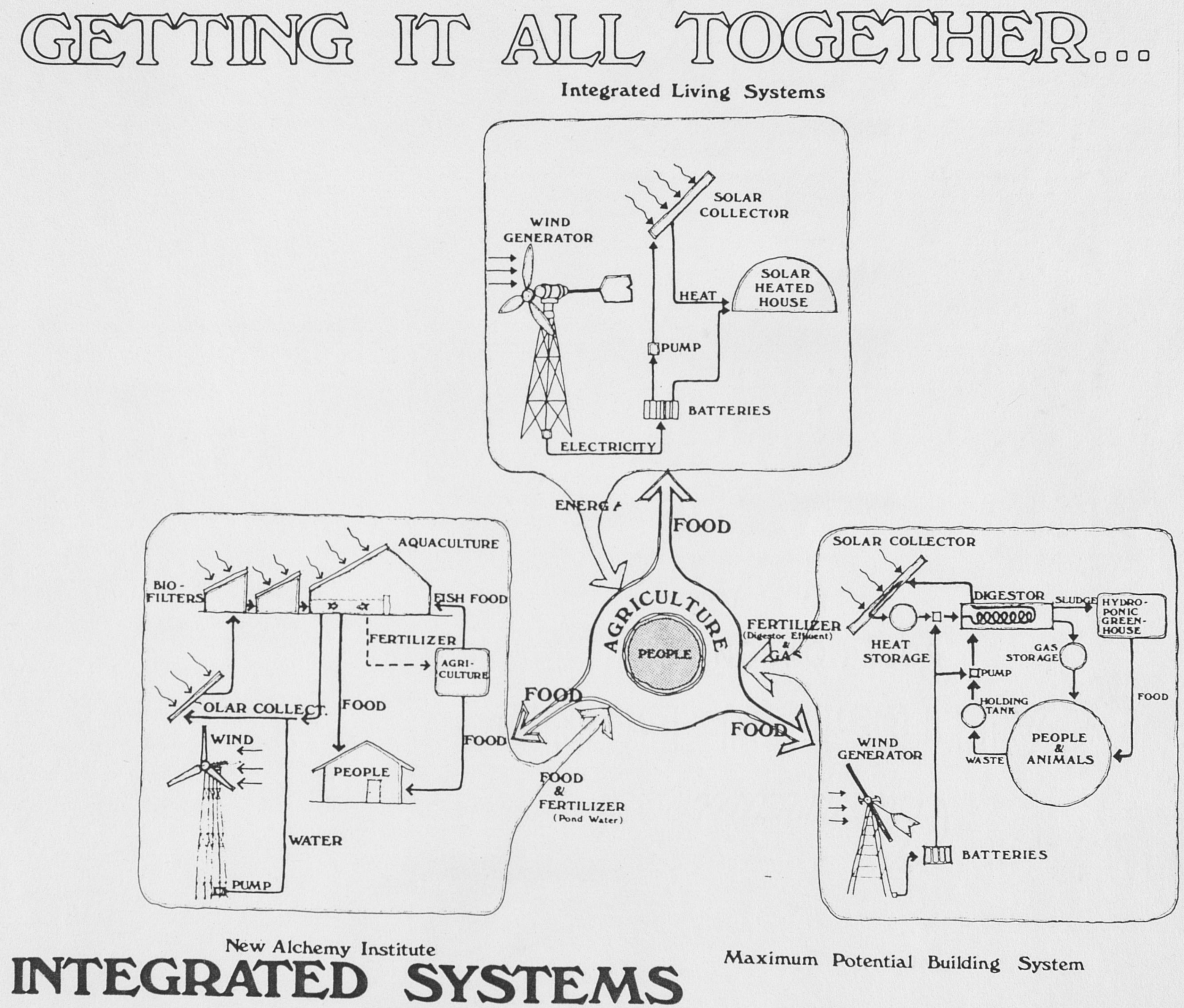


FIGURE 15.

34. The Marysville Energy Study, pp.66

Soft Path - Strategy One Conservation/Solar

Residential

RESIDENTIAL - CONSERVATION

For existing dwelling units, the first measures looked at in this sector were those which could most easily be accomplished and which would require the least expenditure. These measures are termed "no-cost/low-cost". An example of no-cost measures would be thermostat setbacks, adding a brick to the water closet to reduce the amount of water required to flush, cooking at later hours in the summer to avoid adding heat to the home while the air-conditioning unit is operating, and so on.

Low-cost measures include: replacing lighting with lower wattage bulbs where possible; adding caulking and weatherstripping; replacing shower heads with flow restrictor `water savers'; adding insulating blankets for water heaters; increasing wall and ceiling insulation; and installing numerous other devices which would not require a large investment yet would make a significant contribution to energy conservation. (Insulation was considered a low cost measure, because substantial savings on investment could be achieved by taking advantage of Federal and State tax incentives which are available through December, 1985.)

Low-cost/no-cost measures are intended to generally `tighten up' the home and reduce energy costs without adding a significant burden to the homeowners budget. Numerous other suggestions are detailed in The Kansas Energy Saving Handbook for Homeowners which is available free to state residents.(35)

The estimate of potential energy use reduction was based on a `Dwelling Characteristics' survey which assessed current levels of conservation measures in place in Marysville.(36)

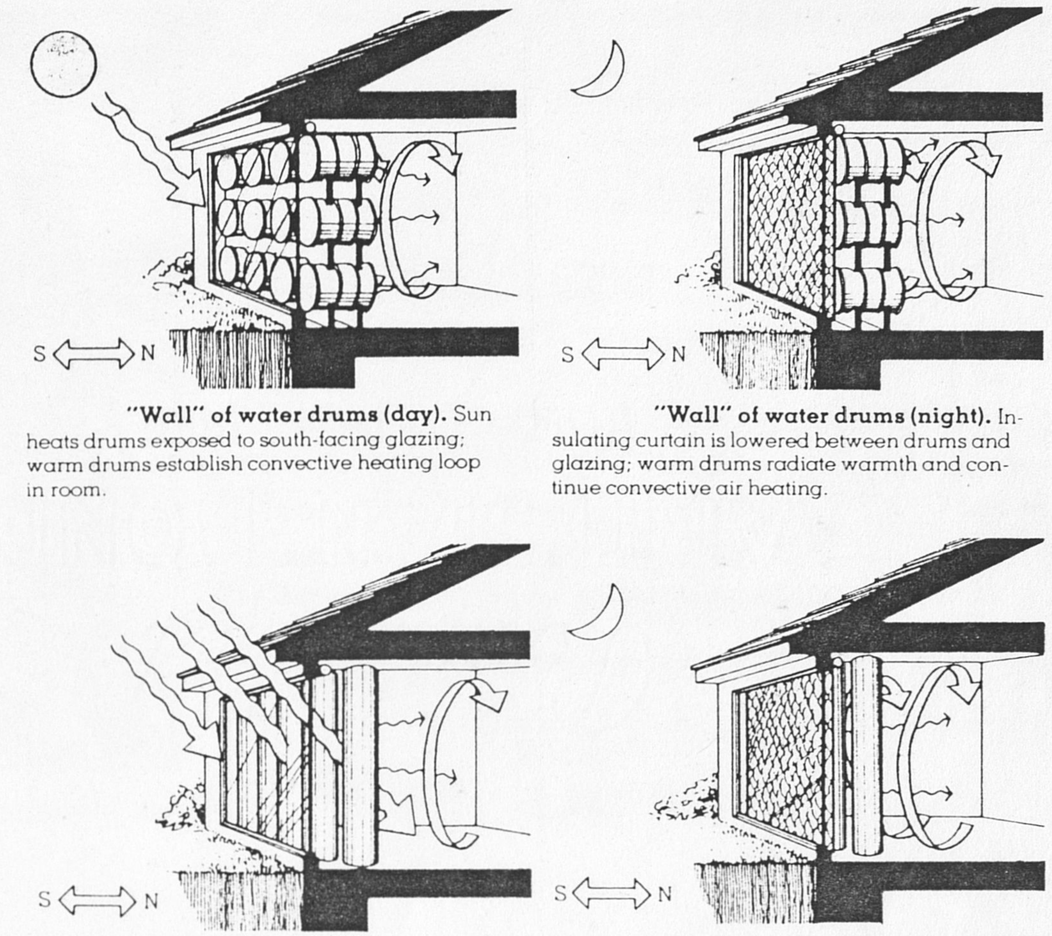
Improvements in efficiency of heating and cooling systems, and household appliances were also considered in projecting reduction in energy demand. Standards for these measures were adopted from The U.S. Solar Research Institute (SERI) Solar Conservation Study A New Prosperity(37), and Alternative Energy Demand Futures to 2010, by the Committee on Nuclear and alternative Energy Systems (CONAES), National Research Council.(38)

Through implementation of these conservation measures energy demand could be reduced by as much as 53 percent over the 1982 base year. Conservation Measures and their projected reduction of energy demand are illustrated in Table 6.

Conservation in Existing Typical Single Family Residence

End Use	1982 Base Year MBTU	Soft Path: Strategy One Conservation Measures	Red. %	Year 2002 MBTU
Space Heating	96.1	Walls to R-13; Ceiling to R-38; Windows: half remain with storms at R-2, half with R-5 insulating shades added; Added weather-stripping and caulking reduce air change to .8 per hour; Heating system efficiency increases to 90%.	56.1	42.2
Water Heating	30.7	Gas heaters - reduce standby losses with more tank insulation, pilotless ignition; elec. heaters-more insulation. Low flow devices.	50.0	15.3
Cooking	9.8	All ranges - door seal, insulation; pilotless ignition for gas range.	56.6	4.3
Refrig.	5.5	More efficient replacement unit.	52.7	2.6
Cooling	4.2	Due to shell improvements and more efficent replacement equipment.	32.5	2.8
Appli./Other	4.1	More efficient replacement units.	30.0	2.9
Lights	3.7	Replacement of bulbs and Fixtures.	45.0	2.0
Clothes Dry.	1.8	More efficient replacement units.	18.0	1.5
Total	156.0		53.3	72.8

TABLE 6.



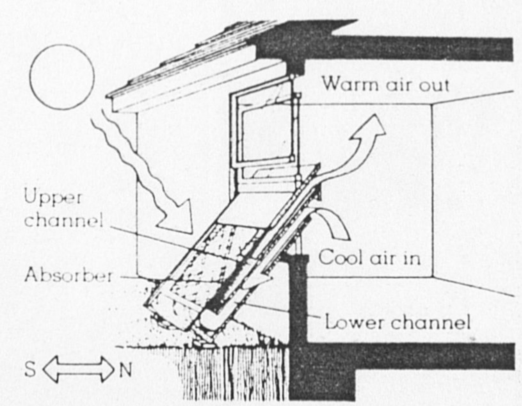
"Wall" of water drums (day). Sun heats drums exposed to south-facing glazing; warm drums establish convective heating loop in room.

"Wall" of water drums (night). Insulating curtain is lowered between drums and glazing; warm drums radiate warmth and continue convective air heating.

"Wall" of water columns (day). Sunlight shines between columns to heat room directly, strikes columns to warm water within.

"Wall" of water columns (night). With insulating curtain lowered, columns heat room by radiation and convection.

FIGURE 16. Solar Wall Applications



Window box heater. Lath absorber converts sunlight to heat and transfers it to air (in upper channel), which then rises into house; cooler air flows into lower channel.

FIGURE 17. Window Box Heater

35. The Kansas Energy Saving Handbook for Homeowners, Harper & Row, Publishers; New York. 1979
36. The Marysville Energy Study, pp.166
37. Solar Energy Research Institute (SERI, A New Prosperity - Building a Sustainable Energy Future (Andover, Massachusetts; Brick House, 1981), pp.65-68
38. National Research Council, Committee on Nuclear and Alternative Energy Systems Alternative Energy Demand Futures to 2010 (Washington, D.C.; National Academy of Sciences, 1979), pp.57

RESIDENTIAL - SOLAR

Once conservation measures have been taken, the next set of alternatives looked at to reduce energy use are solar technologies. Three solar applications are considered for implementation. The first two are passive and active solar systems; the third, super-insulation, is not normally considered a solar application, but is included in this category.

The number and types of systems and configurations for installation are almost limitless. Some of the most widely recognized systems are: solar water heaters; solar greenhouses; sun rooms; Trombe walls; hot-air collectors, wall or roof mounted; water walls (water filled cylinders, either metal or fiberglass). (Tax incentives are still available for some of these improvements also.)

Whereas most of the improvements in the `residential - conservation' sector can be applied to virtually any dwelling unit, the potential for reduction in energy use by solar means for the existing housing stock was based on a `Solar Suitability' study. This study rated the housing stock on several characteristics: a) percent of access to the sun during specific times of day; b) percent of roof exposure available; c) percent of southern wall exposure. The results of the survey show that 63.3 percent of the existing housing stock has a high potential for employing solar retrofit systems to reduce energy demand, and that 73.3 percent had a high potential for solar water heating.(39) These results indicate that the Marysville housing stock has the flexibility necessary to implement solar retrofit technologies, which could have a tremendous impact on the residential energy demand.

RESIDENTIAL - NEW CONSTRUCTION

New residential construction is assumed to be designed and built using passive solar techniques and energy efficient appliances and equipment, the sum of which reduces energy demand by 88.7 percent of projected `Business-As-Usual' energy demand for new construction.(40)

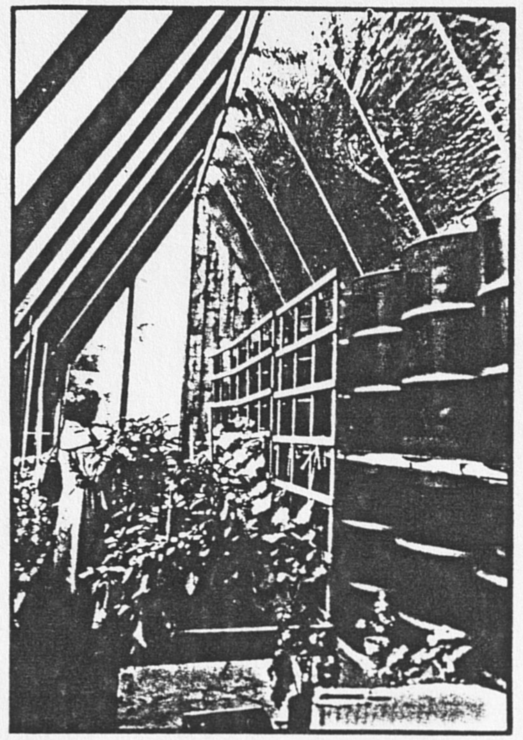


FIGURE 18. Greenhouse

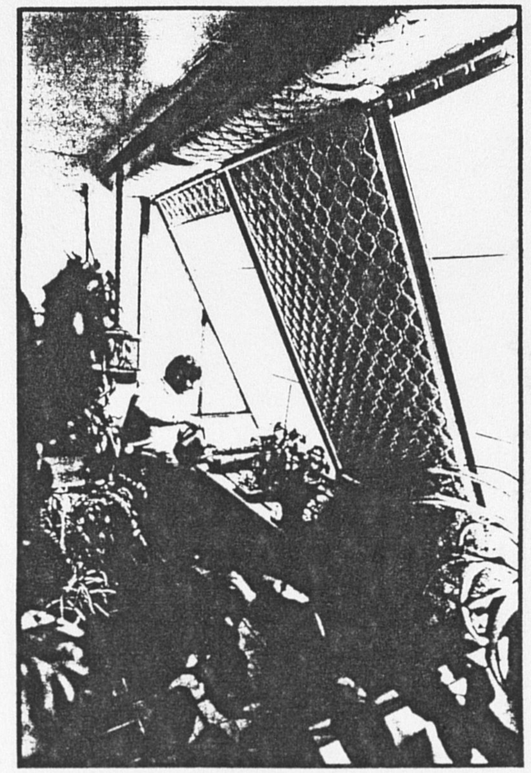


FIGURE 19. Insulating Curtains

Residential 100% Participation Soft Path Strategy One Summary

	Business As Usual: Exist. & New		Soft Path: Strategy One Conservation Existing		New Const.		Soft Path Total	Total Reduction from B.A.U.
End Use	N.Gas MBTU	Elec. MBTU	N.Gas MBTU	Elec MBTU	N.Gas MBTU	Elec. MBTU	MBTU	%
Heating								
Space	172,506	2,893	28,509	1,537	7,752		37,798	78.5
Water	54,978	1,247	12,402	385	2,168	-	14,955	73.4
Cooking	3,533	15,081	924	4,106	309	1,237	6,576	64.7
Refrig.		10,362	-	3,055		1,089	4,144	60.0
Cooling		7,903	-	3,302		1,602	4,904	37.9
Appl.		7,678	-	2,867		2,030	4,897	36.2
Lights		7,088	-	2,427		1,185	3,612	49.0
Cls. Dry	666	3,110	330	1,486	216	1,064	3,096	18.0
Totals	231,683	55,362	42,165	19,165	10,445	8,207	79,982	72.1

100% Participation Soft Path Strategy One Cons./Solar Energy Demand By Energy Type

	B.A.U. MBTU	Red. %	Soft Path Strategy One MBTU
Natural Gas	231,683	77.3	52,610
Electricity	55,362	50.6	27,372
Total	287,045	72.1	79,982

TABLE 7.

SUMMARY OF SOFT PATH STRATEGY ONE RESIDENTIAL ENERGY USE DEMAND REDUCTION

The reduction in Total Residential Energy Use is based on 100 percent participation in `residential -conservation' and 75 percent participation in `residential - solar' measures. The total reduction is projected to be 72.1 percent of the `Business-As-Usual' scenario.

Through implementation of Soft Path Strategy One measures, Average Residential Household energy costs would be 5.9 percent of gross family income, a reduction from 12.3 percent in the Business-As-Usual scenario, and a slight increase from 5.1 percent of gross family in the 1982 base year. Clearly, as energy prices continue to rise, households will have to implement a number of measures just to maintain their current economic status.

FIGURE 20. Solar Greenhouse

39. Marysville Energy Study, pp.166
40. Ibid., pp.79

Commercial

As in the Business-As-Usual scenario, the 'Soft Path' assumes that 85 percent of commercial buildings will be retained in the year 2002 and that the remaining 15 percent will be replaced by new structures. It is also assumed that there will be an additional 15 percent of total square footage added to the commercial sector.

COMMERCIAL - CONSERVATION

Conservation measures to be implemented in the commercial sector are similar to those identified in the 'residential - conservation' section. Measures such as weatherstripping, added insulation, lower thermostat temperature settings, and more efficient appliances and heating/cooling systems are assumed to reduce total space heating energy demand by as much as 50 percent over Business-As-Usual energy demand.(41) It is more difficult to implement conservation measures on manufacturing and industrial processes already in place than it is to apply these measures to the buildings which house them (these processes account for 22.2 percent of the energy demand in this sector). For this reason, all conservation measures combined are projected to reduce energy demand in the commercial sector by 18.5 percent.(42)

COMMERCIAL - SOLAR

Participation by businesses in adopting solar measures is assumed to be lower than that in the residential sector, because it is assumed that it is more difficult to retrofit commercial structures. (Items such as as store-front display windows are an integral of advertising, and many building facades should be left intact to preserve the historical character of the structure.)

Commercial solar applications are projected to reduce the total energy demand by another 15.6 percent over the Business-As-Usual scenario.(43)

COMMERCIAL - NEW CONSTRUCTION

New commercial structures are assumed to be 48.1 percent more efficient than projected in the Business-As-Usual scenario.(44) For assumed conservation / solar energy reduction percentages in commercial applications for new buildings, see Table 8.

Soft Path Strategy One New Commercial Buildings

	B.A.U.	Strategy One Conservation/Solar		
End Use	MBTU	Red. %	Par. %	E.D. MBTU
Heating				
Space	7,076	70	100	2,123
Water	1,221	80	100	244
Cooling	445	60	100	178
Lighting	2,685	30	100	1,879
Cooking	600	20	100	480
Refriq.	1,003	40	100	602
Ind. Pro.	4,472	20	100	3,577
Total	17,502	48.1		9,083

TABLE 8.

SUMMARY OF SOFT PATH STRATEGY ONE COMMERCIAL ENERGY USE DEMAND REDUCTION

Combining conservation and solar measures on existing and new construction, the total Soft Path Strategy One energy reduction over the Business-As-Usual scenario is projected to be 36 percent (see Table 9). This represents a 24.7 percent reduction from the 1982 base year energy use for this sector.

Soft Path Strategy One Commercial Summary

	1982	Business As Usual			Soft Path Strategy One High Cons./ High Solar			Total Red.
End Use	Base Year MBTU	Exist Bldg. MBTU	New Bldg. MBTU	Tot. MBTU	Exist Bldg. MBTU	New Bldg. MBTU	Total MBTU	From BAU %
Heat.								
Space	23,587	20,049	7,076	20,125	9,524	2,123	11,647	57
Water	4,071	3,460	1,221	4,682	1,315	244	1,559	72
Cool.	1,479	1,257	445	1,701	885	178	1,063	38
lights	8,949	7,607	2,685	10,292	5,895	1,879	8,774	33
Cook.	2,000	1,700	600	2,300	1,615	480	2,095	9
Refrig.	3,344	2,842	1,003	3,846	2,558	602	3,160	33
Process	14,907	12,671	4,472	17,143	12,045	3,577	15,623	9
Total	58,337	49587	17,501	67,088	33,837	9,083	43,920	36

Soft Path Strategy One Energy Demand By Energy Type

Energy Type	MBTU
Electricity	27,883
Natural Gas	16,037
Total	43,920

TABLE 9.

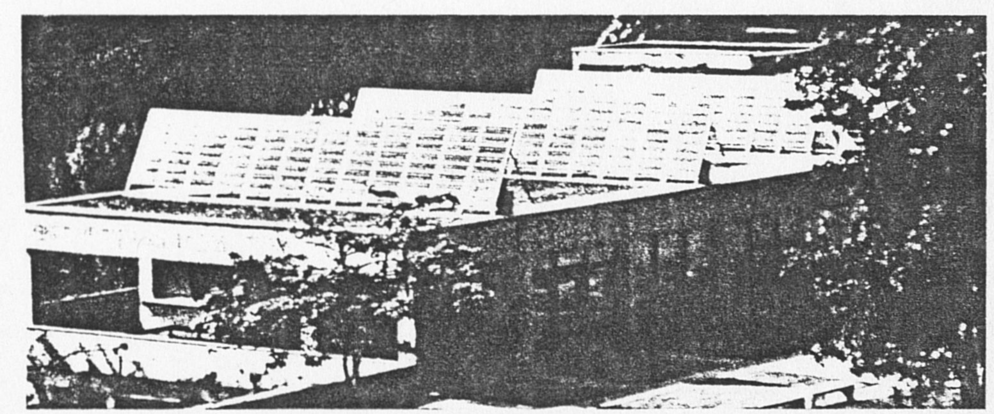


FIGURE 21. Photovoltaic Application

41. Ibid., pp.92
42. Ibid., pp.93
43. Ibid., pp.93
44. SERI, A New Prosperity, pp.141

MUNICIPAL - BUILDINGS

Only conservation measures were included in the analysis of municipal structures. A 26 percent reduction in energy demand over the Business-As-Usual scenario was projected. (The new all-electric city hall building is the largest energy user, and all other other buildings were determined to be unsatisfactory for solar retrofit options [other than photovoltaic applications].) (45)

MUNICIPAL - OPERATIONS

It is assumed that there will be little opportunity to make significant improvements in the water and sewer system because of the long expected lifetime and high cost of capital equipment now in place.(46)

Major savings in this area are projected to come from reduced loads brought about by more energy efficient plumbing systems in retrofitted housing, and more efficient construction of new structures.

The largest energy demand reduction comes from more energy efficient street lighting. It is assumed that more efficient fixtures will result in a 40 percent reduction in energy demand for streetlighting.(47)

MUNICIPAL - VEHICLES

This category is accounted for in 'Soft Path' transportation projections.

SUMMARY OF SOFT PATH STRATEGY ONE MUNICIPAL ENERGY DEMAND REDUCTION

The total energy demand reduction for the municipal sector is 27 percent over the Business-As-Usual scenario, and a 22 percent reduction from the 1982 base year energy demand for this sector.

Municipal Soft Path Strategy One Summary

	1982 Base E.D. MBTU	2002 B.A.U E.D. MBTU	Soft Path: Conservation Red. %	Soft Path: Conservation E.D. MBTU
Buildings				
City Hall	444	444	20	389
Police	449	449	28	324
Warehouse	848	848	37	536
Other	724	724	21	573
Sub. Total	2,465	2,465	26	1822
Operations				
Streetlight	1,740	1,740	40	1044
Water/Sewer	2,800	3,302	20	2642
Other	471	471	30	330
Sub-Total	5,011	5,513	20	4016
Total	7,476	7,978	27	5838

Post-Strategy One Energy Demand by Energy Type

	Buildings	Operations	Total
Electricity	785	3,438	4,223
Natural Gas	1,137	578	1,615

TABLE 10.

Soft Path Strategy One Schools Cons./Solar Summary

School	1982 Base/ B.A.U. Total	Conservation Sp. Heat Red. %	Conservation Sp. Heat E.D. MBTU	Conservation Elec. Red. %	Conservation Elec. E.D. MBTU	Solar Sp. Heat Red. %	Solar Sp. Heat E.D. MBTU	Solar Wa. Heat Red. %	Solar Wa. Heat E.D. MBTU	Total Red. %	Total E.D. MBTU
Sr High	3,497	-	2,623	25	484	30	1,836	60	114	29	2,480
Jr High	4,487	-	2,942	25	670	30	2,059	60	326	29	3,185
Central	2,306	32.5	1,392	25	129	40	835	60	14	56	1,014
Lincoln	1,258	24.8	790	25	96	40	474	60	16	50	626
Other	1,794	-	1,708	25	65	40	1,025	-	-	39	1,090
Total	13,342		9,455		1,444	-	6,229	-	516	37	8,395

Strategy One Energy Demand by Energy Type

	MBTU
Natural Gas	6,951
Electricity	1,444
Total	8,395

TABLE 11.

Since recent energy conservation efforts have been directed toward the Junior and Senior High buildings, major emphasis was placed on the Lincoln school, which is lacking in maintenance and general upkeep.

Estimated space heating reductions were 32.5 percent for Central school and 24.8 percent for Lincoln school. A 25 percent reduction in energy demand was assumed for all school buildings.

Since all the schools are located in relatively large open areas, it is assumed there is sufficient retrofit potential for solar space heating and solar water heating.

SUMMARY OF SOFT PATH STRATEGY ONE SCHOOLS ENERGY DEMAND REDUCTION

Conservation and solar measures are projected to combine for a 37 percent reduction in demand over the Business-As-Usual scenario.

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45. The Marysville Energy Study, pp.96

46. Ibid

47. Ibid

Transportation

Unlike buildings or other energy use activities which have a definite location, the very nature of transportation is movement, which makes assessment of this sector more difficult.(48) In addition, the Middle East oil situation is impossible to predict, and travel estimates are constantly changing as the price of gasoline fluctuates.

In a movement toward self-reliance, trends in travel outside the community could be influenced by changes in food and other production systems (locally produced commodities will reduce the distance goods are transported, for example). Therefore only the local transportation energy demand is projected here.

TRANSPORTATION - CONSERVATION

Reduction in energy demand is based on four factors:

a) average fleet increased fuel efficiency to 50 mpg;

b) fewer trips resulting in a 10 percent reduction in vehicle miles traveled;

c) changes in modes of transportation (ie. bicycle, walking); reductions of 10 percent VMT for medium trucks, 25 percent for heavy trucks, 5 percent for auto, and 5 percent increase for motorcycle;

d) increased passenger occupancy.(49)

SUMMARY OF SOFT PATH STRATEGY ONE TRANSPORTATION ENERGY DEMAND REDUCTION

Based on combined energy conservation measures, projected energy demand reduction is 64.6 percent from the Business-As-Usual scenario.

Transportation Energy Demand Projections, Year 2002

Business as Usual Scenerio

Vehicle Type	Number of Vehicles	Vehicle Miles Traveled	MPG	Fuel Use Gallons	Percent Fuel Use
Auto	4,459	8,851,420	27.5	321,870	54.6%
Light Truck	2,011	3,830,599	20	191,530	32.5
Medium Truck	158	300,975	9.5	31,681	5.3
Heavy Truck	187	355,698	9.5	37,442	6.4
Motorcycle	366	342,018	51	6,765	1.1
Total	7,181	13,680,711		589,288	100%

High Conservation Scenerio

Vehicle Type	Vehicle Miles Traveled	MPG	Fuel Use Gallons	Percent Fuel Use
Auto	5,032,530	50	100,650	48.2%
Light Truck	2,348,514	34.4	68,271	32.7
Medium Truck	167,751	10.8	15,533	7.4
Heavy Truck	167,751	10.8	15,533	7.4
Motorcycle	671,004	75	8,947	4.3
Total	8,387,550		208,934	100%

Note: The number of vehicles for the Low and High Conservation scenerios is the same as for the B.A.U. scenerio.

Soft Path Strategy One Energy Demand By Energy Type For the High Conservation Scenerio

Energy Type	MBTU
Gasoline	23,216
Diesel	3,227
Total	26,443

TABLE 12.

Soft Path Strategy One: Total Energy Demand Reduction

Through adoption of recommendations in each sector, Marysville could reduce it total community energy demand by 53.4 percent of what is predicted in the Business-As-Usual scenario. This also represents a reduction of 43.6 percent of the 1982 base year community energy demand.

For a complete summary of Soft Path Strategy One, see SOFT ENERGY PATH SUMMARY pp.27.

48. Ibid., pp.100
49. Ibid., pp.101

Soft Path - Strategy Two Renewable Energy Supply

Soft Path Strategy One addressed energy consumption, and reducing the demand on Marysville's energy supply systems. Soft Path Strategy Two approaches the energy supply side of the community energy systems. Strategy Two assumes that all goals of Strategy One have been met.

So for we have looked at conservation and solar improvements which would be initiated more or less on an individual basis. There are energy systems available, however, which would require community investments through creation of bond issues (for example, establishing a Municipal Solar Utility - see Appendix A). Another possible funding source the use of Federal matching grants, such as UDAG (Urban Development Action Grants), or CDBG (Community Development Block Grants).

Investments of this type would include: hydroelectric power, wind farms (clusters of wind generators), and photovoltaics for community electrical production (photovoltaics is the direct conversion of the sun's energy into electricity).

Soft Path Strategy Two explored the potential in Marysville for these kinds of community action.

Hydroelectric Power

The big Blue river flows by Marysville and an existing dam and generating system have lain dormant there since being given to Marysville by KP&L approximately 20 years ago.(50)

According to a recent study of hydroelectric power potential in Kansas, the Marysville site ranks 25th in potential power output and 10th in relative economic feasibility.(51)

With installation of state-of-the-art low-head generators, it is projected that the Marysville site could produce 7.9 percent of the current Total Community Electrical Energy Demand and 110 percent of the current Municipal electrical demand. Based on the Strategy One conservation/solar energy demand it would provide 8 percent of Total Community Electrical Demand, and 112 percent of Municipal electric demand.(52)

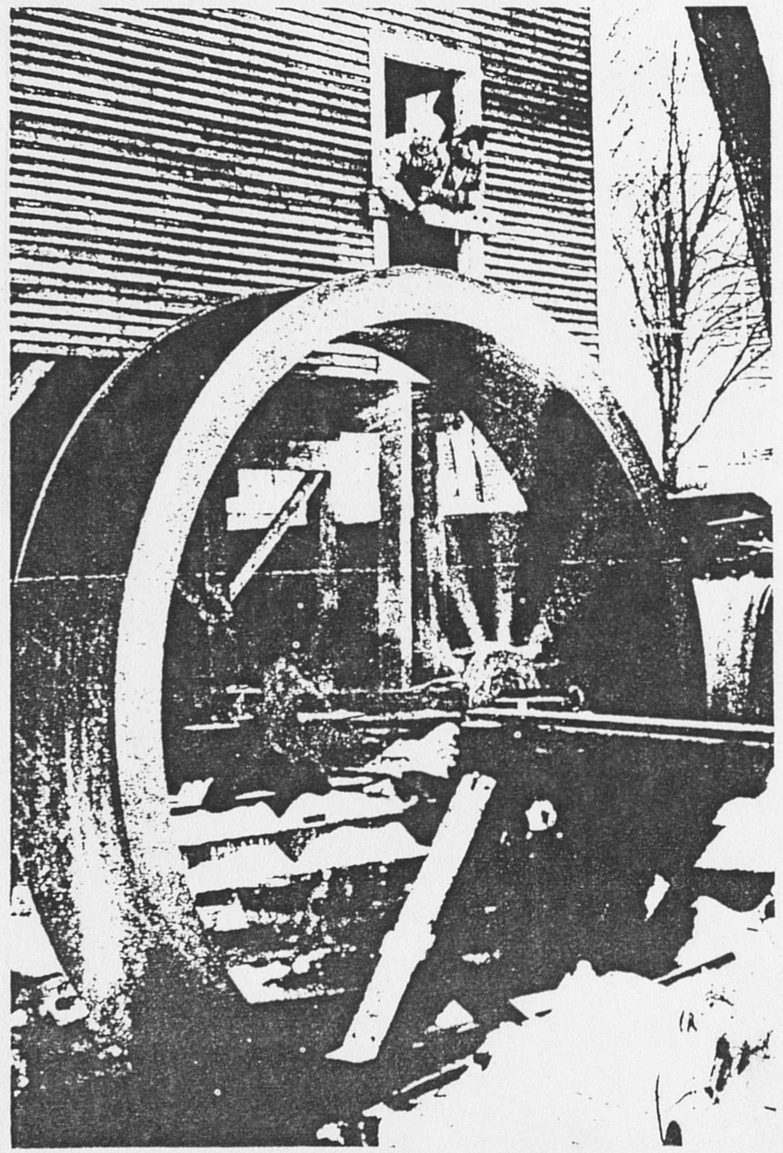

FIGURE 22. Hydroelectric Power

Photovoltaics

PHOTOVOLTAICS - COMMERCIAL

Marysville has approximately 250,000 square feet of unused rooftop area in the business district; this is an ideal location for mounting photovoltaic collectors for electrical production. The cost per kilowatt hour of electrical production from these systems is expected to competitive with conventional systems (coal and nuclear) by 1990. (53)

In estimating potential photovoltaic output, first the total available square footage was reduced by 25 percent to take into account shading of low buildings by adjacent higher buildings. Of the remaining square footage, a ratio of collector array area per unit of roof area of 36 percent was determined. Thus, approximately 67,500 square feet is available for placement of photo-cells.

It is assumed that any new commercial structures would have photovoltaic systems incorporated in to their design. Potential output for the commercial sector is estimated to provide 17.8 percent of the Soft Path Strategy One projected Total Community Electrical Demand.(54)

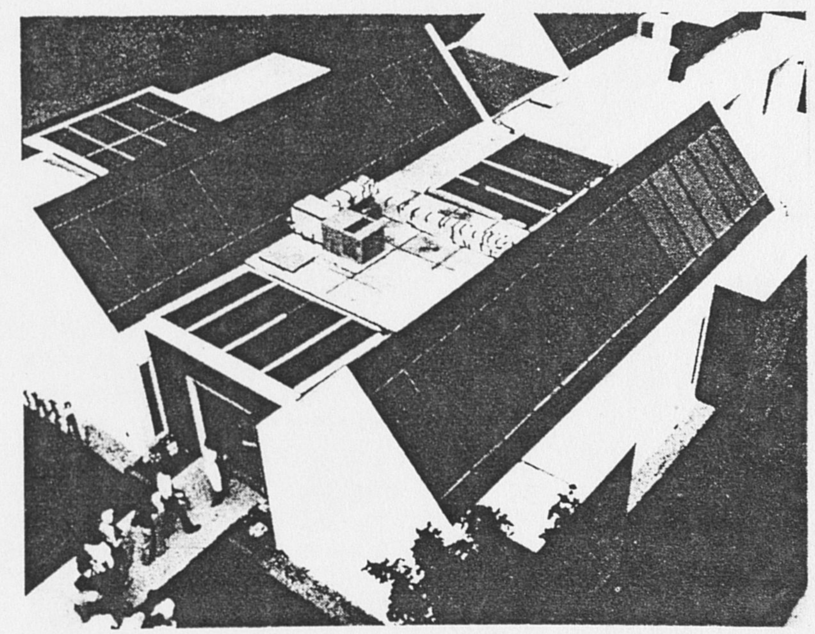

FIGURE 23. Photovoltaics

PHOTOVOLTAICS - RESIDENTIAL

The estimated residential potential was based on the rooftop space available as determined in the Solar Suitability study(55). It was also assumed that new construction would incorporate photovoltaics in their design. Output was estimated to be 31.2 percent of Soft Path Strategy One Total Community Electrical Demand(56).

SUMMARY OF PHOTOVOLTAIC ENERGY POTENTIAL

The total projected output of photovoltaic electrical production is assumed to provide 49 percent of the Total Community Electrical Energy Demand predicted for the year 2002 under the Soft Path Strategy One scenario.

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50. Kansas Hydro-power: An Assessment of Low-Head Hydroelectric Opportunities, pp.7, 11, 15.
51. Ibid.
52. The Marysville Energy Study, pp.112
53. Paul D. Maycock and Edward N. Stirewalt. Photovoltaics: Sunlight To Electricity In One Step. Brick House; Andover, Massachusetts, 1981.
54. The Marysville Energy Study, pp.116
55. Ibid., pp.167
56. Ibid., pp.117

Wind Energy

Marysville is located in an area which is considered to have a strong potential for wind generated electrical production.(57)

The terrain surrounding Marysville is of gentle sloping hills. The predominant winds come from the northwest and the south. For this reason, northwest and south facing slopes are the prime locations for placement of wind generators. The hill on the north side of Marysville is considered to have the greatest potential for two reasons: a) closeness to the city will save on transmission line costs; and b) wind generators can be combined with a shelterbelt which would increase output potential and at the same time help protect the city from north winter winds.(58)

The following assumptions are made for wind energy:(59)

1) 12 mph average wind speed (a conservative estimate).(60)

2) 40 machines placed at the prime location discussed above.

3) Estimated annual energy output per machine - 29,136 kilowatt hours. This estimate is based on a "Windstream 33" model wind generator placed on a 40 foot tower. (Jacobs Wind Electric Company has recently placed on the market a "Jacobs 20kw" model with an estimated annual power output of 32,297 kilowatt hours, based on average wind speed of 12 mph)

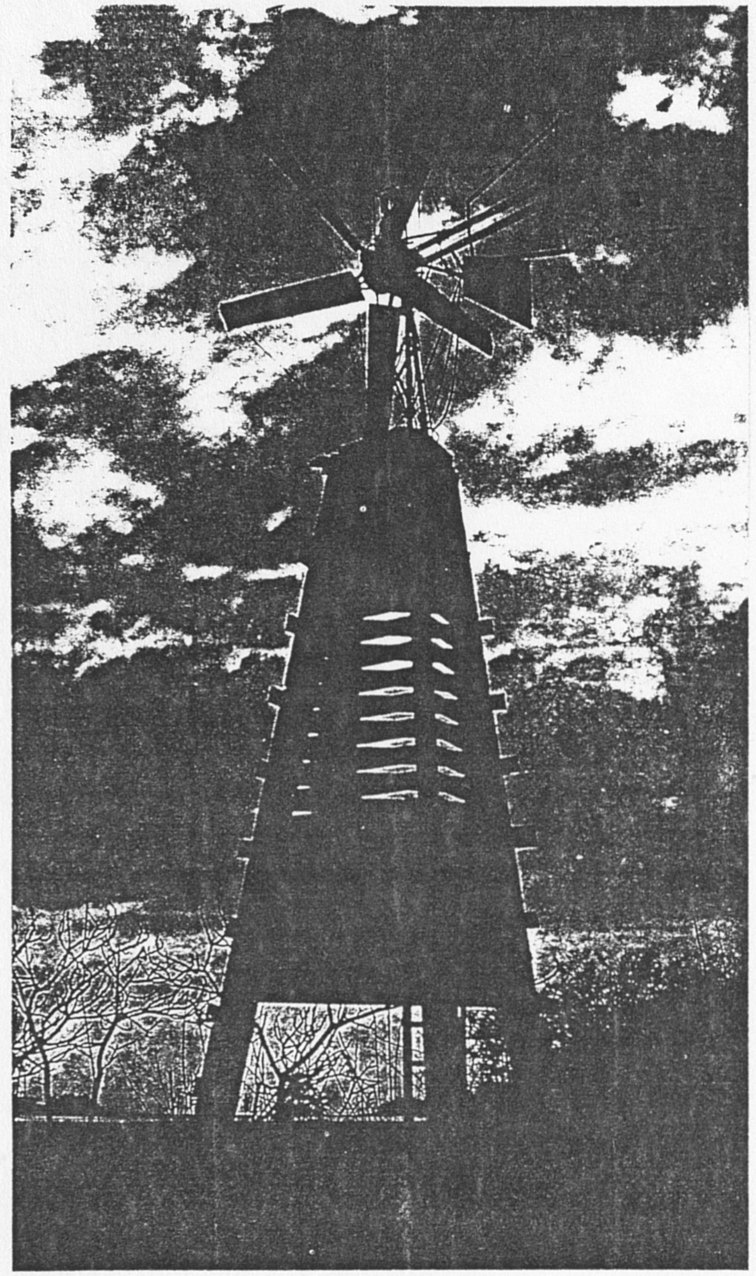

FIGURE 24. Wind Power

WIND ENERGY POTENTIAL

The estimated annual potential of 40 machines is 1,165,44 kilowatt hours of electricity annually, and this would provide 5.8 percent of the Total Community Electrical Energy Demand forecast in the Strategy One scenario. (The Jacobs model estimated annual output is 1,291,880 kilowatt hours, or 6.3 percent of Total Community Electrical Energy Demand.)

The estimates for potential electrical production are conservative. For example, based on a 15 mph wind speed (which is closer to the estimated potential for the site), and using the Jacobs model, annual output is estimated to be 2,145,840 kilowatt hours or 11.7 percent of Total Community Electrical Energy Demand. Also, there are a variety of sites within the immediate area of Marysville which could be easily adapted for wind energy production, and the potential is probably much greater than reported here.

Municipal Waste - Energy Production

There are many new systems for the conversion of waste to energy being developed annually, and many are cost effective at today,s prices. Two forms of municipal waste were considered in the evaluation; solid waste (trash) and sewage.

Solid waste can be burned to produce steam, or processed as a biofuel for burning. Two processes of conversion (hydrogenation; and pyrolysis which can be converted to liquid, gas, or a solid for burning) have been developed by the U.S. Interior Department.(61) It was assumed solid waste would be converted to a liquid or gaseous fuel for burning and would provide for 57.2 percent of Strategy One transportation fuel demand.(62)

Through an anaerobic digestion system, sewage waste is assumed to be processed into a liquid or gaseous form. This product is to be substituted for liquid transportation fuel, and provide 43.2 percent of Strategy One fuel demand.(63)

WASTE ENERGY POTENTIAL

As can be seen by the two figures presented above, waste conversion has the potential to provide 100.4 percent of the community's Total in-town Fuel Energy Demand for the Transportation sector.

Wood

The assumed development of a shelterbelt system for wind control and increased wind generation potential, would also provide a forest crop for wood production.

Wood can be converted to liquid fuels or burned to provide space heating. It is assumed that wood will be used to reduce the year 2002 Natural Gas Energy Demand for space heating by 20 percent. (64)

WOOD ENERGY POTENTIAL

Wood burning is predicted to provide 10.8 percent of the residential natural gas space heating demand. This also accounts for 8.1 percent of the Total Community Natural Gas Energy Demand projected in the Soft Path Strategy One Scenario.

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57. Dr. Gary Johnson, "Kansas Wind Resource Assessment, July 1980 - June 1982", Research, Kansas State University, Report 151, August 1982.
58. The Marysville Energy Study, pp.113
59. The estimates of wind energy output are from student work by Lisa Foreman using the Kansas Energy Office publication: Kansas Wind Energy Handbook, John Selfridge, ed.
60. "Kansas Wind Resource Assessment"
61. Wilson Clark, "Solar Bioconversion and Waste Disposal", Energy for Survival - The Alternative to Extinction, Anchor Books, Anchor Press/Doubleday; Garden City, New York, 1974. pp.452
62. The Marysville Energy Study, pp.118
63. Ibid.
64. Ibid., pp.119

Soft Energy Path Summary

SOFT PATH STRATEGY ONE:
TOTAL ENERGY DEMAND REDUCTION

Through adoption of recommendations in each sector, Marysville could reduce its Total Community Energy Demand by 53.4 percent of what is predicted in the Business-As-Usual scenario. This also represents a reduction of 43.6 percent over the 1982 base year Total Community Energy Demand. (see Table 13.)

SOFT PATH STRATEGY ONE:
COST TO IMPLEMENT

It is assumed that 75 percent of households will participate in Strategy One measures. For each participating household, the average cost to implement these measures is estimated to be $2,829. A fuel savings over twenty years is projected to be $40,349 per household.

SOFT PATH STRATEGY TWO:
ENERGY SUPPLY PROJECTIONS

Through a shift toward renewable energy supply systems, Marysville has the potential to provide for 35.1 percent of its Total Community Energy needs remaining once Soft Path Strategy One measures have been taken.

Based on current use (1982 base year), renewable energy systems could provide 19.8 percent of Total Community Energy Demand.

Energy Demand Projections Summary

	Business As Usual				Soft Path: Strategy One			
Sector	Elec. MBTU	Nat Gas MBTU	Oil MBTU	Total MBTU	Elec. MBTU	NatGas MBTU	Oil MBTU	Total MBTU
Resid.	55,362	231,683	-	287,045	34,612	90,606	-	125,218
Comm.	4,930	42,158	-	67,088	27,883	16,037	-	43,920
Muni.	5,514	2,464	-	7,978	4,883	1,615	-	5,838
Scho.	1,925	11,417	-	13,342	1,444	6,951	-	8,395
Transp.	-	-	74,412	74,412	-	-	26,443	26,443
Total	92,601	287,852	74,412	449,865	68,162	115,209	26,443	209,814

TABLE 13.

SOFT PATH STRATEGY TWO:
COST TO IMPLEMENT

The costs to implement Strategy Two are assumed to be shared by all households. The Average Household Cost would be $5,569. The estimated fuel savings per household over twenty years is projected to be $17,889.

SOFT PATH STRATEGY ONE AND TWO:
ENERGY COST REDUCTION

Marysville's 1982 base year energy cost was $2,491,965, and the Average Household Energy Cost was $1,642 (10.3 percent of family income). The projected cost of energy in the Business-As-Usual scenario is $8,470,647; which raises the Average Household Energy Cost to $4,718, or 24.2 percent of family income.

Assuming all Strategy One and Strategy Two measures are implemented, Total Community Energy Expenditures could be reduced to $1,570,576. This represents a reduction in the percent of family income spent on energy to 4.3 percent, and the Average Household share of Total Community Energy Cost would then be $838.

Soft Path Strategy Two

Energy Type	Strategy One Amount Saved MBTU	Post-Strat. One Energy Demand MBTU	Strat. Two Energy Supply MBTU	Final Demand MBTU
Electricity	24,439	68,162	42,824	25,338
Natural Gas	167,643	115,209	9,334	105,875
Oil (gasoline)	47,969	26,443	26,531	-88
Total	240,051	209,814	73,689	133,125

TABLE 14.

SOFT PATH STRATEGY ONE AND TWO:
REVERSING THE DOLLAR DRAIN

In the 1982 base year, $2,165,644 was exported from the community in the form of energy dollars. Under the Business-As-Usual projections that amount is expected to increase to $7,369,463

The Soft Energy Path reverses this trend, by reducing the amount lost to $1,366,401, or 37 percent less than in 1982 and 81.5 percent less than the Business-As-Usual year 2002 scenario.

Summary of Year 2002 Projected Energy Costs

	B.A.U.			
	Elec.	Nat.Gas	Oil	Total
Residential	$1,713,454	$2,780,196	-	$7,218,242
Commercial	742,318	539,622	-	1,646,552
Municipal	137,356	31,539	-	197,108
Schools	47,952	146,138	-	324,814
Transport.	-	-	3,710,926	3,710,962
Total	$2,641,080	$3,497,495	$2,332,072	$8,470,647

	Soft Path: Strategy One and Two			
	Elec.	Nat.Gas	Oil	Total
Residential	$119,550	$604,664	-	$724,214
Commercial	393,036	205,897	-	598,310
Municipal	105,195	20,672	-	125,867
Schools	35,970	88,973	-	124,943
Transport.	-	-	(-4,389)	(-4,389)
Total	$653,751	$919,563	$(-4,389)	$1,570,576

TABLE 15.

SOFT PATH STRATEGY ONE AND TWO:
JOB CREATION

Instead of exporting jobs in the form of lost energy dollars, the Soft Energy Path creates jobs within the local economy. It is estimated that to implement Strategy One, 180 one-year jobs would be created. This is based on 45 person-years of labor for each million dollars spent to install conservation measures.(65) (The total cost estimate for implementing Soft Path Strategy One is $4,000,000.) In addition, it is estimated that 15 permanent jobs would also be created.

Estimates of job creation by implementing Strategy Two was not completed in the Marysville Energy Study. However it is certain that results would be comparable to those of Strategy One.

Soft Energy Path Summary

As the energy picture unfolds, the paths before us become clear. If we continue to allow entities outside the community to have total control over our energy systems, the economic implications spell disaster. Marysville and other communities do have a choice in deciding the direction of their future.

The Soft Energy Path provides a means by which communities like Marysville can begin to take control of their energy future. It is not only economically viable, but it very well may be the only means to avoid an energy related economic crisis in the not so distant future.

65. Elizabeth Schaefer and James Benson, Energy and Power In Your Community (Fairfax, Virginia: Institute for Ecological Policies, 1980), pp.51

Where Do We Go From Here?

Where Do We Go From Here?

Clearly the scenarios just presented define alternatives which will determine the future economic stability of our communities and towns. Continuing with a Business-As-Usual attitude toward energy and other related systems will only lead to further erosion of an already precarious situation.

Taking Control

For purposes of this thesis it was assumed that the citizens of Marysville have opted to begin taking control of their energy future, and have elected to pursue a Soft Energy Path future.

Figure 26 summarizes the Comprehensive Community Energy Planning Process that Marysville, or any other community, should adopt to begin preparing for such a move toward increased local self-reliance.

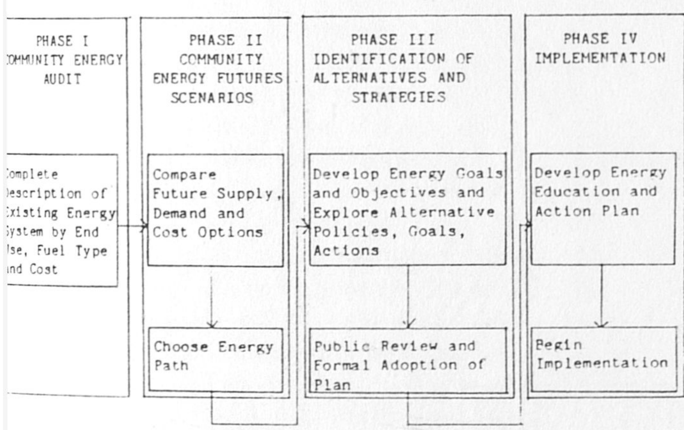

FIGURE 25. Comprehensive Community Energy Planning Process

Phase I and II have been completed and presented in the beginning of this report. Phase III is outlined here, and expanded upon in following sections. Phase IV, implementation, will be in the hands of the citizens of Marysville, for it is they who control the final decision about the fate of their community.

FIGURE 26. Marysville - 9th. & Broadway - Circa 1925

Developing Energy Goals

In order to provide for an orderly transition from a nonrenewable energy based society to one which relies on renewable forms of energy, the adoption of a set of goals to direct this movement is critical. Following the logic of self-reliance, the following goals were developed as the basis for design and planning proposals illustrated in this report.

1) To reduce energy demands of land use by creating more energy efficient patterns of development.

2) To reduce the amount of indirect energy used to provide new and existing development with services such as lights, roads, and water and waste connections.

3) To minimize distances between places of living, working, worship, shopping and recreation in order to reduce transportation energy use and to encourage healthful patterns of walking and bicycle use.

4) To maximize the potential for energy conservation and the production of energy from on-site flows of renewable energy.

5) To maximize the potential for both on-site and community waste recovery and recycling.

6) To develop systems which are sensitive to the natural environment and ecosystems.

These six community energy planning goals support and are supported by three larger purposes: 1) to maximize democratic participation in all decision making processes related to land use, energy production and use, and local economic development; 2) to minimize reliance on external sources of basic goods and services while promoting community economic self-reliance (ie. to reduce the dollar drain associated with sole or primary reliance on imported energy, food, manufactured products, and professional services in areas such as health care and education; and 3) to nurture and develop a strong sense of place and community through both the character of land use and physical development and the processes of comprehensive plan implementation and action.

Moving Toward Self-Reliance

Thus far, we have looked at the energy situation as it exists in Marysville today. We have seen the tremendous dollar drain from the local economy associated with the reliance on nonrenewable energy systems. It has also become evident that if Marysville were to continue with a Business-As-Usual approach to the energy problem, it is highly probable that in the very near future the community will be facing an economic crisis of major proportions.

Fortunately, there are alternatives which, if implemented in a timely fashion, could head off such a crisis. and would insure future generations of an economically sound and environmentally safe community. These alternatives have been described in the Soft Energy Path.

It is time now to translate the Soft Energy Path into a plan of action. Based on the overall goals for self-reliance developed in the previous section, a specific set of goals and recommendations relating directly to Marysville was developed for directing the design sequence of this report.

The following summary of goals and actions provides a brief overview of the approach taken in the design which follows.

LAND USE - Historical patterns of development were studied to provide a basis for future directions of change. Included in this are: floodplain use (an historical perspective is included and defines the position this report has taken concerning the flood plain issue), residential growth, commercial development, transportation systems, manufacturing and food production systems, and community energy supply systems.

Goals: Develop energy efficient and ecologically sound land use patterns.

Recommendations: a) Begin a gradual shift of residential and commercial development out of the flood plain. b) The floodplain should be developed into a food, fuel, and fiber shelter belt system. c) Development of industry should take place along the rail line which is proposed to be the new 'edge' of the community. d) Commercial development should be accomplished with in-fill on Broadway and Center streets, with 'cottage industries' allowed to be re-established in residential sectors. e) Existing residential areas should be filled-in with new and relocated floodplain housing. New residential development should be pedestrian oriented with extensive use of pedestrian and bicycle pathways. f) Circulation systems should place emphasis on pedestrian and bicycle as primary modes of travel. g) The community should adopt ordinances which promote energy efficient development, ie. a solar access ordinance for housing.

FIGURE 27. Marysville - 9th. & Broadway - Circa 1925

RESIDENTIAL - Existing housing stock was studied for solar retrofit potential, and new housing was seen as a place to make tremendous strides in improving the energy efficiency of the residential sector.

Goals: 1) Develop energy efficient housing, and provide adequate housing for the elderly (within the social fabric of the community). 2) Provide affordable housing for low-income, and young families just getting started. 3) Improve climatic conditions in existing neighborhoods.

Recommendations: a) Adopt rigorous building codes for new housing. b) Adopt energy related building codes for any existing structure undergoing renovation. c) Renovate second story space in the downtown for elderly and displaced flood plainresidents. d) Uncover existing brick streets, and use brick pavers on new streets (aids in lowering ambient temperature, and reduces reliance on oil-based paving materials). e) Increase tree planting for improving micro-climate (deciduous shade trees).

COMMERCIAL - The commercial center is seen as the heart of the community. Efforts should be made to restore life to this district, as well as improve the energy situation.

Goals: 1) Improve economic activity in the business sector. 2) Retain the energy dollar in the community. 3) Improve visual characteristics of the downtown. 4) Improve energy performance of buildings. 5) Improve climatic conditions in the downtown (micro-climates).

Recommendations: a) Develop solar related industries. b) Adopt energy related building codes. c) Retrofit existing buildings where appropriate. d) Remove 'plastic' facades from historically significant buildings (to improve the visual appearance of the downtown as part of an overall economic development plan). e) Adopt ordinances protecting historical structures. f) Renovate second story space into apartments and offices. g) Improve streetscape and climatic control through planting of appropriate vegetation. h) Place emphasis on pedestrian circulation (reduce vehicular access). i) Develop outside public gathering spaces.

MUNICIPAL - The community's elected officials will play key roles in the movement towards self-reliance. Emphasis is placed on making the municipal sector more responsive to the community's energy needs.

Goals: 1) Increase energy awareness within the community. 2) Reduce energy demands on the community infrastructure, ie. water and waste treatment systems, streetlighting. 3) Improve energy efficiency of city buildings. 4) Provide energy supply systems for the community.

Recommendations: a) Initiate community energy education programs. b) Improve energy efficiency in buildings and operating equipment. c) Develop Municipal Solar Utility to operate community energy supply systems(see Appendix A - Municipal Solar Utilities). d) Retrofit existing dam for hydroelectric power. e) Install a wind generating system. f) Install photovoltaics on commercial and school buildings. g) Initiate a recycling program for solid waste, ie. newspaper, glass, aluminum, and so on. g) Develop a biomass waste conversion system.

SCHOOLS - We learn and develop habits at a very early age; the schools have a tremendous opportunity and responsibility to prepare our youth for the challenges concerning energy which lie before us. Since the Central school has been demolished, and no structure has been built to replace it, this report has capitalized on that opportunity to propose a shift toward smaller neighborhood oriented schools.

Goals: 1) Improve energy awareness in school age children. 2) Improve energy efficiency in existing structures. 3) Reduce distance of travel from buildings and their users.

Recommendations: a) Initiate energy awareness programs in the educational system. b) Initiate a rigorous energy conservation in the school maintenance program. c) Construct several neighborhood schools schools throughout the residential areas.

Background Analysis

In order to develop a comprehensive plan for the future, one must look at the historical trends of development which took place within the community. In order to provide a proper perspective of Marysville, a brief synopsis is offered here.

During initial analysis of Marysville, several physical characteristics were recognized which would have a tremendous bearing on any proposals which might be developed.

Since the late 1800's Marysville has been literally at the crossroads of the Midwest. The Oregon Trail passed through the town, with a major ferry crossing for the Big Blue river located at the edge of town. A Pony Express 'home station' was operated in Marysville, and is still located at the original site in the heart of the city. In the late 1800's the Union Pacific railroad came to Marysville, and now literally bisects the city.

During the horse and buggy days, when Marysville was first beginning to grow, the location of the railroad presented no major problems. With the present emphasis on vehicular transportation, there tends to be some conflict between the two systems, as two major highways cross the rail line within the city limits; US 36 running east and west, and US 77 as the north-south route. This situation is not necessarily one that can not be remedied, and as will be seen later, it also can be turned into an advantage.

The main physical characteristic of Marysville which presents the greatest problem, yet could be turned into an asset in a move toward self-reliance, is that a large portion of the city lies within the 100 year floodplain of the Big Blue River. (see Figure 28.) Roughly 202 residences and 27 commercial units are currently located in the floodplain.(66) Virtually any structure located

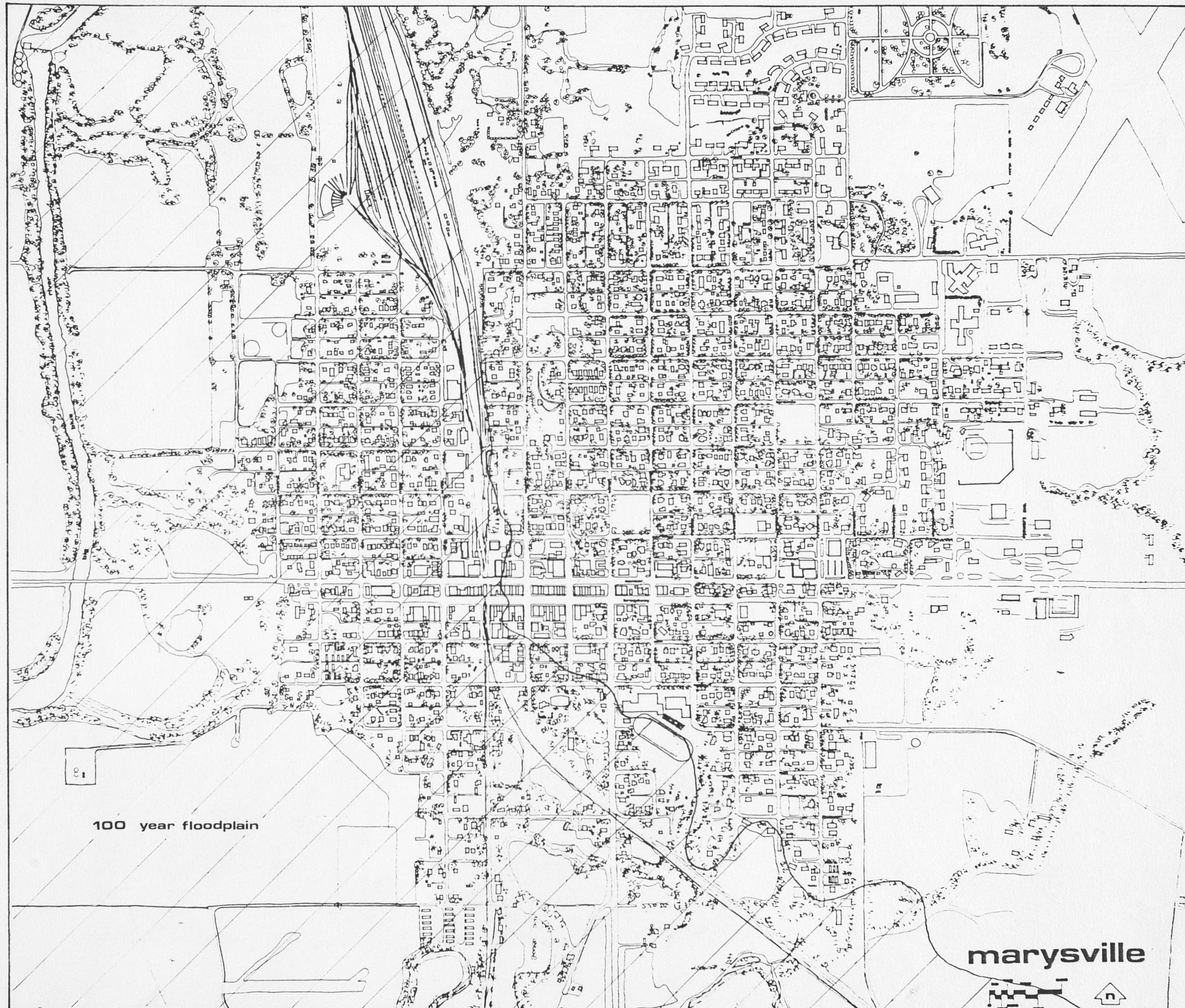

FIGURE 28. Marysville - 1982

west of the railroad tracks is in the floodplain, although the terrain varies slightly in this area and some locations are higher than others.

The flood problems are a constant source of headaches for the residents in the area. "Marysville has suffered at least 16 damaging floods since 1941. At current price levels (1977) these floods have caused a total of $1,513,000 damage. One of the most damaging floods occurred in October 1973 and caused $604,000 damage at current price levels." (67)

The flood situation has been addressed frequently by the community. The United States Army Corps of Engineers has compiled several reports on the flood problems, and proposed several alternatives. The levee plan which was designed and ready for construction in 1967 was eventually rejected by the community. ("At October, 1977 price levels, this levee would cost an estimated $4,675,000. Including operation and maintenance cost of $5,000 annually, the annual cost of the levee would be $315,000...assuming a 100-year economic life. This cost exceeds the total average annual damages by a factor of 3 to 1.") (68)

Although initially in favor of the construction of a levee in 1967, the Corps of Engineers has reversed its position (1977): "During the discussion of alternatives, the groups were informed that a flood control levee built by Corps of Engineers standards was economically infeasible by a wide margin. It was explained that infeasible projects were not recommended for authorization because such projects cannot compete successfully for Federal construction dollars when feasible projects sometimes remain unfunded for extended periods because of higher priorities."(69)

This action leaves the residents of the floodplain in a Catch-22 situation. "...flood insurance is mandatory as a condition for loan from Federal, Federally regulated, or Federally insured sources...FHA and FMHA lenders will not make loans to buildings below the 100 year flood elevation."(70)

The problems are summed up by the Corps of Engineers as follows: "1) Homeowners below the 100-year flood elevation are trapped in by the program. (Federal Flood Insurance Program) Prospective buyers cannot obtain financing to purchase a house below this level. Therefore, a floodplain homeowner cannot get his equity out of his home to purchase another home. 2) Opportunities to improve housing are limited. Homeowners west of Third Street cannot improve their property and those east of Third Street that are below the 100-year flood level cannot improve their property if they need a loan. 3) Some less expensive homes are taken out of the market for low income families due to the inability and/or reluctance of lending institutions to make loans in the flood-prone area. 4) Devaluation of property results as the number of rental and/or vacant houses increase. Floodplain homeowners lose confidence in the future of their neighborhood because neighbors are unable to improve their homes and the number of rental and/or vacant homes may increase because potential new owners cannot finance a home in the 100-year plain."(71)

The floodplain is again in the public eye, and Marysville is currently seeking Federal UDAG money to possibly assist with the construction of the levee.

This thesis proposal develops a completely new approach to the floodplain.

Floodplain Psychology

A common psychology affects people who live in floodplains, and who are confronted with the threat of flooding. Flood disasters are a signal from the environment that something is amiss in the relationship between people and their local ecosystem. If flooding is severe, it pressures people to change that relationship — and that means adjustments in their ways of thinking and behaving.

The Soldiers Grove experience indicates there are three characteristic stages of "floodplain psychology": denial, avoidance and acceptance.

Denial. The first response to flooding usually is to try to ignore it, and to deny that it is a long-term problem. Floodplain property owners tend to assume that each flood is a freak occurrence. After several, they may try to persuade themselves that something has changed to make future floods unlikely — upriver conservation practices, perhaps, or some other alteration in the watershed. Further, they are subject to "floodplain amnesia," the tendency to forget the trauma of flooding as time goes on and to remember mostly the positive experiences of the last disaster. They may remember how the community pulled together, or new friendships they formed, but forget how much mud they shoveled from their floors or the grief they felt when irreplaceable belongings were lost. Denial is a device for refusing to acknowledge a problem, and therefore, ignoring the need to do anything about it.

Avoidance. If flooding persists, its victims eventually are forced to admit that it may be a permanent problem, and that something may have to be done about it. Avoidance then sets in. Through avoidance, victims attempt to shift responsibility for action to someone or something else. Typically, communities have asked Congress and the Corps of Engineers for flood control projects, thereby shifting the cost to the national taxpayer, the effort to the federal government and the trauma of change to the ecosystem. In the avoidance stage, floodplain residents admit they have a problem, but attempt to avoid direct responsibility for solving it.

Acceptance. When avoidance does not work (the federal government will not fund a project; a structure is killed by court action; or a structure is built, but fails), floodplain residents face a critical choice. They can regress to denial; they can choose to do nothing, hoping to withstand future floods; or, they can choose to take the responsibility of change upon themselves. In any case, they come under pressure to mature in their relationship with the river. The only paths forward are to consciously accept the liability for remaining in the floodplain, or to consciously and deliberately get out of the river's course.

Soldiers Grove has experienced all three stages. The villagers denied that flooding was a problem until their first major disaster in 1935. Then they practiced avoidance, asking Congress to assume responsibility for flood control. When the Kickapoo Valley dam project was halted in 1975, the villagers moved into the acceptance stage, proposing a solution (relocation) in which they would take control of the flooding problem and assume as much as possible of the burden for ending their history of flood disasters.

At which stage are the people in your community?

FIGURE 29.

Northeast corner at 5th and Jenkins Streets.

Northwest corner at 5th and Jenkins Streets.

FIGURE 30. Marysville - 1973 Flood

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66. Feasibility Report on Flood Problems in the Vicinity of Marysville, Kansas, United States Army Corps of Engineers, Kansas City District. January 1979. pp.15
60. Ibid., pp.10
61. Ibid., pp.14
62. Ibid., Appendix 3, A-5
63. Ibid., Appendix 2, C-1
64. Ibid., pp.11

Design Proposals

Land Use

It became apparent from the start of this project that the issue of the floodplain would have to be addressed if any proposals were to have a major impact on the energy situation in Marysville.

Recommendations are made in this report which would require physical improvements of structures beyond that of no-cost and low cost measures. Yet, as seen earlier, the homeowners located in the floodplain plain are not be able to make any significant improvements to their structures that would require loans to complete. Therefore they are bound into a situation where they can not effectively do anything about the constantly rising price of energy. In attempting to make recommendations to improve the energy situation in Marysville, it does not make sense to only address certain sections of the community and let a large portion of the community remain untouched and in continuing economic strife.

Following the logic of self-reliance, it is the recommendation of this report to accept several facts: 1) the Big Blue river has flooded its banks on a regular basis since the first settlers arrived in Marysville; 2) the Big Blue river will continue to flood its banks long after the Marysville residents located in the flood plain are finally washed out; 3) the Corps of Engineers will not back any proposal to construct a levee system around the area; 4) it is highly unlikely that the Federal Government will release UDAG funds to for any such levee proposal; and 5) unless a positive approach toward the floodplain is taken in the near future, the situation will only continue to deteriorate and the economic stability of those residents affected will continue to be eroded as well as that of the community.

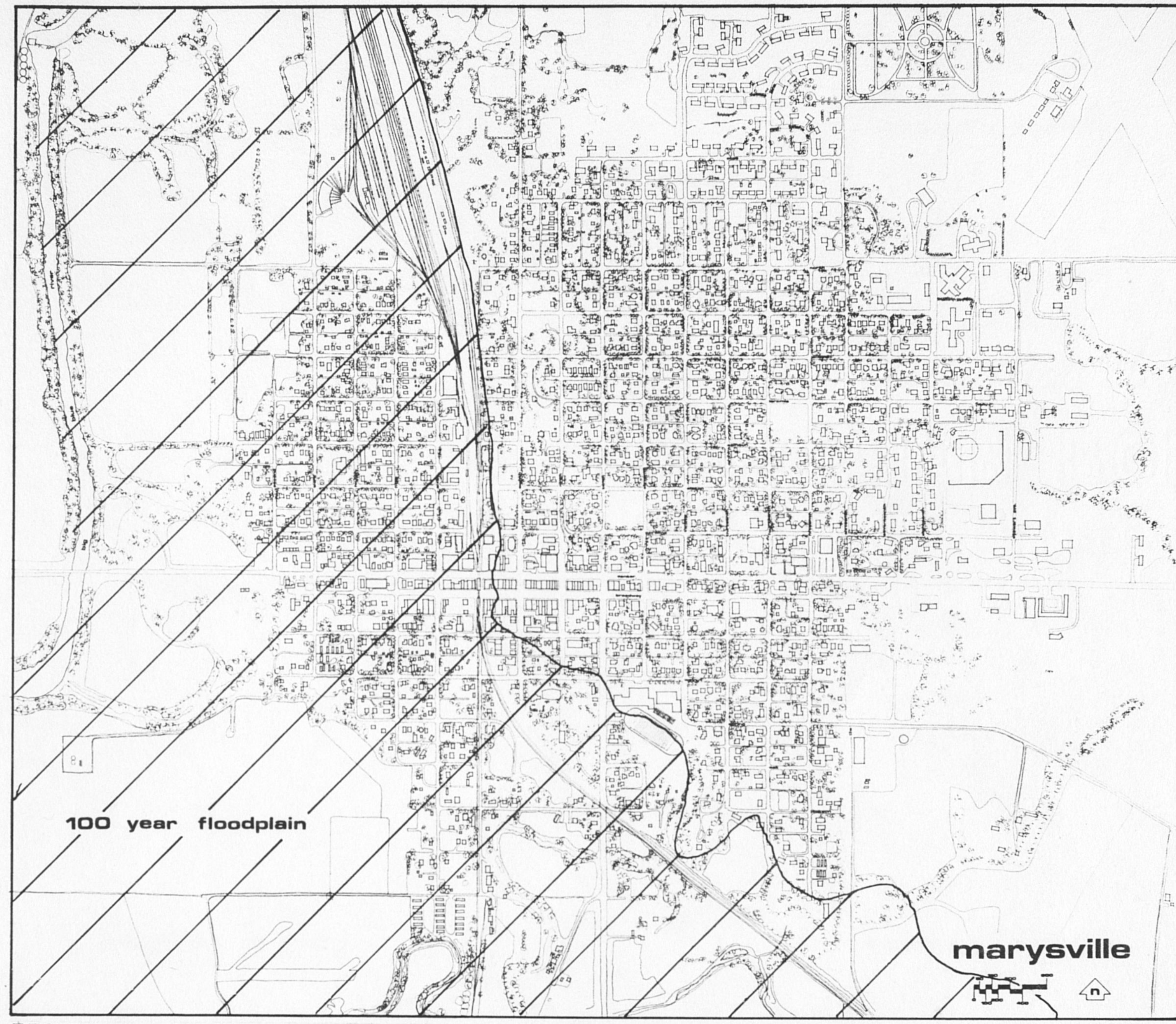

FIGURE 31. Marysville - 1982

Therefore, it is recommended that the residents and businesses which are located in the floodplain be relocated, letting Mother Nature reclaim that which she so adamantly insists on having. At first this may sound like an impossible concept to achieve, but as one begins to unfold the pure and simple logic of the situation it is the only sound alternative Marysville has.

There is a precedent for just such a move, Soldiers Grove, Wisconsin faced a very similar situation. Their entire business district was located in a floodplain, and they literally moved the entire downtown to higher ground.(72)

Moving homes from one location to another is not a difficult task. In some communities it is almost a daily occurrence. There are a substantial number of homes located in the floodplain which are in fairly good condition; it is a shame to see them continue to come under constant attack by nature and its forces.

It is realized that such a move would not come without much emotional stress, but how much stress is there each time a flood hits? How much stress is there each time a major storm moves into the area and the threat of another flood arises and has the residents wondering if they are really going to get it this time?

72. William S. Becker. Come Rain, Come Shine: A Case Study of a Relocation Project at Soldiers Grove, Wisconsin. Bureau of Water Regulation and Zoning, Wisconsin Department of Natural Resources, Madison, Wisconsin.

It is also realized that such a move would be costly. Yet since records have been kept (1941 t0 1977) a total of $1,513,000 in damages has been incurred. With no action, damages will continue to mount up, and be a constant source of economic blight to the entire community. How much will it cost to do nothing?

The proposals developed in this report illustrate what the floodplain might look like if it was converted into a green park composed of intensively cultivated fields, shelterbelts and energy "farms". This vision is intended to illustrate the direction of change. As such it is a conceptual image not a literal design proposal. It is realized that as the problem is dealt with in the community, that the actual transformation would be centered around a vision of what the residents and the community feel should take place. Indeed, it is felt that by change being directed from within the community, actual development would be more incremental, much richer, more diverse than what appears in the proposals illustrated.

To illustrate the expected divergence of ideas on this issue, what appears in the proposal presented here is almost a complete evacuation of the floodplain, with isolated households remaining as 'caretakers' for the proposed community farms and gardens. In actuality, there may be pockets of structures which can be flood-proofed, and these households would remain located on knolls interwoven with community gardens, orchards, and woodlot/shelterbelts.

There might even be new development taking place on these protected knolls, or possibly the relocation some of the residences from lower flood prone areas. The range of possible solutions to the floodplain problem is limited only by the imagination of the citizens of the community.

The relocation process recommended here is to occur over an extended period of time. A phased a time schedule could be established to provide for a timely transition. Such a plan should maximize opportunities for residents to freely choose how best to respond to circumstances as they arise. The undertaking of such a relocation project would require a community-wide effort, and the local government would play a key role in its success.

Financing portions of the transition could take place by establishing a "Municipal Corporation" (see TOOLS -FINANCIAL pp. 66), which would provide incentives and assistance for those participating in the program. The city could begin "banking" vacant lots and developable sites with special economic advantages for those relocating out of the floodplain before (preferably) or after the next flood.

The concept of relocating the floodplain residents and businesses raises many questions, many of which will be addressed as this proposal unfolds; others will have to be worked out within the community itself. The proposal developed here is intended to confront the floodplain issue and provide one alternative. Within this alternative, the directions any particular development could take place are virtually limitless.

It is not the intention that a proposal such as this overshadow the greater concern which is energy self reliance. To the contrary, it is hoped that this proposal for the floodplain will act as a catalyst which will help Marysville move toward self-reliance in all areas such as energy, food production, manufacturing, and other community support services.

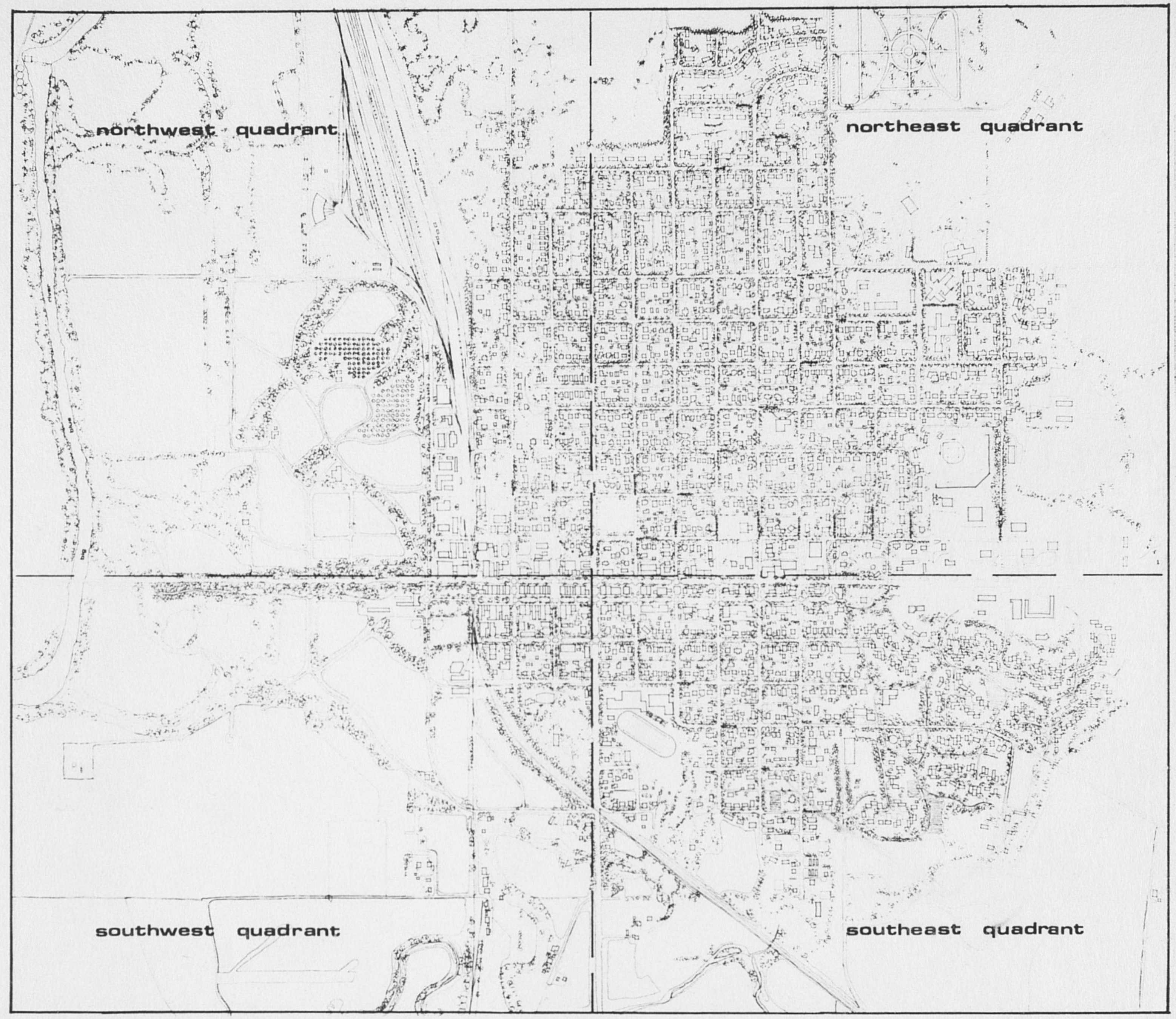

FIGURE 32. Marysville - Proposed, Year - 2002

Floodplain

As residents are relocated out of the floodplain, it should gradually shift toward a food, fiber, and shelterbelt system. This could happen in a variety of ways.

Community gardens could be established as co-ops, or plots could be rented on an annual basis. Community crop production and community orchards could be maintained by establishing caretakers for the area and retaining several of the dwellings within the floodplain (elevated and flood-proofed).

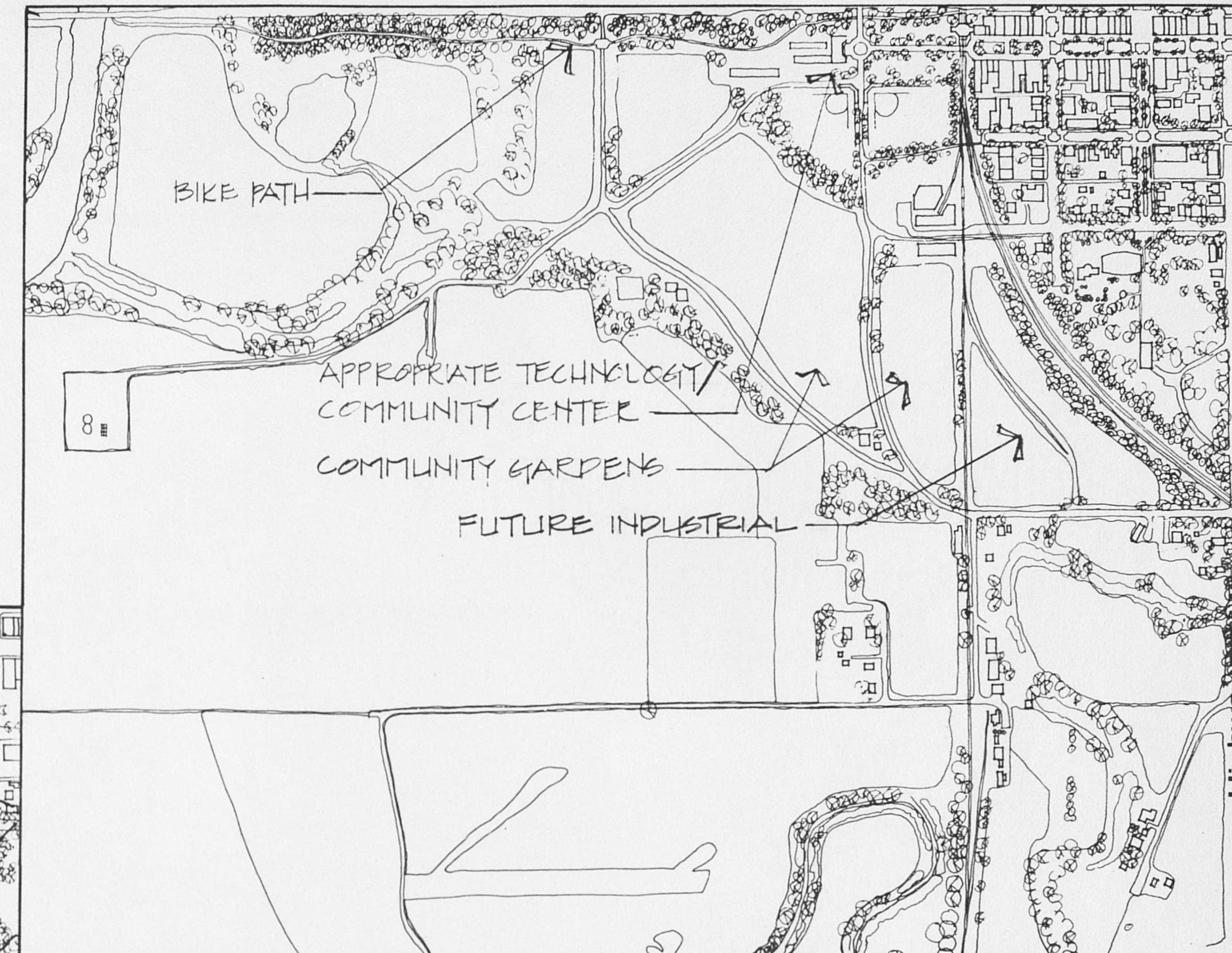

FIGURE 34. Proposed Southwest Quadrant - Year 2002

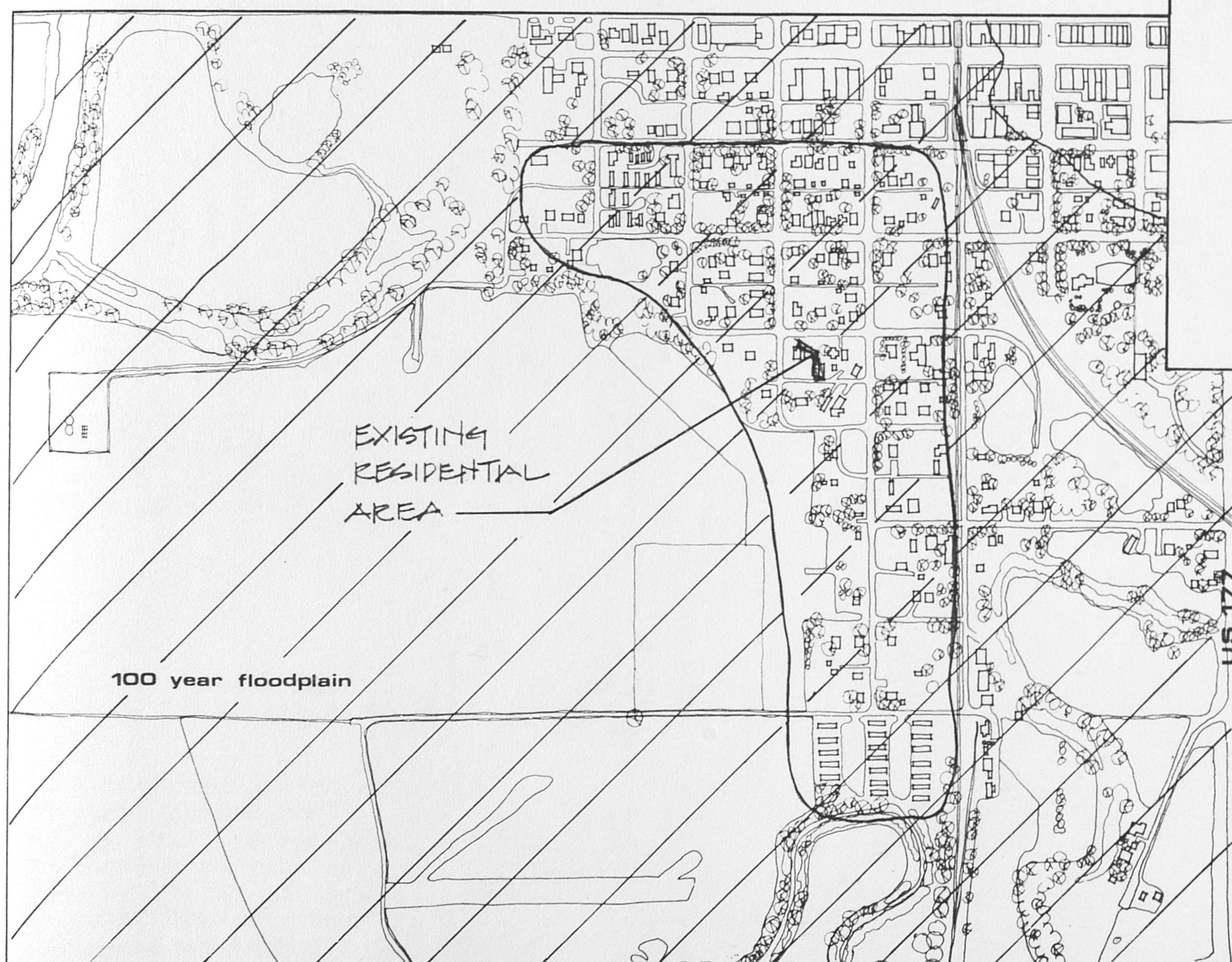

FIGURE 33. Southwest Quadrant - 1982

Community food production would reduce the reliance on outside sources for fresh fruits and vegetables, and at the same time reduce the energy consumed in production and transportation. (The average food molecule travels 1,300 miles before it is consumed).(73)

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73. The Cornucopia Project. Empty Breadbasket? The Comming Challenge to America's Food Supply and What Can We Do About It. Rodale Press; Emmaus, Pa. 1981.

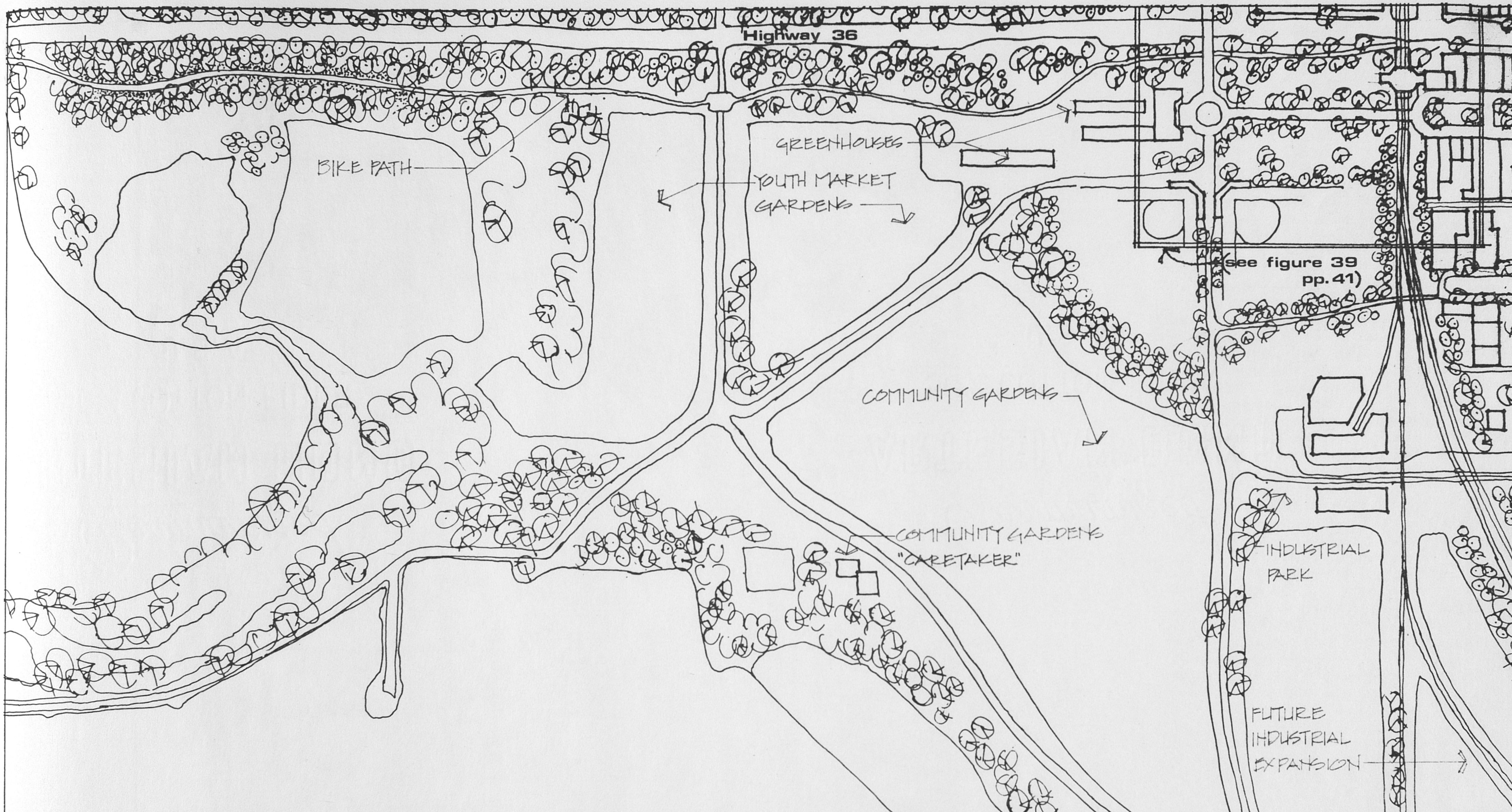

FIGURE 35. Proposed Southwest Quadrant - Year 2002

A proposed Appropriate technology demonstration building would be built to house a guidance and learning center for the community.The building would serve as a solar demonstration model and classes and workshops could be developed to assist the community in the transition towards self-reliance. Community greenhouses would be an integral part of this scheme to provide year-round food production capabilities.

As part of this program, youth market gardens would be established to introduce the concepts of self-reliance at an early age. This could be linked to programs within the traditional school system; and it could also provide jobs for youth and assist in the development of a strong `work ethic'.

As part of an overall program for year-round food production, a canning and storage system should be established. This operation could perhaps be run by the elderly and coordinated with the youth market garden concept as a shared learning experience. Surplus and profits from any programs could be used to provide assistance for the needy through a community food bank.

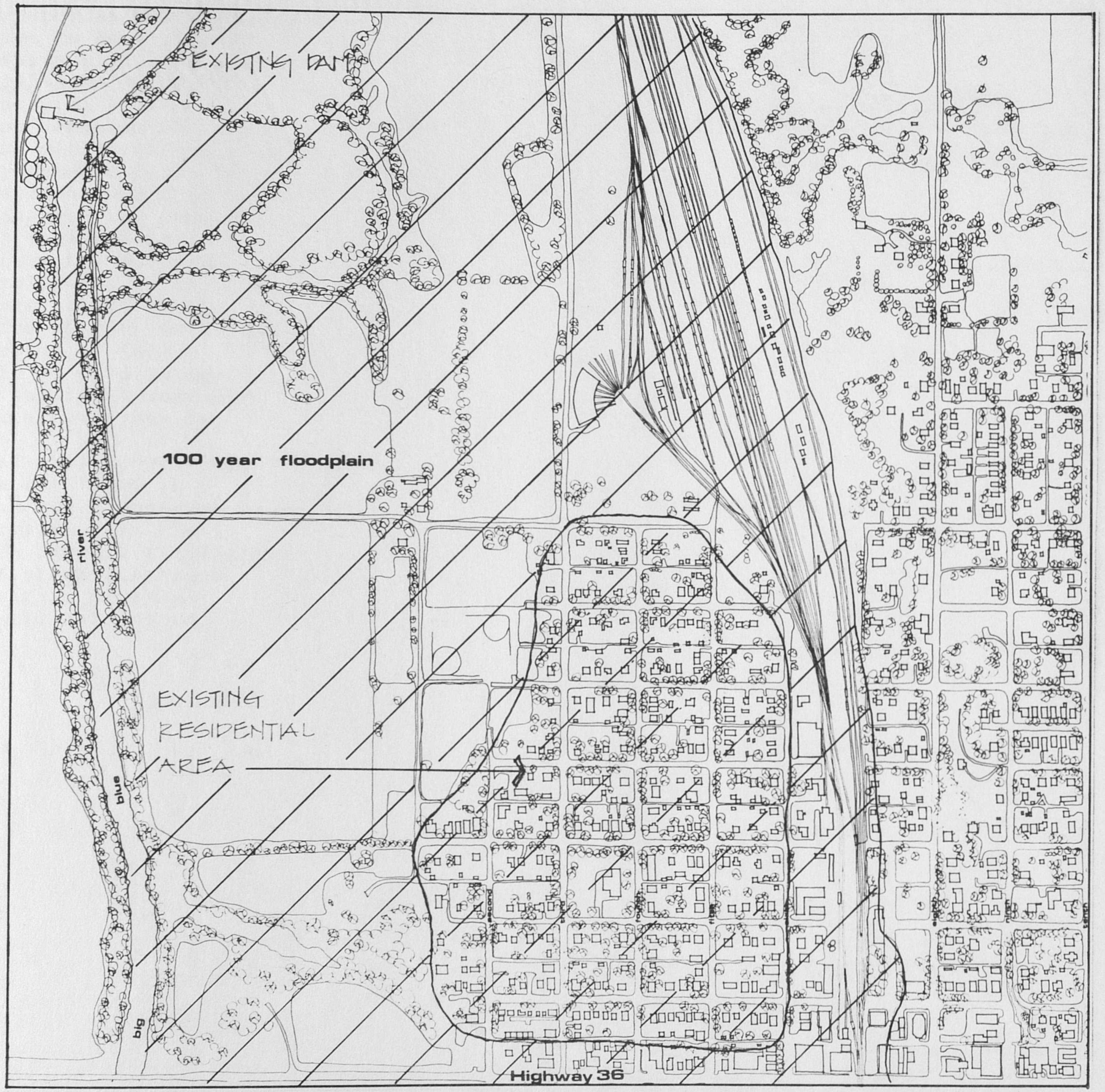

FIGURE 36. Northwest Quadrant - 1982

With active community support of programs such as the "youth market gardens" the young people in Marysville would be able to see a future in the community. The community as a whole could begin to revision Marysville as a producer of wealth and of goods, not just a consumer of products produced in far-off distant lands.

With the emergence of such a system of food production/ preservation, a permanent year-round farmers market is proposed for the community and is located adjacent to the floodplain and railroad line (see Figure 37, pp. 39; and Figure 51, pp. 50). This would not only provide a place to distribute food produced in the floodplain, but would also provide a marketplace for area farmers, and encourage them to diversify their operations. There would be social benefits from implementing these programs as well. It would provide a sense of `community gathering', historically a main function of communities.

Because of the proximity to the downtown and proposals for renewed life in that district, as well as that of a proposed industrial park development nearby, a section of the floodplain is devoted to a community park and recreation area. This is in conjunction with the Appropriate Technology Community Center. The displaced ball diamonds (currently located in the northwest sector of the floodplain) would be relocated to this area as part of this scheme. Perhaps this would be the most logical site to provide a permanent `home' for the newly acquired bronze Pony Express statue. It could express a common bond between the `pioneer spirit' of the founding fathers of Marysville, and a newly found `pioneer spirit' inspiring Marysville's move toward self-reliance. In essence the pioneers were breaking new ground for future generations, the same as Marysville would be doing in a move toward self-reliance.

As in proposals for other sections of the community, circulation systems are pedestrian and bicycle oriented. It is felt that in the future, as the oil sources continue to be depleted, petroleum products will escalate to costs which will make vehicular travel occur only as a necessity. It is felt that communities should prepare for the situation and have circulation systems in place which will accommodate the shift in modes of travel throughout the community.

A woodlot shelterbelt is incorporated into the proposed floodplain development in an effort to control winter winds in the northwest sector of the community. Through management of this shelterbelt, it is also intended that a steady supply of wood for community heating purposes be provided.

Additional shelterbelts are proposed to be developed in locations which would increase wind production potential for the community.(74) Some of these areas are located on privately owned land, and some type of lease arrangement would have to be developed.

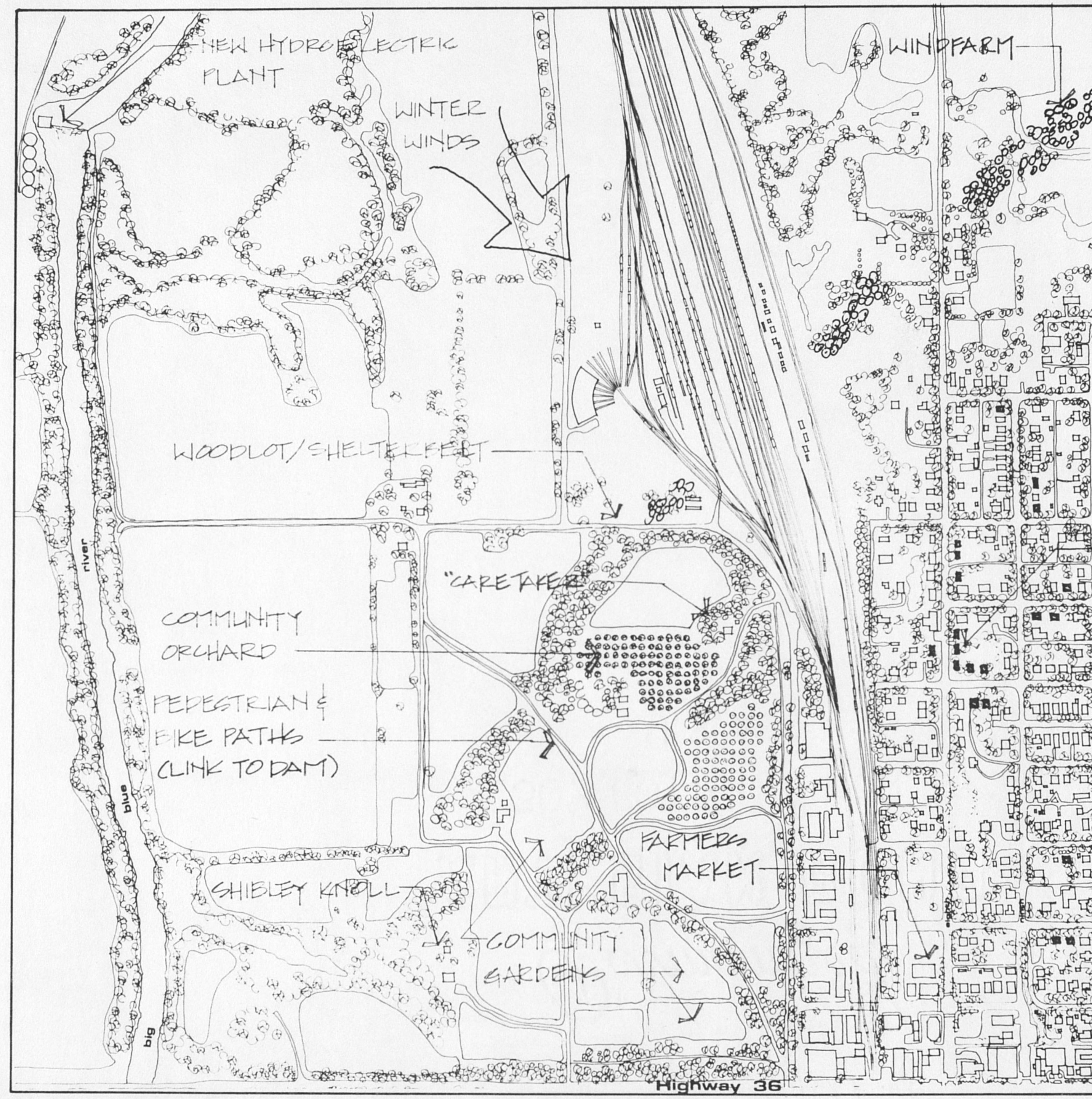

FIGURE 37. Proposed Northwest Quadrant - Year 2002

74. Lisa Foreman, "A Wind Study of Marysville, Kansas", (Undergraduate Thesis, Kansas State University, Spring 1983), unpublished.

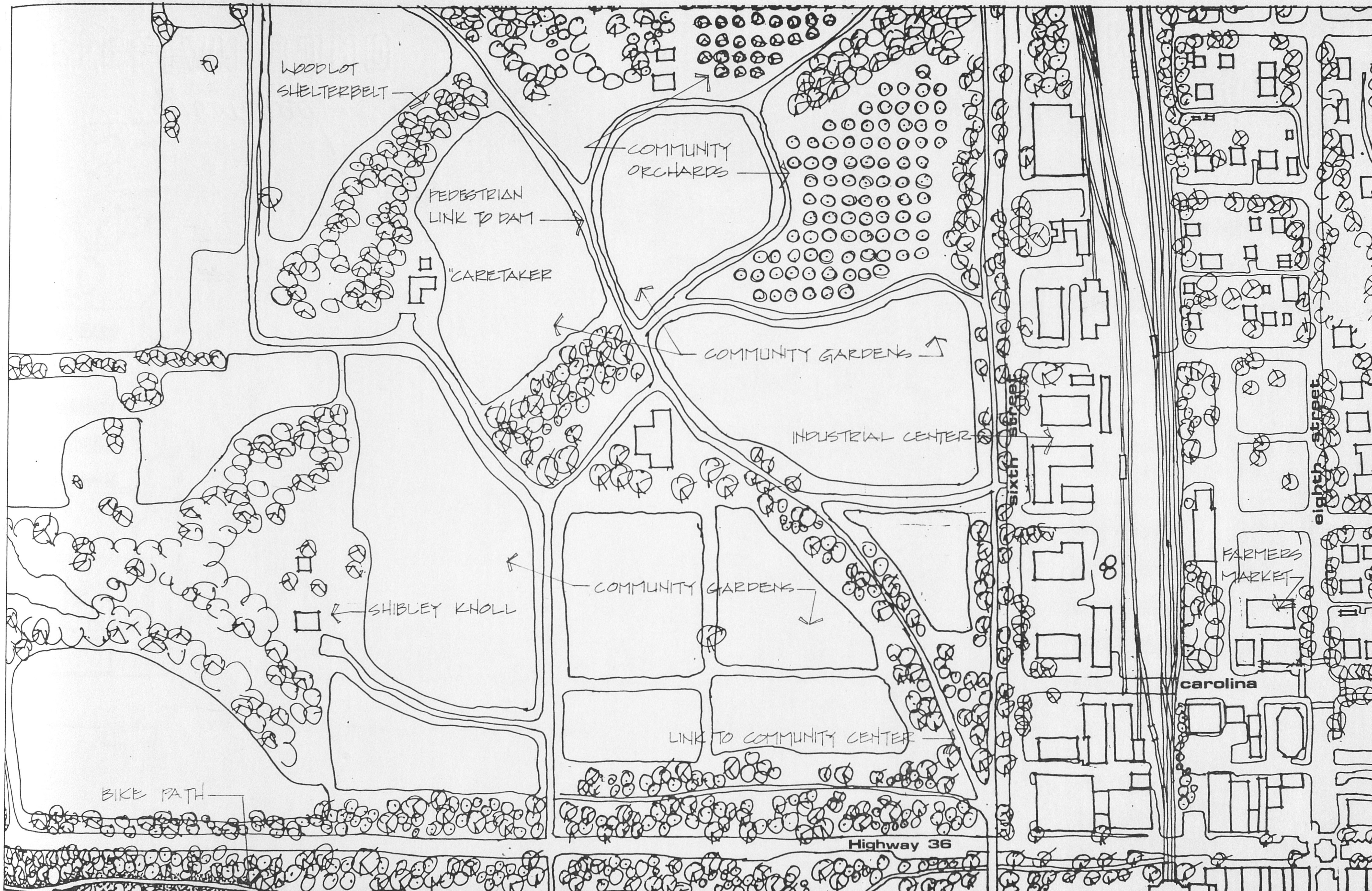

FIGURE 38. Proposed Northwest Quadrant - Year 2002

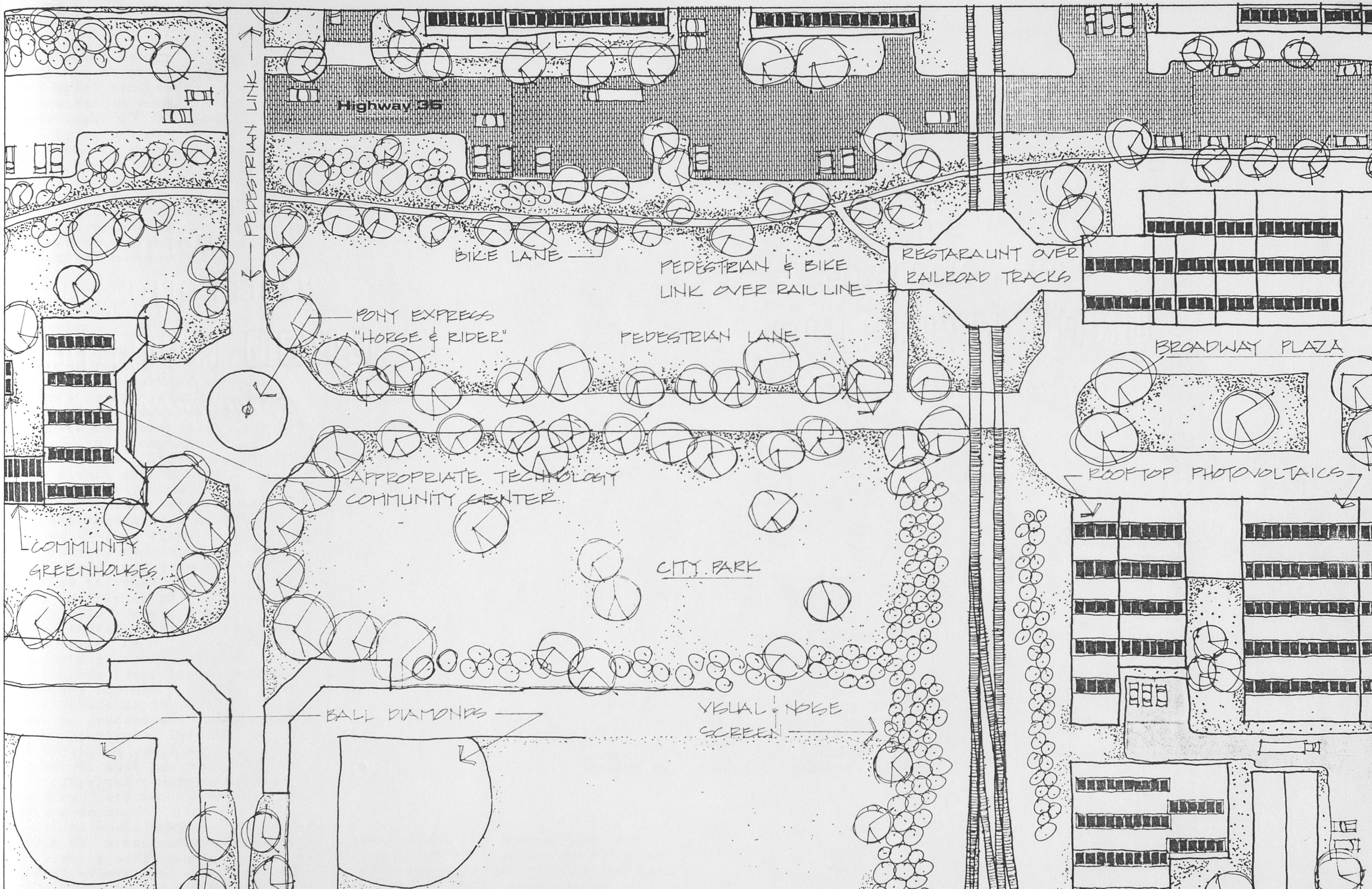

FIGURE 39. Proposed Southwest Quadrant - Year 2002

Housing

A shift away from the floodplain as an area of residential settlement is recommended to occur in two directions. 1) The relocation of existing structures, which have been found to be economically justifiable in moving, should occur largely through in-fill in existing neighborhoods. 2) A new housing development is proposed in the southeast sector of Marysville to accommodate the majority of new residential construction.

Relocation

With care taken to keep relocated residential neighborhoods intact (to the extent possible), identify vacant lots and groups of vacant lots throughout the community and undertake an in-fill approach to relocating neighborhoods. There are several areas within established neighborhoods (out of the floodplain) that have several adjacent vacant lots (Figure 37, 43, and 45); in these areas groups of relocated residents who have established long term friendships and wish to remain close together would be able do so. In some cases, within newly established subdivisions, entire blocks could be relocated as a unit if the residents desired to do so. Initial lot identification was conducted through a visual surveillance of the areas. In order to proceed with any specific design proposals, further investigation would need to be completed, such as, ownership of land, physical characteristics of the site, location of utility hook-ups and so on.

Care would have to be taken to insure the architectural integrity of existing neighborhoods. At the time of relocation, the dwelling units could be renovated and energy conservation measures introduced, (whereas prior to relocation, no renovation is possible). To insure that the units are adequately renovated to meet energy standards (in the case of rental units especially), requirements could be linked to funding sources providing relocation assistance.

FIGURE 40. Northeast Quadrant 1982

New Housing

It is assumed that not all structures located in the floodplain will be assessed favorably for relocation (see "Concentration of Housing in Need of Repair", Marysville Energy Study, pp.69). In these cases, new housing will need to be built. This is proposed to take place in three forms.

a) new housing to be located in established in existing subdivisions. (see Figure 42.)

b) new housing subdivision to be established in the south-east quadrant of the city. (see Figure 47, pp.47; and Figure 49, pp.48)

c) renovation of second story space in the downtown area. (see Figure 55, pp.53)

FIGURE 41. Existing Residential - Year 2002

FIGURE 42. Proposed Northeast Quadrant - Year 2002

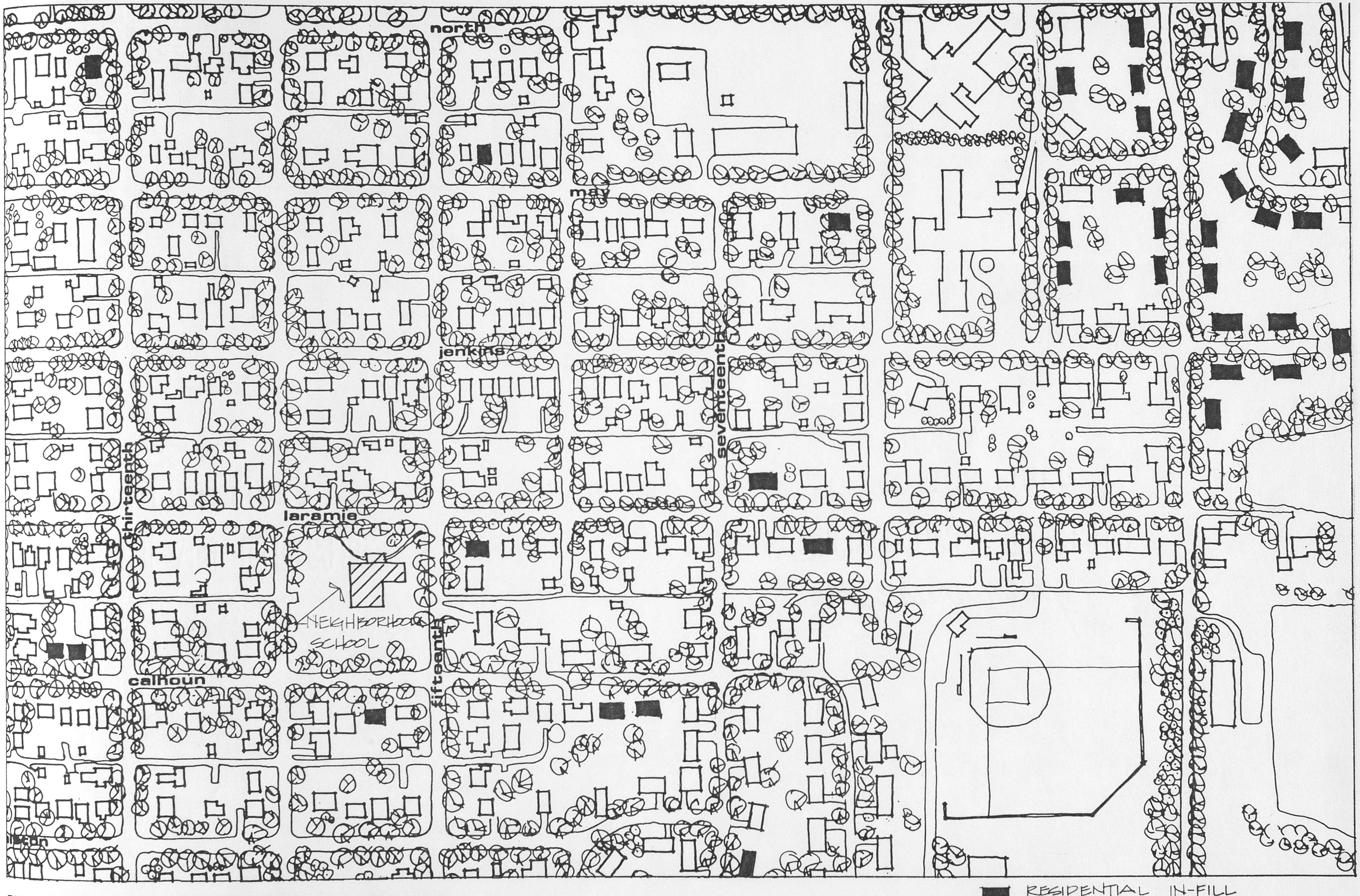

FIGURE 43. Proposed Northeast Quadrant - Year 2002

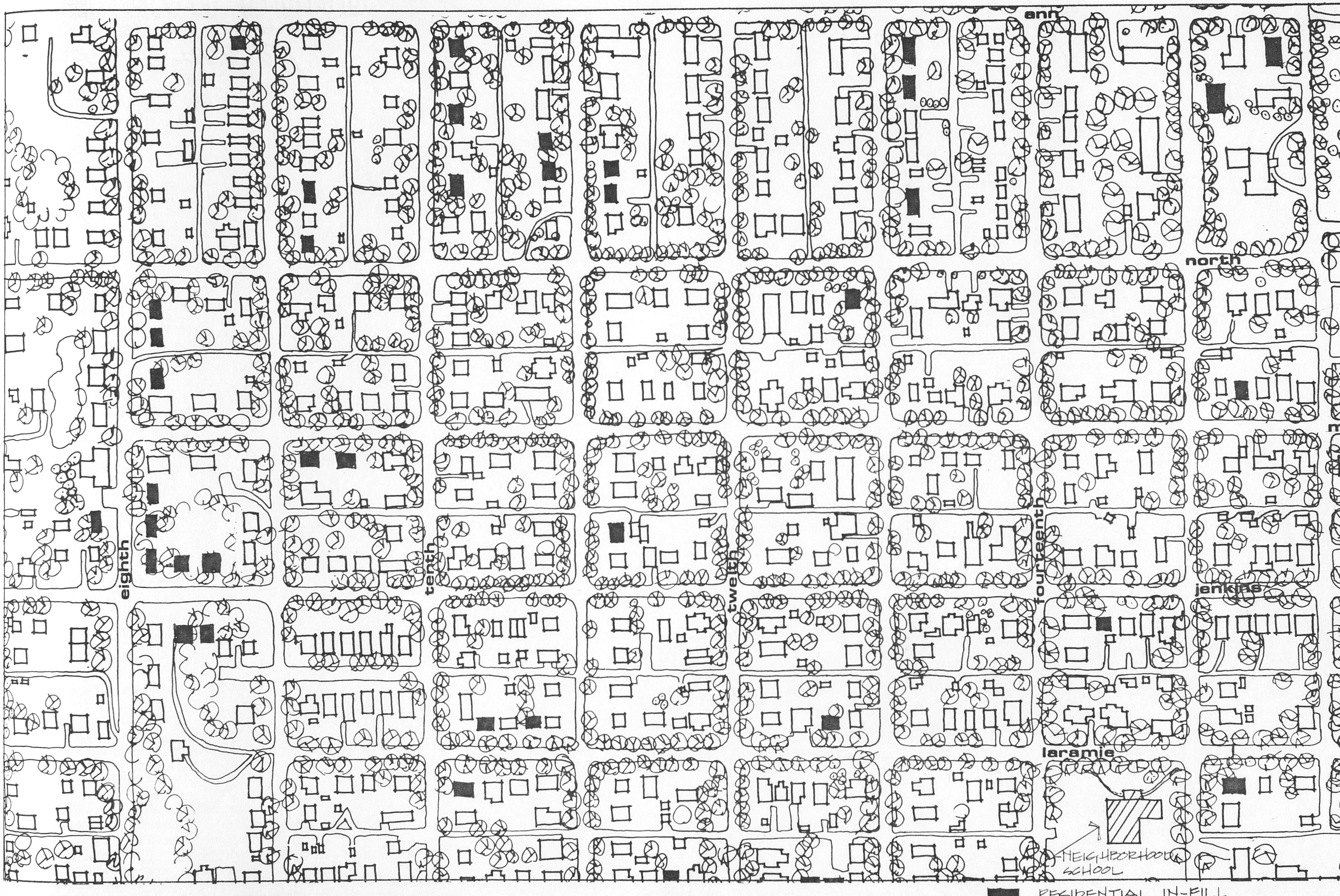

FIGURE 44. Proposed Northeast Quadrant - Year 2002

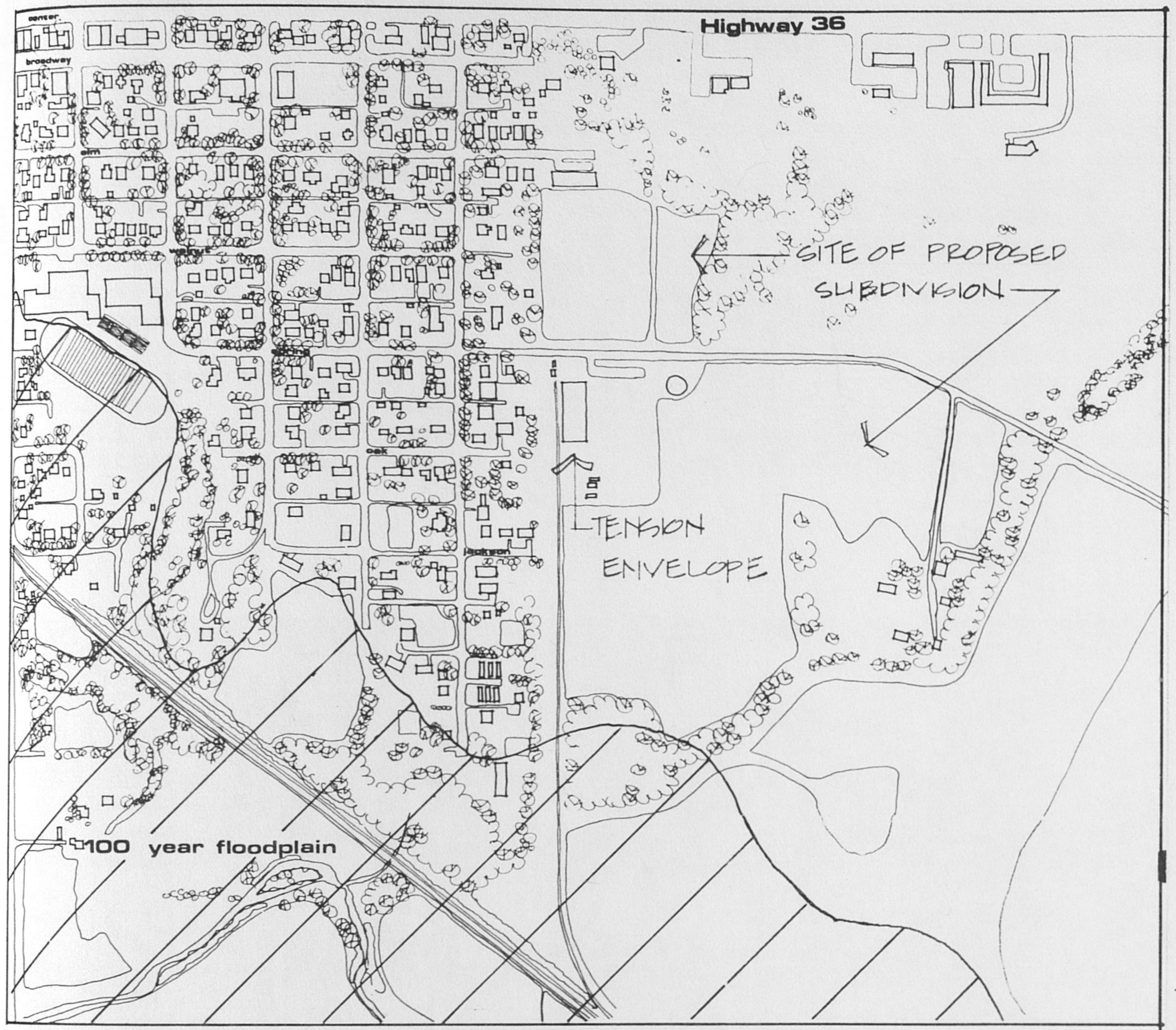

FIGURE 45. Southeast Quadrant - 1982

Housing Guidelines

All housing development should be developed according to the following guidelines:

1) Existing housing stock should be upgraded to appropriate levels of energy conservation standards. Where possible, implement such measures as solar greenhouses; sun-spaces; solar water heaters; solar wall heaters (Trombe wall, hot air collectors, water walls etc.) Building codes should be developed that would cover renovation of existing structures, and require certain levels of energy conservation.

2) Relocated dwelling units should be renovated to certain standards established by the community, and implemented within the same measures as recommended for existing housing stock.

3) New housing should be constructed to be as self-sufficient as possible. This should be accomplished by the adoption of a set of building codes which would require certain energy conservation measures such as: superinsulated (R-40 - R-60) ceilings and walls; required solar water heating; energy efficiency standards for appliances; low flush water closets to reduce demand on municipal waste treatment, and separation of 'grey' water in the plumbing system; triple glazed windows for north, east, and west windows; minimum exposure for glazing on the north face of the structure; maximum exposure for glazing on the south face of the structure a certain percentage of heating required to accomplished by passive solar features; and other requirements as deemed necessary to achieve energy efficient housing.

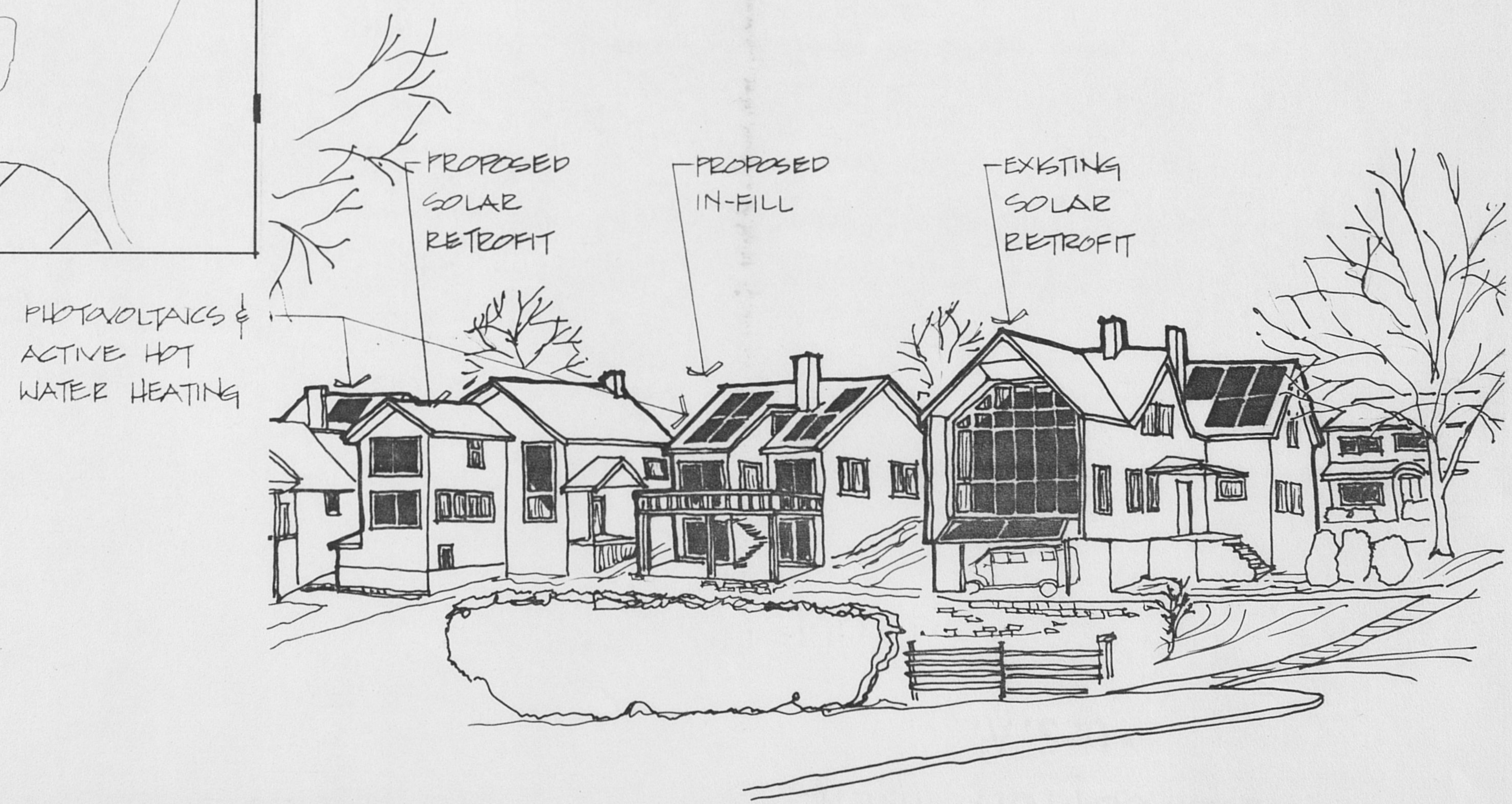

FIGURE 46. Proposed Residential In-fill

(Building codes can be written to allow for flexibility in design and construction. The main intention is to ensure energy efficient building practices. Such codes are effective, affordable, legally enforceable and have been tested in court [see Davis, California].) (75)

4) New subdivision regulations should be developed to ensure that developments are pedestrian oriented, and that emphasis is placed on pedestrian and bicycle circulation. The re-establishment of small neighborhood shops should be encouraged and included in the subdivision regulations. (At one time there were 22 neighborhood grocery stores located in Marysville.) Similar regulations should be developed for existing neighborhoods. It is the intention of these proposals to bring life back into the neighborhoods through locally owned and operated small businesses. It is not the intention to encourage a `Quick-Rip' on every corner. These nationally owned chains drain the local economy and provide very little in return. Ordinances can be passed which allow only owner-operated businesses to develop.

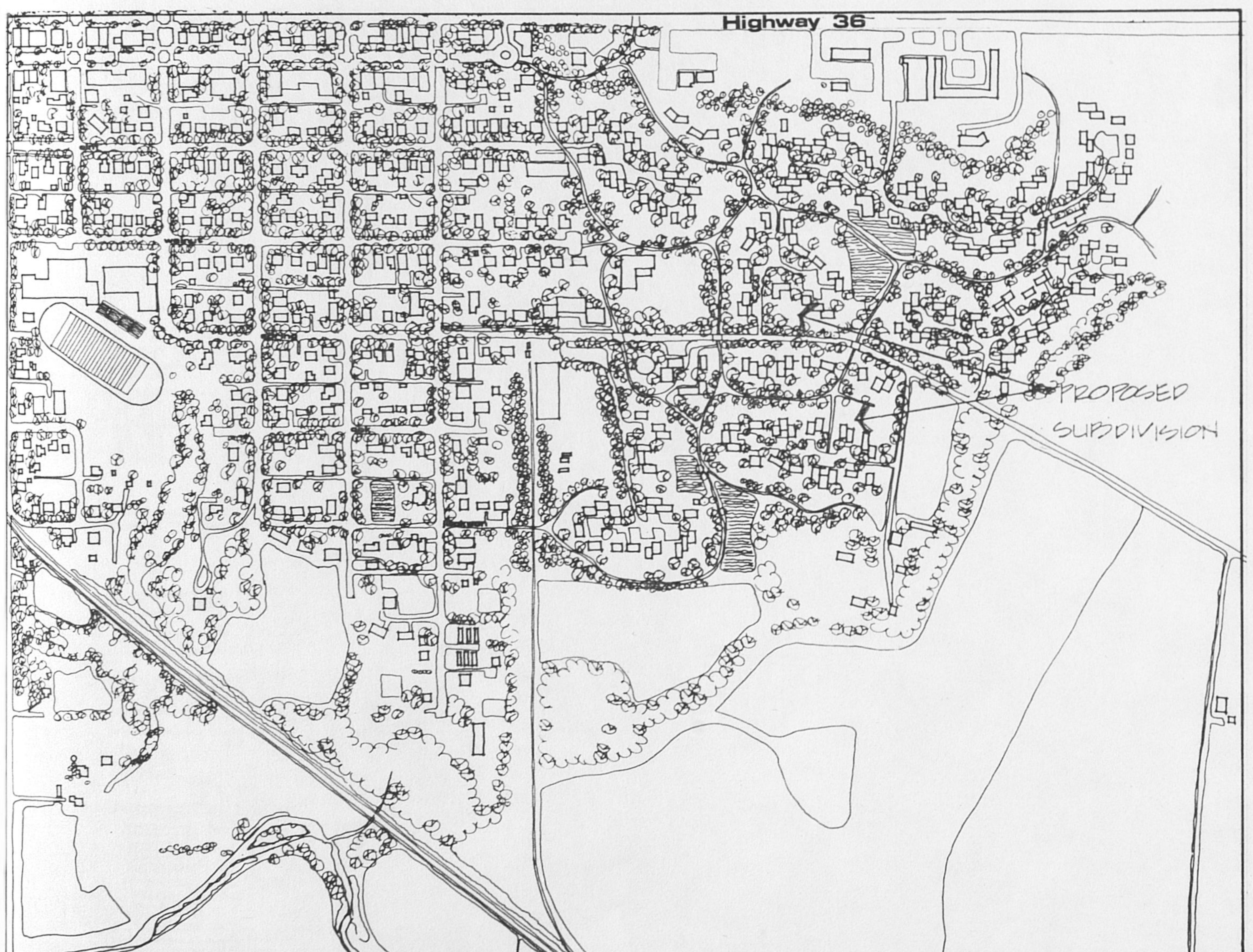

FIGURE 47. Proposed Southeast Quadrant - Year 2002

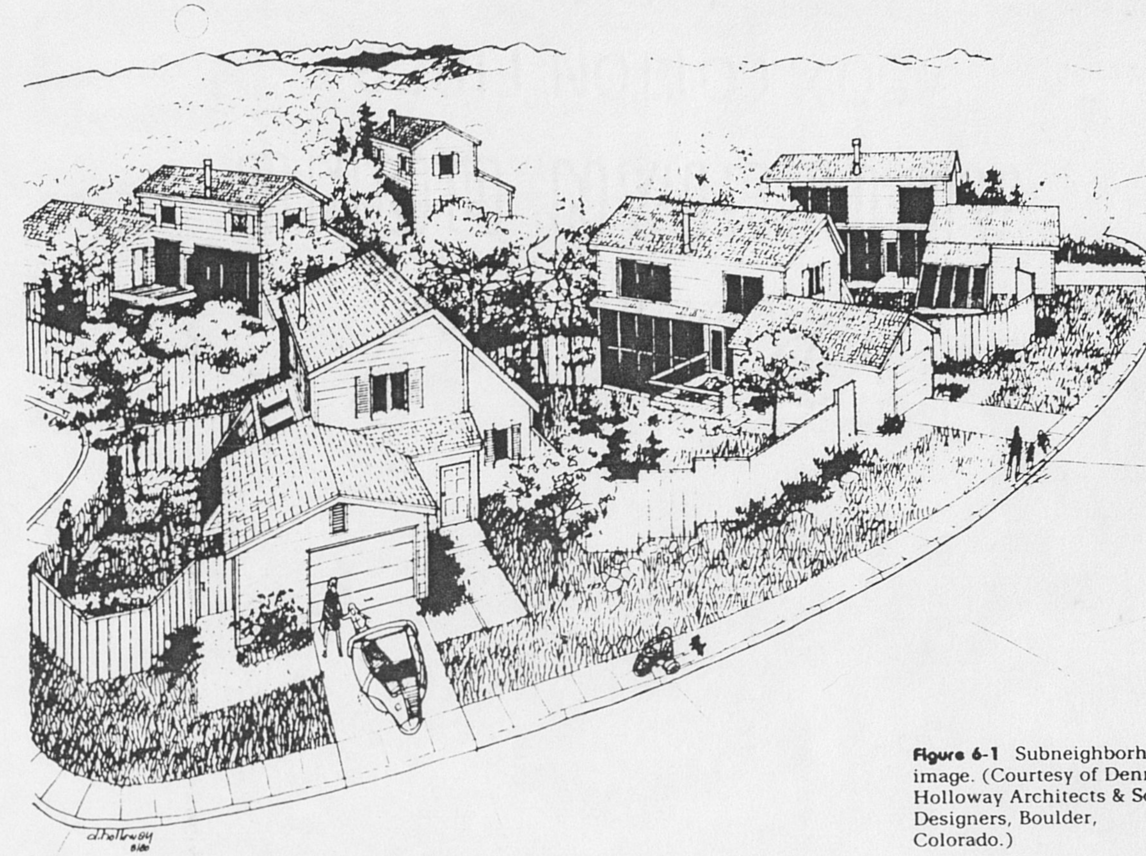

Figure 6-1 Subneighborhood image. (Courtesy of Dennis R. Holloway Architects & Solar Designers, Boulder, Colorado.)

FIGURE 48. Solar Subdivision Image

5) Solar access ordinances and covenants should be passed to ensure that solar investment is protected. These are laws which protect an individual land owners right to access to the sun. (for examples, see Appendix B: Solar Ordinances)

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75. City of Davis, California. "Energy Conservation Performance Standards". City of Davis, California.

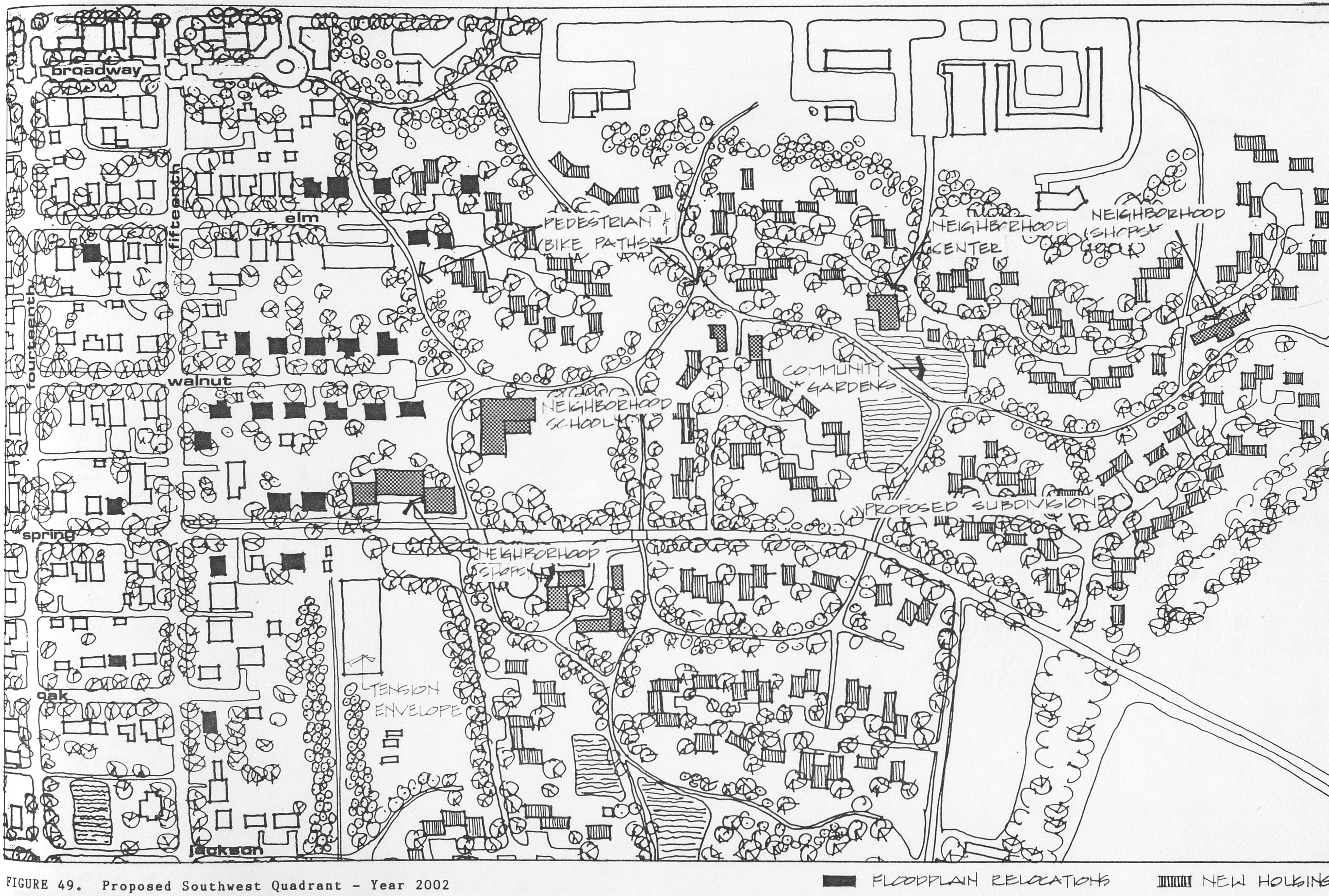

FIGURE 49. Proposed Southwest Quadrant - Year 2002

It is felt that the central business district is the heart of any community. In recent years, the economic and social function of downtown areas in many communities has deteriorated. The signs are all around and very obvious: entire blocks of second story space which at one time were full of life, are vacant; vacant shops on the first floor are boarded up; strip development with its discount stores and fast food restaurants crop up on the city's edge; civic events take place in other parts of the community.

Some communities feel the solution is to tear down the old and replace sections of the downtown with the modern phenomenon know as the 'enclosed mall'. Manhattan, Kansas has opted for such a proposal.

Other communities recognize the historical significance of the downtown and choose to renovate and restore buildings to their original condition, and develop alternate proposals to revitalize the downtown. Galesburg, Illinois is a successful example of this approach.

In addition to preserving buildings for historical purposes, there are other reasons worth studying when considering downtown re-development. There was a great deal of logic involved in the location and construction of older buildings. Many were built at a time when energy supply systems were not as available and convenient as they are today. Construction methods (for example, the use of massive masonry walls) were employed to provide a "time-lag" and slow down heat transmission in the summer.

Two facts should be remembered by those contemplating any development; nothing remains new beyond the day it is built, and once a building is demolished it is lost forever.

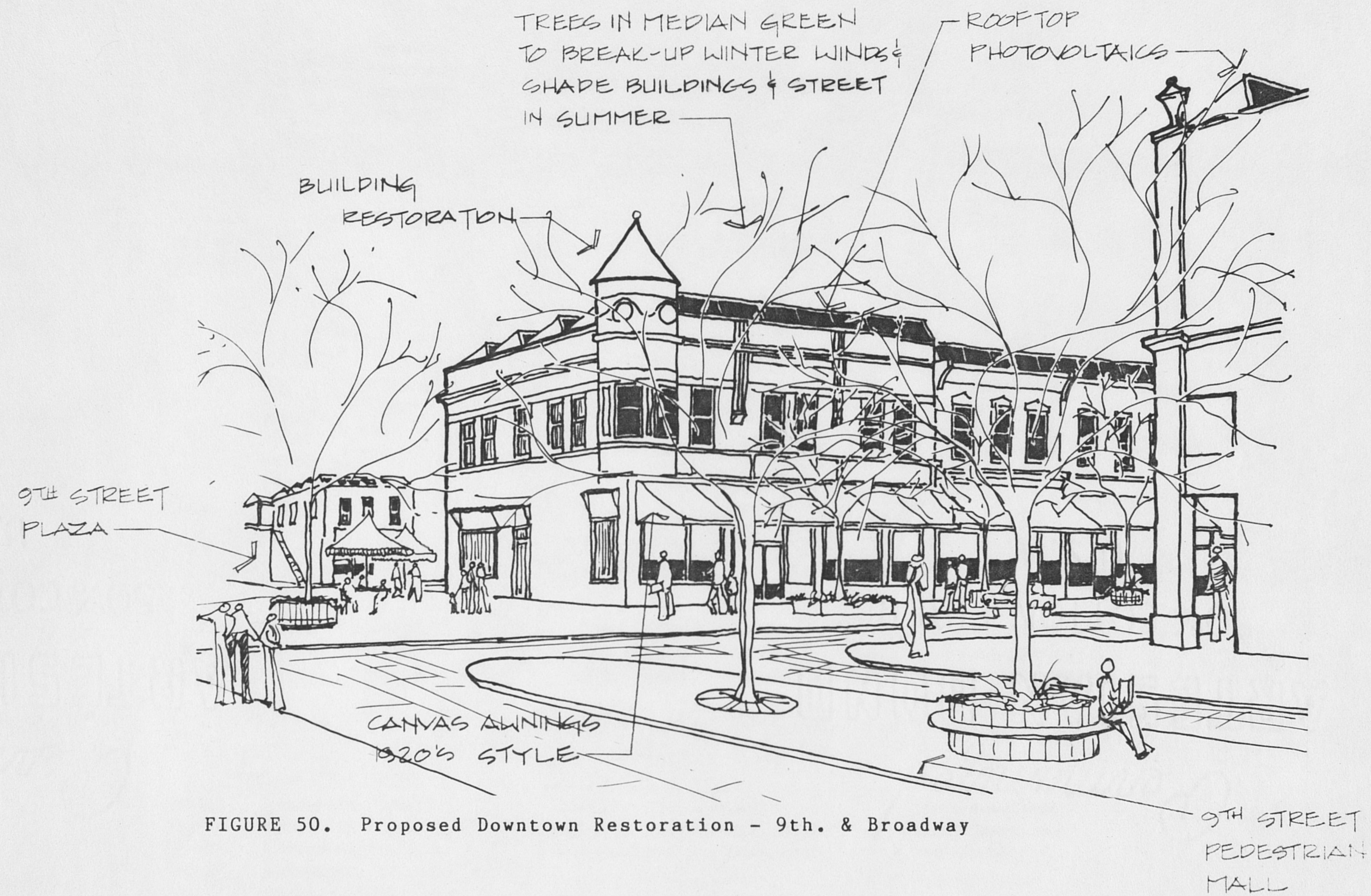

FIGURE 50. Proposed Downtown Restoration - 9th. & Broadway

It is well known that Marysville is rich in history, and its buildings are an integral part of that history. The proposals presented here attempt to capture that spirit and expand upon it.

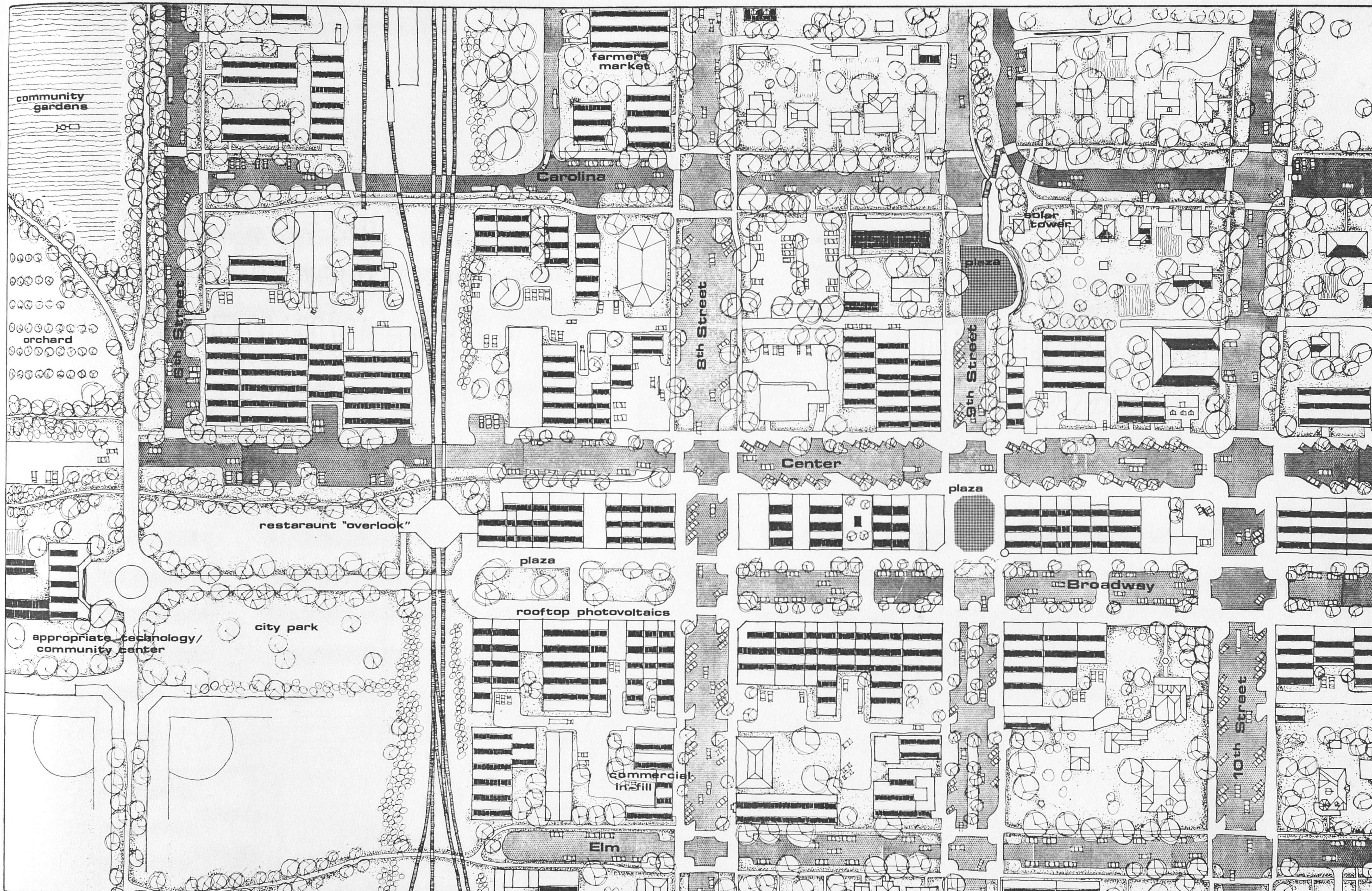

FIGURE 51. Central Business District - Year 2002

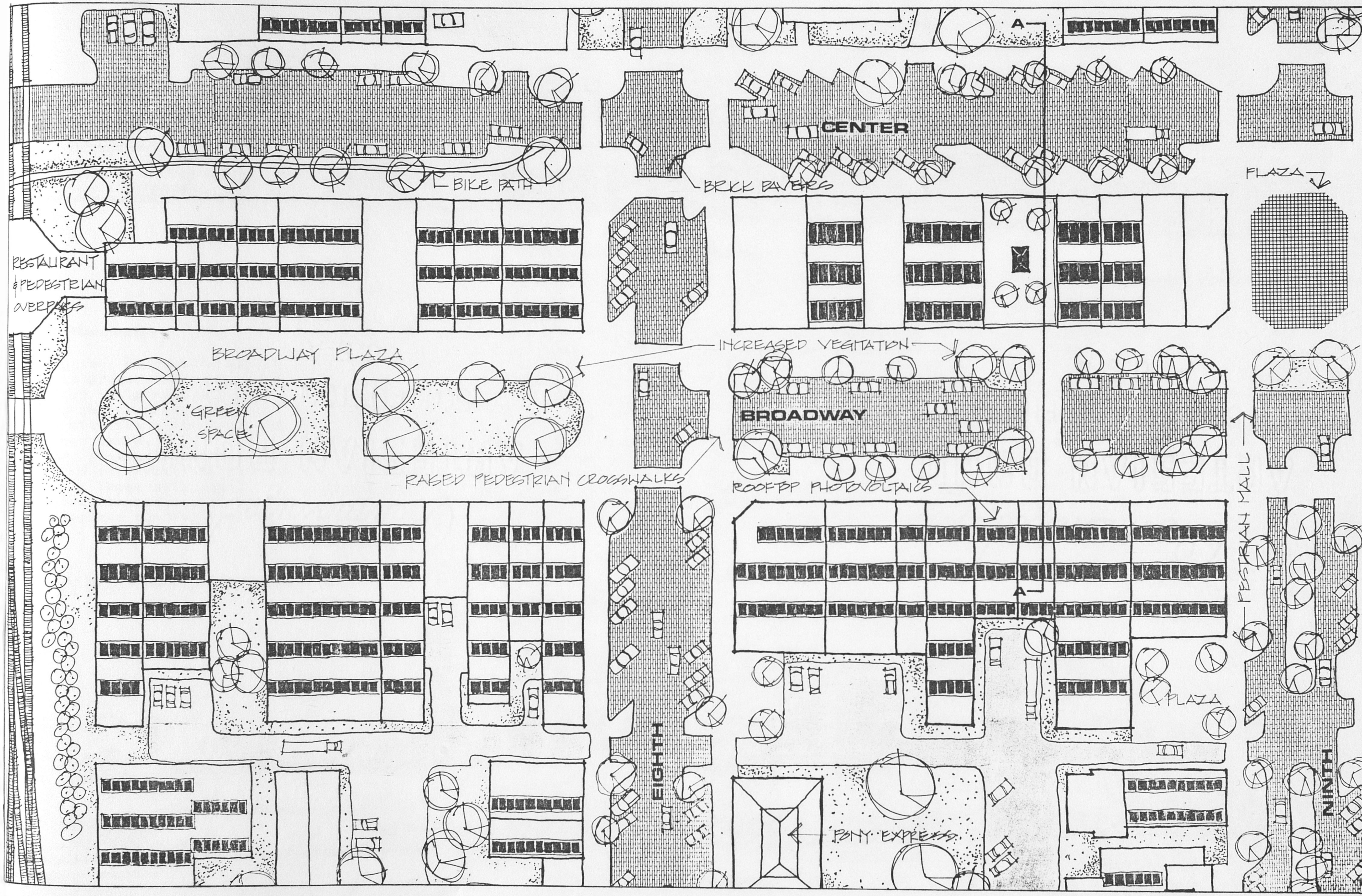

FIGURE 52. Central Business District - Year 2002

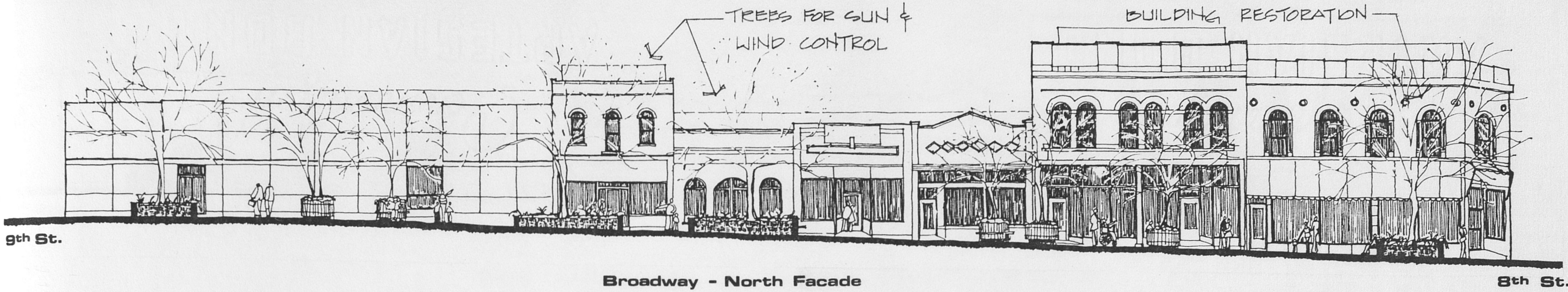

FIGURE 53. Proposed Broadway Renovation

Building Renovation

Rigorous ordinances should be passed to protect the remaining historical buildings, and any building improvements should be in keeping with the historical context of the structure.

The 'plastic' coverings should be removed to reveal the original facades of those buildings. Operable cloth and canvas awnings should replace the bulky metal devices which now exist. This would not only improve the looks of the building, but it would also allow the awnings to be raised at appropriate times in the winter to allow sun into the building and assist in daytime heating.

A wind study of the downtown was conducted in the Kansas State University, Department of Architecture wind tunnel by using a scale model of the downtown area. (76) In this study it was found that by proper placement of awnings and trees throughout the downtown, a significant reduction in air currents along the pedestrian pathways could be achieved. This is especially important during the colder months, when wind-chill factors can drop to well below zero (wind-chill is a relationship between wind speeds and temperature, and is gauge for measuring comfort).

The trees would also act as shading devices which would lower energy bills of the buildings by reducing heat gain during the summer months. The effect of implementing these measures would be greater comfort to the users in the area, and a reduction in energy bills for the merchants.

Further study would have to be completed to select proper species of trees, and determine exact location for maximum effectiveness.

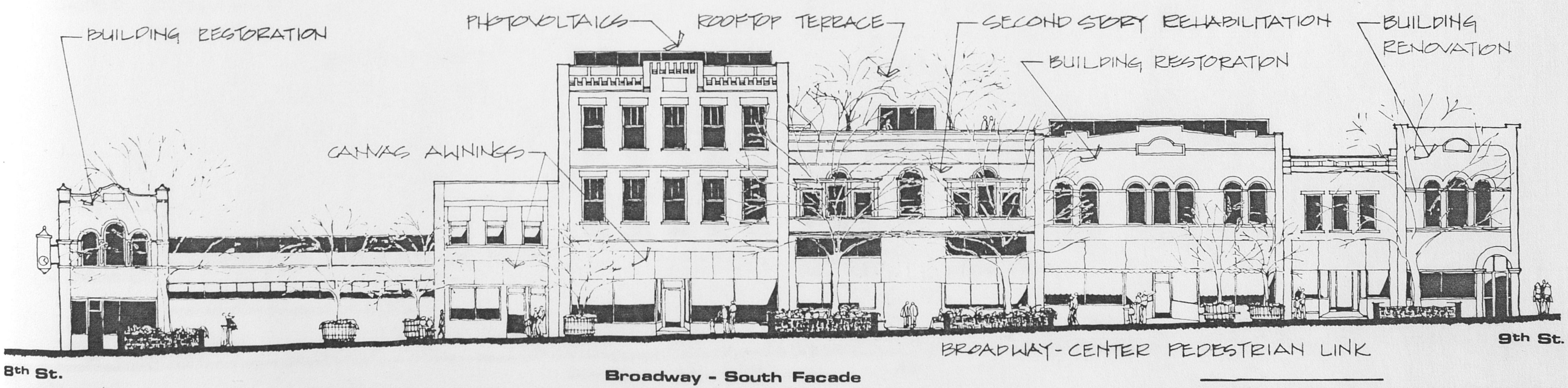

FIGURE 54. Proposed Broadway Renovation

76. "A Wind Study of Marysville, Kansas"

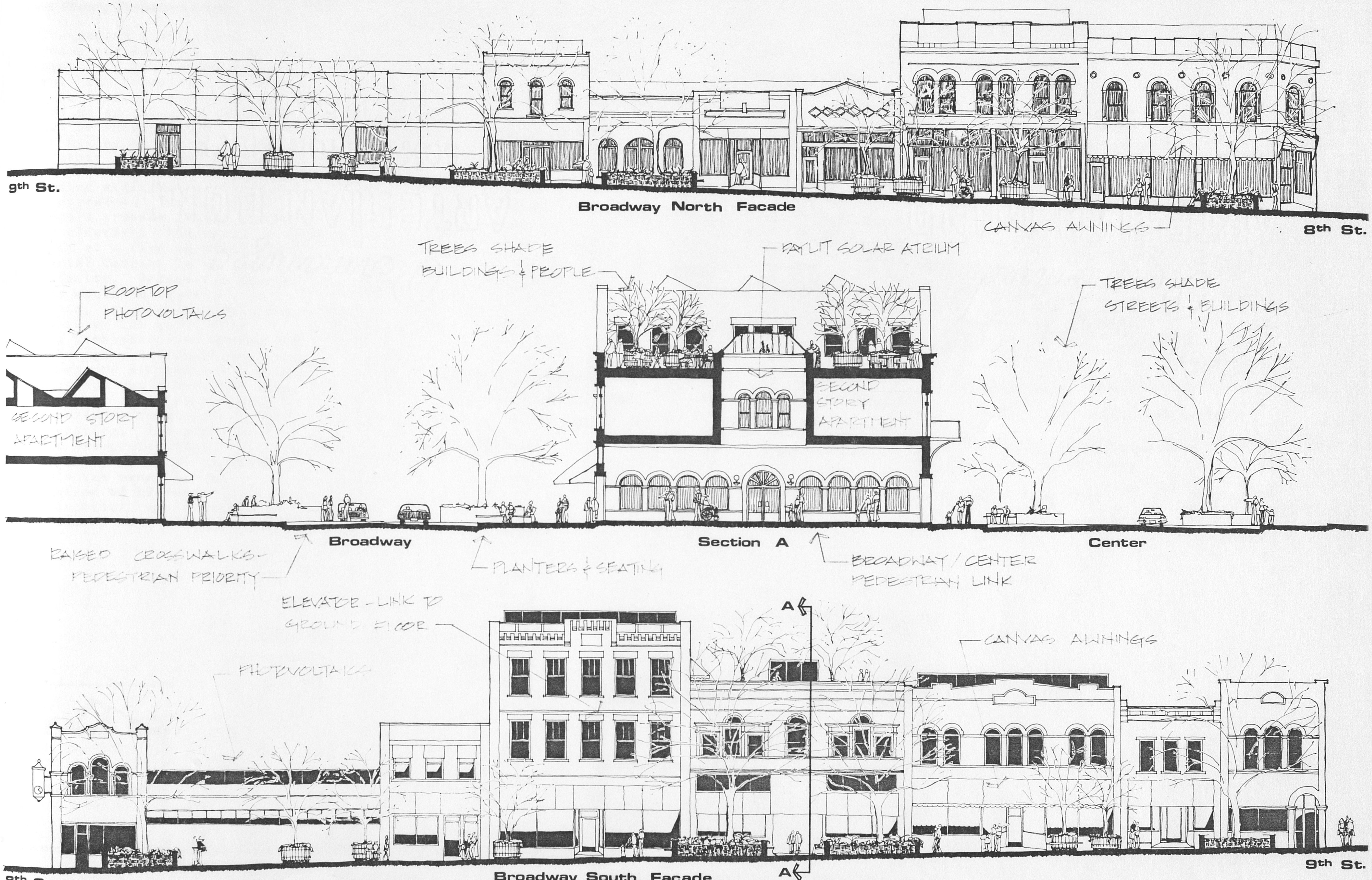

FIGURE 55. "Broadway Street Scene" - Year 2002

Second Story Rehabilitation

The second story space throughout the downtown should be renovated into apartments and offices. The recently renovated apartment located in the Koester Block is an excellent example of what can be accomplished.

By taking advantage of the second story space, energy costs for the building would be shared, making more efficient use of the energy expended. The dwelling units could provide living space for the elderly in the heart of the community at a time in their lives when social contact is an important health factor. Because goods and services would be readily accessible, it would minimize their dependence on the auto, thus reducing transportation energy use and encouraging healthful patterns of walking and bicycle use. Other living groups would have the same advantages in addition to being in close proximity to places of work, and recreation. The physical problems associated with accessibility could be remedied with relative ease through installation of elevators. Through proper location, one elevator could serve several adjacent buildings.

The merchants in the area would benefit by the increased resident population. The entire downtown would be more 'alive', with a human presence in the area around the clock.

With the price of new housing skyrocketing, the second story space could provide affordable housing for the younger generation as well as displaced floodplain residents.

FIGURE 56. "Broadway Street Scene" - Year 2002

BROADWAY LOOKING WEST

FIGURE 57. Proposed Downtown Second Story Rehabilitation

It is felt that vehicular use will be greatly reduced in the future, and that the downtown area should begin to orient itself toward increased pedestrian and bicycle use (as should other areas of the community).

This proposal develops a concept which reduces the emphasis on the auto by narrowing traffic lanes, and a reduction of parking on Broadway street. In this manner, emphasis can then be placed on pedestrian circulation, and begin to create a `mall' effect. With the renovation of second story retail space into living units, it is foreseen that there will be a great increase in pedestrian movement.

Also included in the streetscape proposal is the introduction of vegetation throughout the downtown area. By proper selection and placement of trees and other vegetation several major aims related to the creating of a pleasing environment can be accomplished.

1. Reduction of ambient air temperatures during the summer months. Proper planting can reduce the air temperature in areas which have little vegetation. Vegitation also aids in "human comfort" by providing shade from the sun.(77)

2. Reduction of wind speed. Buildings have a tendency to funnel winds and actually increase wind speeds especially near corners and intersections (known as the Venturi effect). Proper placement of trees can begin to break up and disperse the winds.(78)

3. `Green' places are preferred settings and places toward which people migrate.(79) The effects of pleasing environments and a person's preference for these areas have been the subject of many studies, and the implications for creating a pleasing shopping environment are great. "On the everyday scale there are countless opportunities for creating a greater exposure to natural, living things. Many of these would have a high (though intangible) payoff for little expenditure."(80) It should be noted here, that there exists a variety of species which can grow so that their canopy would allow visual access to store fronts, which is a major concern of merchants.

4. Proper selection of deciduous (leaf bearing) trees would also provide sun shading for buildings in the summer and reduce the heat load for air conditioning, and thus help reduce energy expenditures.

FIGURE 58. Proposed 9th. Street Pedestrian Mall

77. Living Systems. Davis Conservation Report: Pratical Use of the Sun. Living Systems, Winters, California, 1977. pp.45
78. "A Wind Study of Marysville, Kansas
79. Rachel Kaplan, "The Green Experience", Humanscape: Environments for People, Kaplan, Stephen; Kaplan, Rachel, Duxbury Press, North Scituate, Massachusetts. pp.193
80. Ibid.

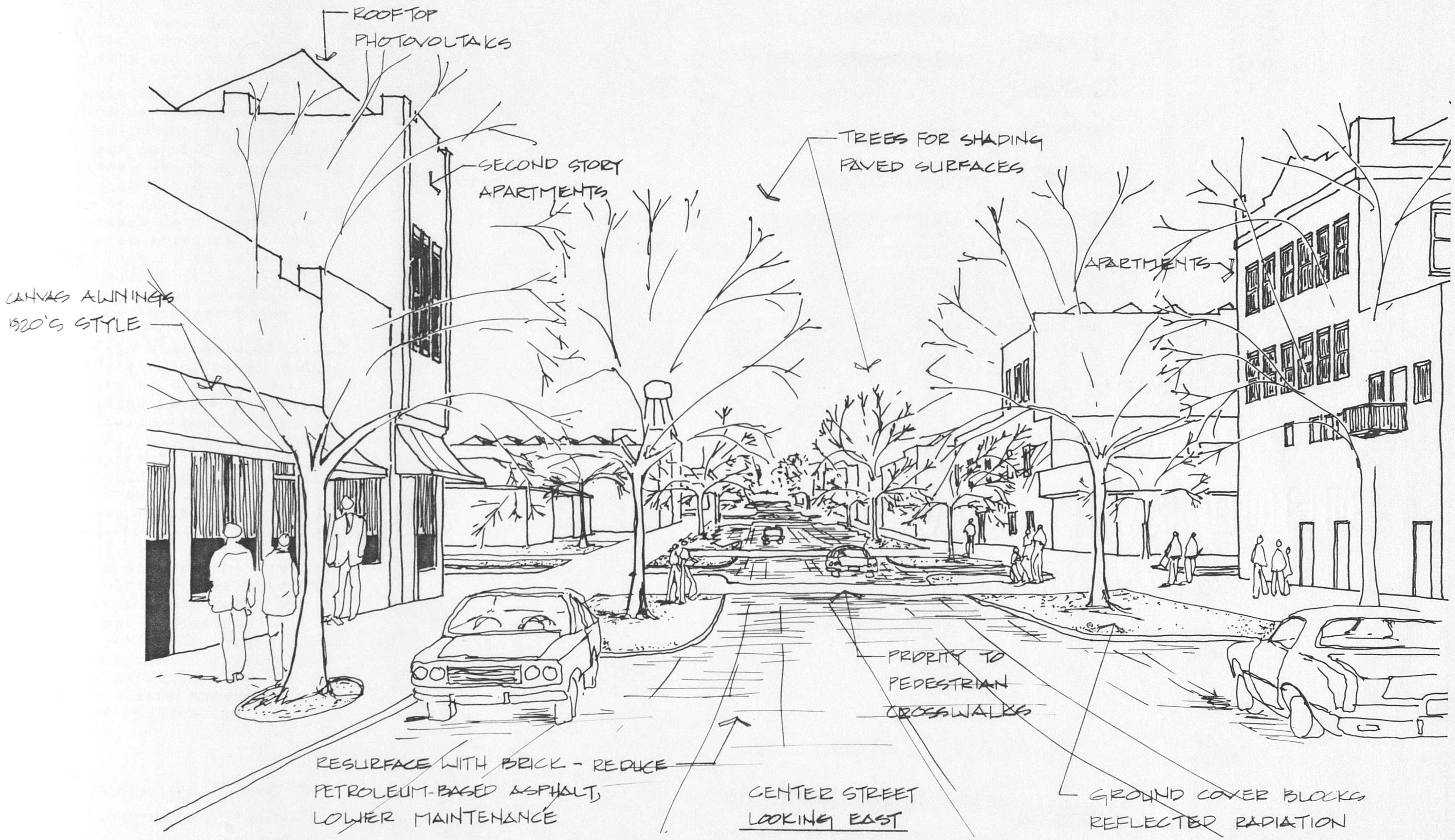

FIGURE 59. Proposed Center Street Renovation

In 1977 when the 1977 Corps of Engineers flood report was issued, there were 27 commercial units located in the floodplain.(81) In accordance with the flood plain proposal in this report, a majority are to be relocated. Those commercial units which are identified to remain in the floodplain are located adjacent to the rail lines, which is important for shipping and receiving merchandise by rail. The proposal suggests further development of the industrial area adjacent to the rail line. This is to take place by relocating some of the displaced businesses here, and by additional in-fill as new businesses are established.

It is felt that moving toward greater self-reliance would induce new businesses to develop which would be related to the appropriate technology field associated with self-reliance. Many items which would be important for such a transition could easily be produced locally. The emphasis on locally produced goods and services is a central theme which runs throughout this proposal.

Products such as solar water heaters, insulating window quilts, insulating window shutters, hot air collectors, and photovoltaic systems are just a few examples of products which could be produced or assembled in Marysville for the local self-reliance movement, and also marketed regionally.

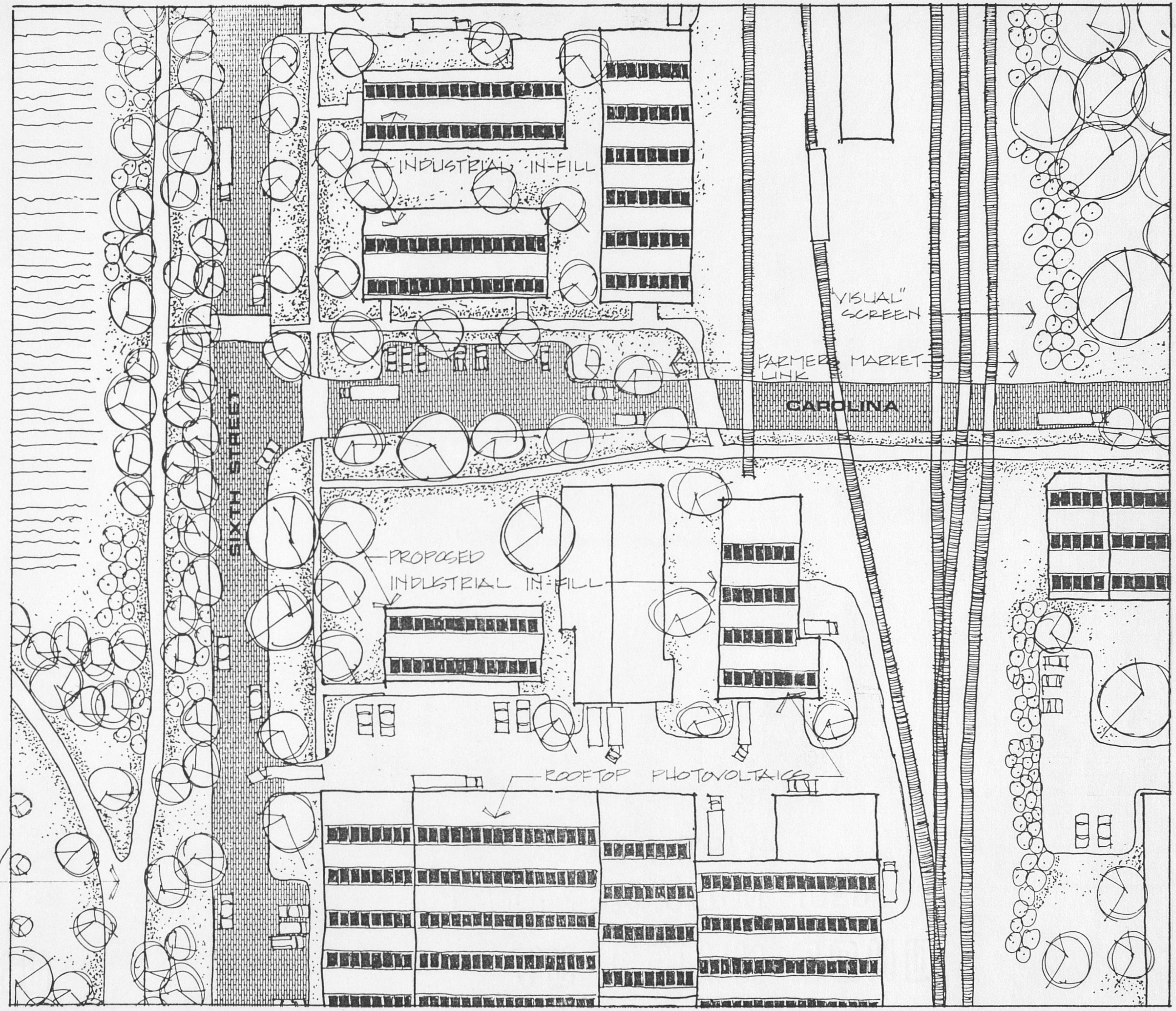

FIGURE 60. Proposed Industrial Park

81. Feasibility Report on Flood Problems in the Vicinity of Marysville, Kansas; pp.15

Two proposals are developed to accommodate remaining displaced businesses which need higher degrees of visual exposure to the general population than the proposed industrial area would provide. (For example, some of the businesses are restaurants which rely on traffic associated with highway U.S 36 for a portion of their customers)

The first involves in-fill of vacant lots in the immediate downtown area. There are several prime locations available to a business needing high public visibility. (See Figure 51., pp.50) The second concept is that of continuing the business district east on Broadway to 15th street, and in-fill along Center Street. As additional business locations become necessary, the commercial center could continue east on Center Street. (See Figure 61., pp.58; and Figure 63., pp.59)

The major concept from a physical development point of view is to keep consumer oriented businesses in the physical center of the community, and industrial and manufacturing processes on the edge of town, away from the majority of residential districts.

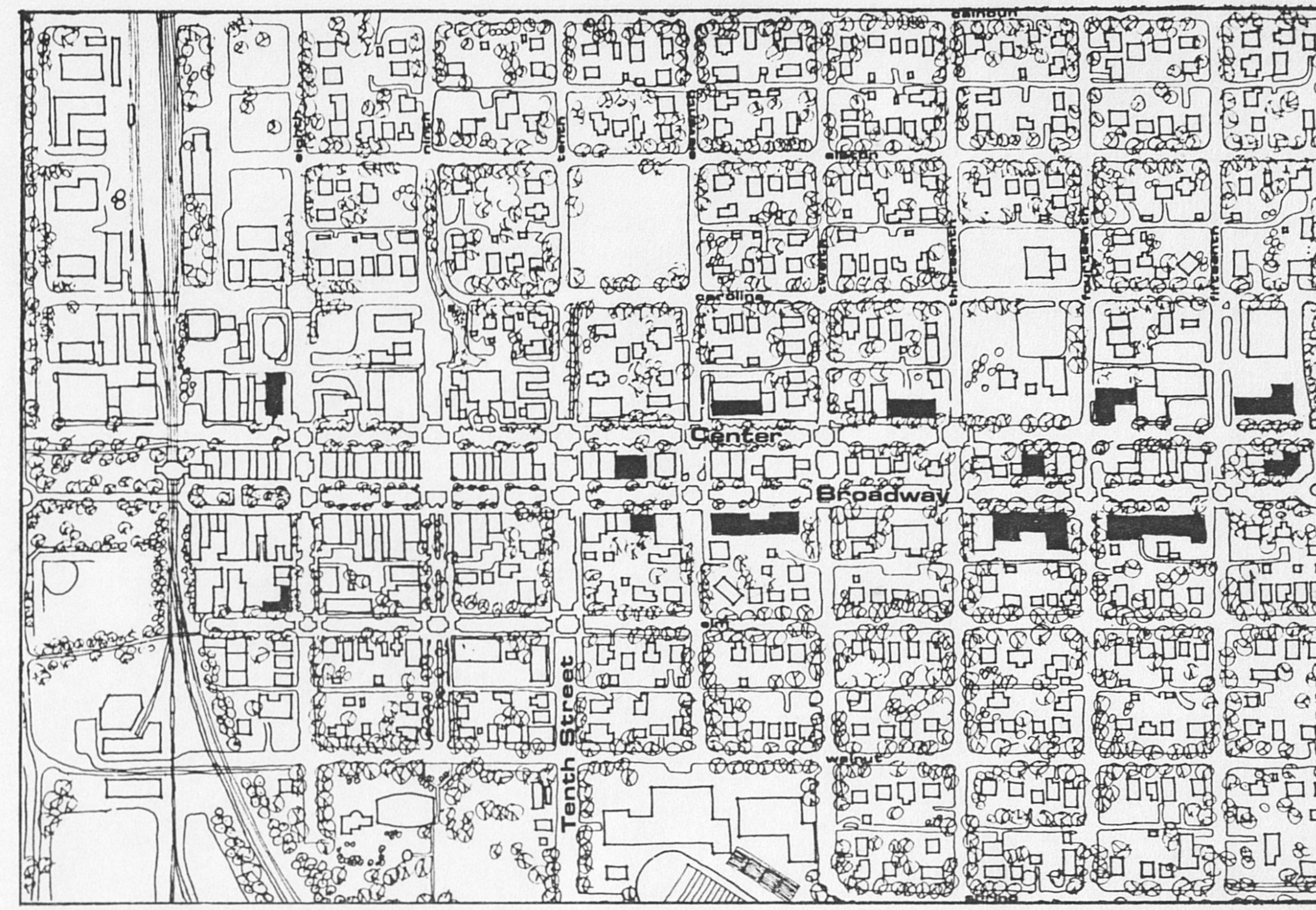

FIGURE 61. Proposed Commercial Expansion

FIGURE 62. Proposed Center Street Renovation

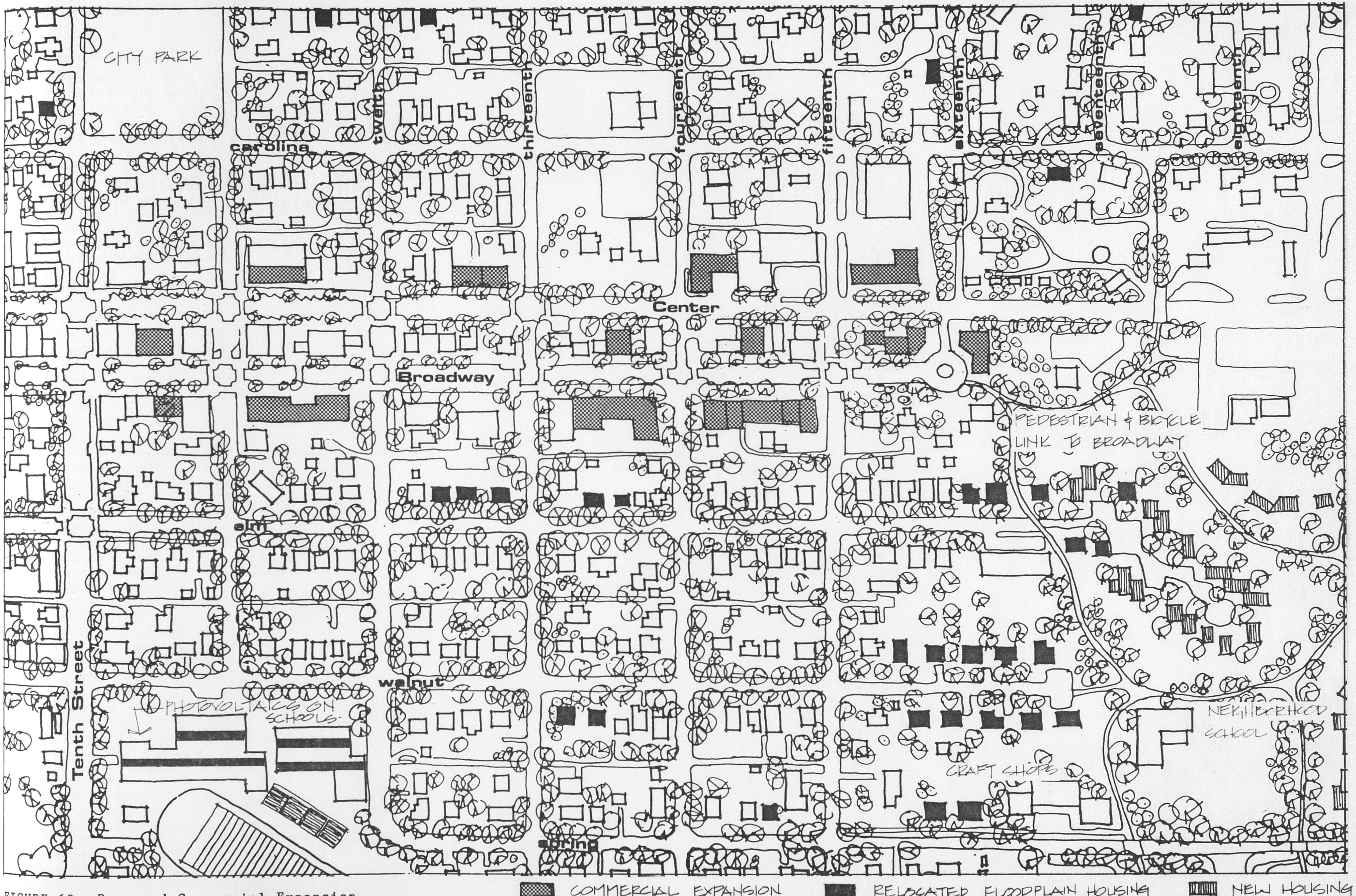

FIGURE 63. Proposed Commercial Expansion

Hydroelectric Power

Some twenty years ago, the City of Marysville was given a hydroelectric plant complete with dam and generators; since that time it has remained dormant. In a 1981 feasibility report on potential hydroelectric power in Kansas, the Marysville site ranked 25th in potential power output, and 10th in relative economic feasibility.(82) It is time to resurrect this system and retrofit it with a state-of-the-art, low-head generating system.

"The estimated annual energy output for the Marysville site is 1.6 million KWH (kilowatt hours) or 5459 MBTU (million BTU's) which is about 8 percent of the 1982 base year Total Community Electrical Demand, or 110 percent of the current Total Municipal Electrical Demand."(83) The hydroelectric plant could save the community as much as $100,000 per year, and in addition the surplus could generate as much as $15,000 annually.(84)

Using 1982 prices and known condition of the site at that time, cost of installation was determined to be approximately $272,950. This is calculated into a simple payback period of 2.31 years with a return on investment of 39.2 percent.(85) Since the 1982 report was completed, is has been rumored that the condition of the dam portion of the structure has deteriorated somewhat by currents undermining the dam. Without engineers studies, this is impossible to verify. Assuming the worst case scenario, and for sake of argument, say the cost of retrofitting escalated to $1,000,000; the system would then have a simple pay back period of less than ten years. The municipal energy costs alone are projected to increase to $197,108 annually by the year 2002.(86)

Whether Marysville elects to take any other steps toward self-reliance or not, this is one system which should be reviewed for feasibility based on economics alone.

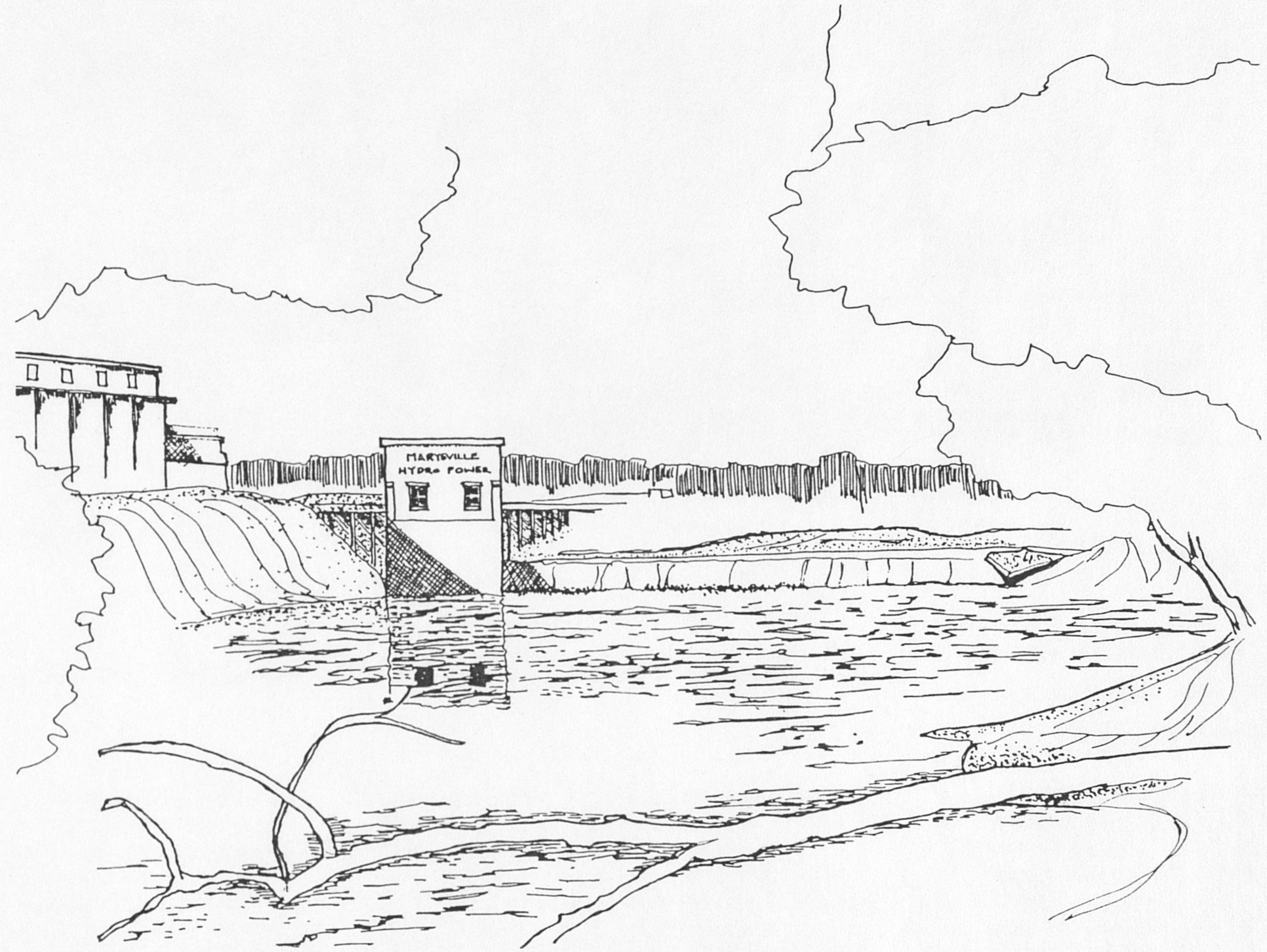

FIGURE 64. Proposed Marysville Hydroelectric Plant

82. Kansas Energy Office, Kansas Hydro-Power: An Assessment of Low Head Hydroelectric Opportunities (U.S. DOE: Kansas City, Mo., 1981) pp.7,11,15
83. The Marysville Energy Study pp.112
84. Ibid., pp.112
85. Ibid., pp.112
86. Ibid., pp.125

Municipal Infrastructure

Already mentioned in this sector were suggestions for waste treatment. The other major operation of the municipal government is the maintaining the street system. It is recommended that major emphasis be directed toward pedestrian and bicycle circulation systems. With proper planning of subdivisions and any new streets, the length of such systems can be reduced, and thus reducing maintenance costs.

During the development of Marysville, numerous brick streets were constructed throughout the community. It is recommended that such practices be resumed. Brick streets last much longer than asphalt streets, they cost less energy to maintain (asphalt systems are oil-based and cost of repairs fluctuates with petroleum prices), and their maintenance is labor intensive (the majority of money spent on repairs stays in the community in the form of wages rather than leaving the community for oil imports). Brick streets can also help reduce the ambient air temperature within the community, and are generally more aesthetically pleasing, making the community more visually appealing not only to the residents, but to visitors as well.

FIGURE 65. Proposed 9th. & Carolina Public Plaza

Public Spaces

A series of small public plazas are proposed throughout the community, especially in the downtown area where major pedestrian circulation paths cross.

In developing the book <u>A Pattern Language</u>, studies conducted by Christopher Allexander determined that: "One of the greatest problems existing in communities is the fact that the available public life in them is spread so thin in them that it has no impact on the community. It is not in any real sense available to the members of the community. Studies of pedestrian behavior make it clear that people seek out concentrations of other people, whenever they are available."(87)

An example of a place where such a center could be established is at 9th and Carolina, where a major pedestrian path links the northeast residential sector with the downtown. This area could very easily be transformed into a small public park which could serve a variety of functions such as providing a setting for street dances and civic events. It could also be used for outdoor weddings by surrounding churches. (See Figure 65.)

Also proposed for this site is a tower, to be placed on the high point which overlooks the community. The subject of high places was also explored by Christopher Allexander. "These high places have two separate, and complementary functions. They give people a place to climb up to, from which the can look down upon their world. And they give people a place which they can see from far away, and orient themselves towards, when they are on the ground... High places are equally important, too, as places from which to look down: places that give a spectacular, comprehensive view of the town. Visitors go to them to get a sense of the entire town they have come to; and the residents themselves do too -- to re-assess the shape and scope of their surroundings."(88)

It is proposed that this tower serve another function as well. It could act as a symbol of Marysvilles' commitment to creating a self-reliant future. The tower could be designed in such a way, possibly through a competition, to symbolize all of the sources of renewable energy which flow into Marysville, and are captured there. For example, a small waterfall could symbolize the use of hydroelectric power; moving parts, and chimes for wind; solar cells to operate lift systems for the handicapped. With such a tower of civic pride it could be said, as a recent Chamber of Commerce brochure stated, that "Marysville will open up to you all the rich possibilities of life in a small town with a large sense of where it has been and an even bigger notion of where it's going"(89)

87. Christopher Allexander, et. al., <u>A Pattern Language</u> Oxfod University Press; New York, 1977, pp.164
88. Ibid., pp.317
89. "Marysville - Where History And Progress Are Both Appreciated", Marysville Chamber of Commerce; Marysville, Kansas. (promotional brochure)

Community Image

The overall image a community projects is important in many ways. The proper image is needed to attract businesses, industry, tourism, and people.

"Marysville is a rich blend of opportunities: for productive and rewarding work, for personal growth, and for the enjoyment of all that is best about life in America."(90)

This phrase is but one of many which describe the quality of life in Marysville. It is part of a promotional document published by the Chamber of Commerce, which also contains a variety of visual images of the community.

Along with the numerous proposals developed in this report, lies a deep-rooted concern to not only preserve the good image Marysville has, but also to enhance it.

Throughout this proposal are recommendations for increased vegetation, especially trees. It has been shown that trees can aid in climatic control by reducing summer temperatures through shading of paved surfaces, and lower energy bills in buildings by reducing heat gain. Also, proper planting of trees will help break up winter winds, and help create a more comfortable environment. The advantages of maintaining pleasing environments by creating `green spaces' for people has also been explored.

FIGURE 67. East "Gateway" to Marysville

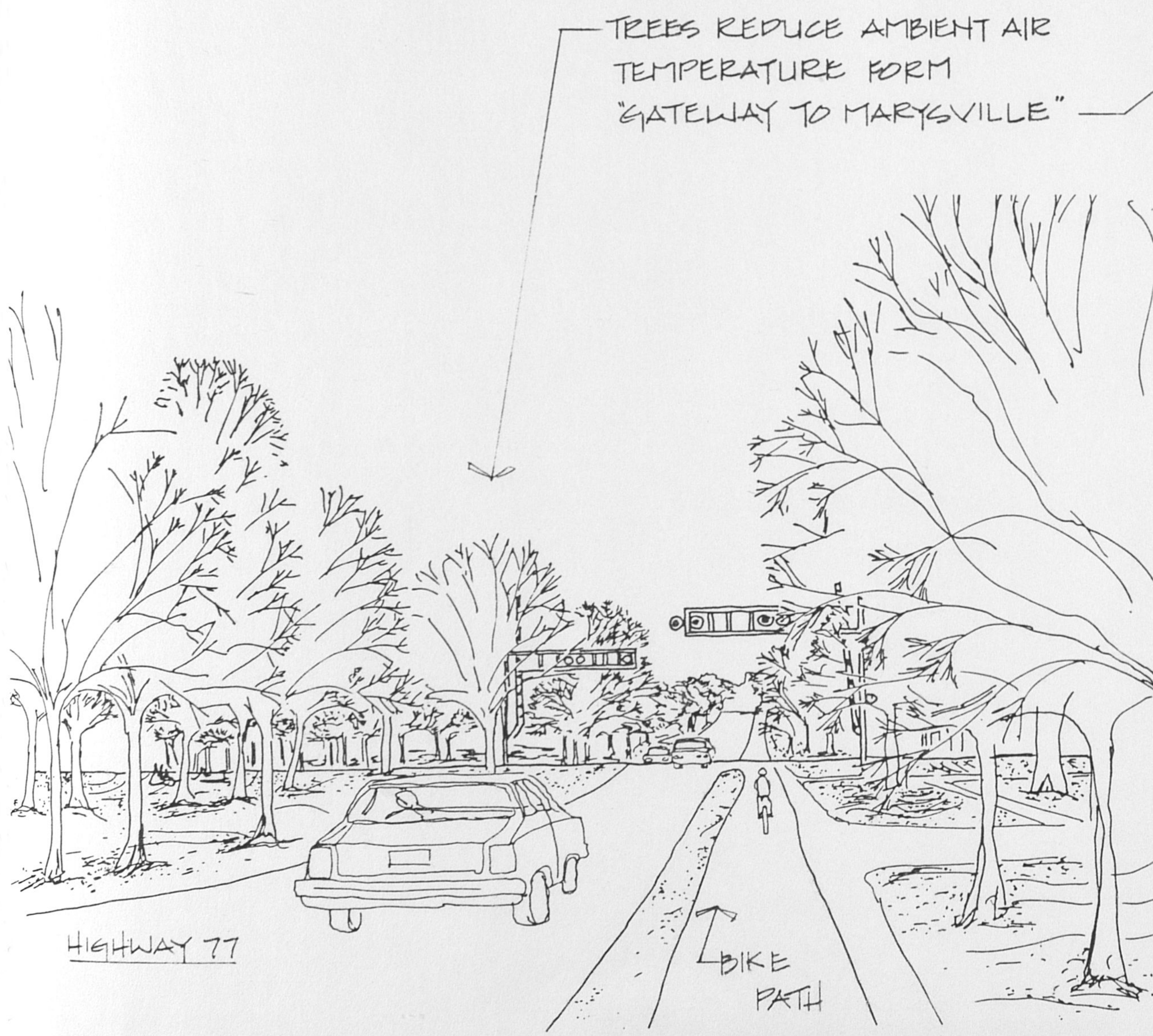

FIGURE 66. South "Gateway" to Marysville

Trees can serve all of these functions, and yet still provide more. They can help strengthen Marysville's image by forming `gateways' to the city. The entrance to any physical setting may be the single most important element in forming a persons perception of that space, whether it be a persons home, a public building, a park, or the paths which lead into a community. First impressions are lasting, and by forming these green `gateways' into the community, visitors would immediately begin to sense that they are about to enter a community which takes pride in its environment and cares about its citizens.

"We value our trees in Marysville, and they remain a vigorous testimony to the abiding values of family life and faith in the future"(91)

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90. "Marysville - Where History And Progress Are Both Appreciated", Marysville Chamber of Commerce; Marysville, Kansas. (promotional brochure)
91. Ibid.

Summary of Recommendations

Summary of Recommendtions

It is evident, based on the facts presented in the Marysville Energy Study, that energy plays a key role in the economic stability of the community. It is also known that centralized nonrenewable energy systems, which provide Marysville with it's present supply of power, contributes to the degradation of the environment. The conclusions drawn from the Business-As-Usual approach to the energy situation, only promise continued decline in the economic stability and quality of life in Marysville.

However important a factor energy is in contributing to the undermining of Marysville's economic structure, it is not the cause of the problem. What has evolved over a long period of time is the reliance on larger, more centralized, regional and national production and service systems at the local level, most of which can be provided cheaper, more efficiently, and with better quality from within the communities themselves.

This report proposes that a Community Energy Planning Process be initiated within the community to begin to resolve the energy/economic situation. Studying energy in the comprehensive manner suggested in this thesis will ultimately lead to exploration of other systems within the local economy, such as food, water, health, finance and so on. It is then that communities will begin to break away from large centralized systems which control their local economy.

It is the position of this thesis that Marysville should begin to restructure its energy supply and demand systems, thus ensuring a move toward a more stable, ecologically sound, environmentally safe future.

To begin this process, there are five major areas which will have to be addressed: leadership, vision of the future, education, tools to implement programs, and a plan of action.

Leadership

It is the responsibility of our elected officials to carry out the day-to-day activities of local government within the community. It is also their responsibility to develop long range plans for their community's future physical and economic growth. As evidenced by the turmoil created by the oil embargo in 1973, and subsequent decline of the nations economic stability, community leaders were not performing as the perhaps should have:

"The severe economic shocks to which so many communities were exposed to during the 1976-77 winter were not the consequence of inadequate federal programs. Rather they were caused by the failure of local community administrators and planners... Because administrators and planners are responsible for the social and economic stability of their communities, people must see to it that their elected and appointed officials develop plans and implement them so that economically stable and uninterruptable supplies of energy are provided...it is at the local level where priorities must be established for maintaining an adequate supply to meet the needs of the community life-styles."(92)

If there is anything that we should learn from the oil embargo experience, it is that we can no longer rely on traditional modes of thinking and planning processes to ensure a stable energy/economic future. It should be noted that in 1976, household electrical energy consumption took a dramatic change and reversed the trend of increased household consumption which had been continuing since 1925. Also, from 1973 to 1984 the cost per kilowatt hour of electricity jumped 338 percent to a price not seen since 1928. (See Figure 14., pp.15: KP&L Rate History)

This report offers an alternative planning process to address the energy/economic problem; it will be up to the community leaders to move beyond the rhetoric of `good will' for the public, and take steps which result in action.

Vision of the Future

The intention of this report is to show what Marysville could be, not necessarily what it will be. If Marysville wishes to move toward self-reliance, it is imperative that the citizens mold and shape their own collective vision of the future, and implement that vision in their own unique ways.

Based on what their concept of what the future should be, the community should begin to develop their own goals and adopt a comprehensive plan which reflects their own wishes and desires. The aim of this thesis is to inform and inspire that search within the Marysville community.

Comprehensive Plan

The importance of considering energy in the process of developing a Comprehensive Plan cannot be overstated and the implications of energy and planning are best summarized in a soon to be published article by Gary J Coates, et.al.:

"The Comprehensive Plan defines what the community wants to accomplish, what it wants to avoid and what it wants to accommodate in the future. Without such a practical framework to define the shared vision of a desirable future, decisions about development of such issues as the design, and layout of housing areas, the placement of public facilities, the location of water and waste lines and so on, would be made ad hoc on a project by project basis. Unless the energy use implications of such decisions are considered wholistically, the development patterns created today will lock Marysville, or any community, into an irreversible commitment to consume amounts and forms of energy which are certain to be more expensive and less readily available in the future. In order to create a whole that is more that the sum of its parts it is necessary to determine whether or not particular development projects take into account overall long term community needs and resources as well as immediate circumstances. By integrating energy considerations into the comprehensive plan, both elected officials and private citizens are provided with a common framework for determining the short-term and long-term impacts of development decisions on household and community energy use."(92)

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92. C.M. Allen, and I.O. Sewell. "Energy Planning: The Community Must Take Charge", <u>Integrated Community Energy Systems Planning -A State-of-the-Art Report</u>. Battelle, Columbus Laboratories; Columbus, Ohio. pp. B-1
93. Gary J. Coates, Steve Ernst, and James H. Dubois. "Community Energy Planning: A Case Study of Marysville, Kansas". (To be published in <u>Marriage & Family Review</u>, Fall 1985.)

Education

The concepts and ideas we instill in our young children today, are seeds that will grow to influence the world of tomorrow. In our society, our public learning institutions play a major role in the educational training of young children. The influence that these schools have on the values and learning habits our children develop is tremendous. The results of a simple puppet show put on to teach children about solar energy solar energy demonstrates the potential power of our educational systems:

"When puppet Solar Sal told kindergarteners in Toms River, New Jersey to save energy, one youngster became so enthusiastic that he insisted his family eat by candlelight for three evenings."(94)

The entire educational system must become responsive to the problems which will challenge leaders of the future. Following generations are already going to inherit an astronomical National Deficit; must the also inherit our energy problems as well? It is recommended that Marysville:

1) Review educational curricula. Integrate energy education within existing coursework, and possibly establish specific programs. An example of coursework integration would be: a) the inclusion of energy economics and energy planning with social studies, and government classes. b) relating the youth market garden concepts with teaching agriculture, hydrology, soils, self-reliance, economics, and marketing.

2) Sponsor youth service organizations which could be trained as Energy Swat Teams" to conduct energy audits and install no-cost, low-cost weatherization measures in low income homes. A sliding fee schedule could be used, with services provided free for those in most need.

Community Seminars - Demonstrations

The Appropriate Technology Center proposed in this report has the intention of serving two purposes, education and demonstration. It is imperative that the community as a whole become aware of and involved in energy conservation as well as the community energy planning process. If an A.T. Center were to be built, it would assist in the education of the general public, as well as provide 'hands-on' experience by conducting workshops and demonstrations.

Proposed in conjunction with the A.T. Center, is the development of community greenhouses, youth and community gardens, and a woodlot shelterbelt system. With the connection of the food, fuel, and fiber concept to the A.T. Center, the community would not only learn how to become more energy self-reliant, but also how to develop a community support systems which are responsive to their every-day needs.

Training seminars in all aspects of self-reliance should be developed and made available to the general public.

The News Media

Perhaps the single most important tool which could be instrumental in bringing about public awareness is the news media, and, in particular, the newspaper. This source of communication has tremendous potential for the dissemination of information which can help to keep the ideals, goals, and aspirations of an energy conscious movement in the front of citizens' minds.

There are many ways the newspaper could play a role. Besides updating progress on long term programs and projects, a weekly column could be introduced, featuring the "Conservation House of the Week" (or Month), "Solar Citizen of the Week". Awards of recognition could be given to those citizens who exert an effort to achieve household and community self-reliance. These "award" winners could then be organized into educational teams to lead seminars, give talks to clubs and schools, conduct hands-on workshops, and so on.

Tools - Financial

Translating the Soft Energy Path vision outlined in this thesis into reality can be a major opportunity for community economic development. Beyond considering just the economic tools needed for implementing the energy aspects of this proposal, lies the greater goal of achieving community self-reliance.

It is essential that through implementation of the Marysville Energy Plan, methods be found to insure that the actual process of plugging the energy dollar drain be translated into re-investment in the community. Without a plan for re-investment, there is nothing that will prevent the money saved from conservation and solar energy use form being spent in other communities, or regional and national markets. In order to ensure community economic growth which is directly of indirectly related to implementing the Soft Energy Path, the city should consider creating a community development corporation to plan, finance and coordinate implementation.

Along with reinvestment strategies to be developed, there are major financial considerations in association with relocation of households from the floodplain. Some possible avenues for financing such a relocation project, and other energy programs such as hydroelectric power, wind farms and photovoltaic power production systems are described here.

Urban Development Action Grants

The purpose of these funds are to provide assistance to cities and urban counties which are experiencing severe economic distress and to help stimulate economic development activity to aid in economic recovery.(95)

The Energy Study in itself strongly argues the point of economic stress created by the community energy dollar drain. The floodplain makes its own argument concerning physical stress, and this proposal presents a strong case for the alleviation of both problems.

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94. "Teaching Kids About Energy". People Power - What Communities Are Doing To Counter Inflation. U.S. Office of Consumer Affairs; Washington, D.C. pp. 224
95. "Subpart G - Urban Development Action Grants". Federal Register, Vol. 47, No. 36. February 23, 1982. pp. 7983

Municipal Corporation

Each state has developed guidelines by which communities are allowed to establish Municipal Corporations. Municipal Corporations have similar advantages that energy utilities have in financing energy self-reliance, in that both can borrow large amounts of money for long duration, both do long range planning , and both can offer reduced energy demand. However communities have one advantage that investor-owned utilities do not have: " they (communities) can borrow money at tax exempt rates. Because owners of municipal bonds pay no federal taxes on the interest received, the bond owners will accept an interest rate lower that they would on other bonds.".(96)

Along with setting up a Municipal Corporation, could be the establishing of a "Municipal Solar Credit Union", where-by low interest loans could be made available for conservation and renewable energy related activities only. Local banks could also set up a re-investment loan fund; such a program would not only be good for the customers, but help improve their own image in the community as well. This would begin to retain the energy dollar in the local economy, and plug the hole associated with nonrenewable energy expenditures.

Municipal Solar Utility

Municipal Solar Utilities (MSU) are established to assist in the implementation of solar energy technologies within the local community. MSU's can be set up under a variety of organizational structures, depending upon the individual community's needs. There are three basic forms related to MSU's:

1) Facilitator Model: acts primarily as an information and assistance center providing information on solar products; setting up consumer education and information center; developing ordinances and building codes; performing energy audits; and initiating self-help programs.

2) Broker Model: acts as the Facilitator, plus provides low-interest loans; leasing/rental option on solar equipment; engineering design; and maintenance and system insurance.

3) Direct Service Model: acts as Facilitator and Broker plus installs the system, provides system maintenance, leases equipment, and finances equipment.(97)

As seen here, MSU's could provide the means to implement many of the proposals recommended thus far. In Marysville, a Municipal Solar Utility could be established to retrofit and operate its hydroelectric power plant, install photovoltaics in the downtown area, develop the proposed wind farm; as well we smaller scale projects such as financing low-interest loans to home owners, and offer guidance and planning services. The specific details of how Marysville would establish its own MSU and the exact functions it would perform would take an in-depth study, and would have to come from within the community.

And So On

The potential funding sources listed above are by no means intended to be all-inclusive. There are a variety of other Federal (Community Development Block Grants as an example), State, and even local sources such as the Helvering Fund which could be utilized in initiating programs.

To finance projects as the floodplain relocation proposal in this report, a variety of funding sources will have to be utilized. This will have to be done by breaking the project into its component parts and seeking funding from appropriate agencies for each. An example of such a diverse funding "package" is provided below. (Figure 68.)

Tools - Regulatory

The main legal tools a community has within its power to enact and to ensure compliance with specific goals are zoning ordinances, building codes, and eminent domain (which is the power of a government entity to take private property for public use upon just compensation to the owner). These powers are granted to municipalities, "For the purpose of promoting health, safety, morals, or the general welfare of the community...".(98)

Regulatory authority is seen as a valuable means to implement programs, and to assist in the orderly transition to a self-reliant future.

Soldiers Grove's Funding Package

State/Local Sources	Amount	Date	Purpose
Regional Planning Commission	$4,000	May 1975	Feasibility study
State Planning Office	$2,700	May 1976	Social/environment study
Dept. of Local Affairs & Development	$13,200	Early 1976	Implementation study
Local businessowners	$3,300	Early 1976	Implementation study
General obligation borrowing by village	$90,000	June 1977	Site purchase
Dept. of Natural Resources	$42,000	Jan. 1978	Public water works
Governor's discretionary fund	$67,684	Feb. 1978	Sewer/water
	$100,000	Aug. 1978	Sewer/water
Village borrowing	$235,000	Aug. 1979	TIF startup
(Farmers Home Administration)	240,000	Aug. 1979	Water works
	$91,000	Aug. 1979	Sewer works
	$150,000	1981	Water works
	$110,000	1981	Sewer works
	$1,072,000	1981	Community facilities
Total	$2,220,884*		

Federal Sources	Amount	Date	Purpose
Housing & Urban Development (CDBG)	$185,600	Oct. 1978	General
	$900,000	Oct. 1978	General
	$573,200	Sept. 1979	General
	$474,300	Aug. 1980	Acquisition/relocation
	$535,000	Nov. 1980	Acquisition/relocation
	$500,000	May 1981	Acquisition/relocation
Community Services Administration	$40,000	Oct. 1978	Administration
Economic Development Administration	$500,000	Aug. 1980	Acquisition/relocation
Dept. of Interior (LAWCON)	$500.452	July 1979	Parkland acquisition
	$145.695	Sept. 80	Parkland acquisition
Total	$4,354,247		

*Total does not include CETA funding for relocation coordinator's salary; substantial in-kind contributions of labor, office space, technical assistance, etc., from village or state agencies; funds related to relocation, but used for general community development; or private borrowing by business owners.

FIGURE 68. Soldiers Grove Funding Package

96. David Morris. Self Reliant Cities - Energy and the Transformation of Urban America, Sierra Club Books, San Francisco 1982. pp. 189
97. California Energy Commission. "Commericializing Solar Energy Through Municipal Solar Utilities", Solar Office, Sacramento, California, November 1, 1981. (Report)
98. Daniel R. Mandelker, and Roger A. Cunningham. Planning and Control of Land Development- Cases and Materials. The Bobbs-Merril Company, Inc., Indianapolis. 1979. pp.227

Plan of Action

The following outline is intended only to provide a point from which to embark. The implementation of any concepts or ideas lies within the hands of the citizens of Marysville; it is their community and it is their future.

Day One

Accept the challenges of the future. Make a commitment to developing a 'better place to live'.

Year One

Form a permanent Marysville Energy Committee appointed by the Mayor and coordinated by a full-time, or possibly half-time Energy Coordinator. The following are recommendations of specific duties to be undertaken by the Energy Committee:

1. As a first task, critically review the Marysville Energy Study completed earlier, and the Comprehensive Plan developed in this report.
2. Modify and adopt the Comprehensive Plan as town policy by the City Council, including short term and long range goals of the plan. Establish committees to study specific items related to the plan ie. Municipal Solar Utility, hydroelectric power plant feasibility, UDAG funding, zoning ordinances, building codes and so on.

Also as an out-growth of the energy study, other areas which affect the local economy should be studied, such as food production systems, health care, and durable goods. Any system which contributes to exporting local dollars out of the community should be included as part of the study. This step should be completed with maximum input from the community at large.(99)

3. Initiate a vigorous energy and self-reliance awareness program through the news media, schools, and civic and religious organizations.
4. Create an action plan extending for at least two years. The plan should focus on implementation of low-cost, high-impact energy conservation measures, and reducing exportation of local dollars from other sectors. In carrying out these tasks it is important to establish specific, realizable goals and procedures. Since low-cost, no-cost weatherization measures can realize immediate and dramatic energy and cost savings, a reasonable goal may be to complete 100 homes in the first year. Along with this program, progress reports should be highly publicized to keep the energy movement "up-front" in the publics' eye.

Year Two

1. Review, and revise as necessary, all programs initiated in year-one.
2. Review feasibility studies of proposed projects (such as the hydroelectric power plant), and make feasible projects a part of the community's capital improvement program.
3. Adopt all regulatory measures developed to ensure successful programs, ie codes and ordinances.
4. Establish new goals based of first year results.

Year Three and Beyond

Continue with short term and long range goals which will lead Marysville toward and economically sound, environmentally safe future.

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99. The Cornucopia Project. "Toward The Regeneration of America". Regeneration. Rodale Press, Emmaus, Pa. Spring 1985.
100. Rock Mountain Institute. "Economic Renewal Project". Old Snowmass, Colorado, 1985.

Conclusions

Conclusions

The major emphasis of this report has been to summarize an energy study which was conducted in 1982 (which is probably the most in-depth energy study conducted in Rural America to-date), and to translate that study into a vision of the future. The Soft Energy Path provides alternative ways to reduce energy demand and cost through application of conservation and solar technologies. Community Energy Planning provides the method to implement such a program. It is up to the citizens of Marysville, Kansas to provide the will to do so.

Although proposals developed in this report were specifically designed for implementation in Marysville, the concepts and general principles upon which this thesis is based on are transferable to other communities in Kansas, and indeed across the nation as well. However, since each community is unique in its structure and setting, it will need to identify its own problems and develop appropriate solutions.

The seed has been planted. It is hoped that this seed has fallen on fertile soil. If properly nurtured,it could eventually grow into a movement which will begin to lead our cities and towns toward an economically sound, environmentally safe future. Marysville, like other communities across rural America, has a choice. The options have been defined. Continue as usual and allow decisions to be made elsewhere, or move forward with a vision of the future which will be as rewarding as it is challenging.

A FINAL NOTE

"Walk around Marysville. You can sense a deep respect for the past and the pioneer spirit which underlies the Marysville work ethic of the present."(101)

It is hoped that this report will rekindle that `pioneer spirit', and that Marysville will emerge from a complacent society to become an national leader in a community based self-reliance movement.

With the completion of this report, the work is not over - it has just started.

101. "Marysville - Where History And Progress Are Both Appreciated".

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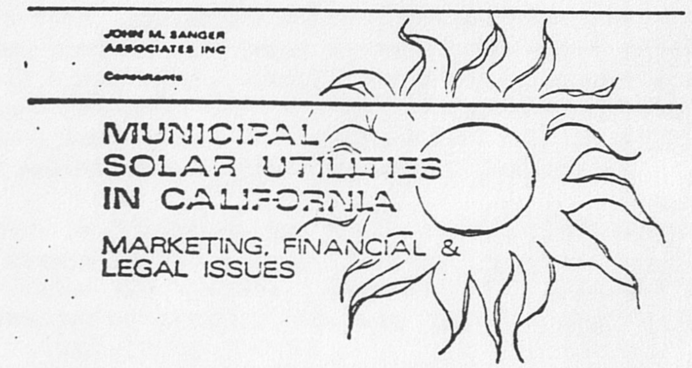
Appendix

Appendix A

Municipal Solar Utilties

California Energy Commission
Solar Office - 2/23/81
CSUDA 80-01, CEC 505-79-022
P500-80-062



<u>SUMMARY</u>

A. MSU'S DEFINED

Municipal Solar Utility (MSU) broadly defined denotes any entity organized at the municipal level to advance the use of solar energy technologies within the local marketplace. As such, the MSU concept encompasses a diverse array of possible organizational structures and program initiatives, ranging from simple consumer education and financial assistance programs to municipal ownership of solar powered generating equipment on the traditional public utility model.

B. MODELS FOR STRUCTURING MSU'S

This report examines three models for structuring a Municipal Solar Utility: the Direct Service Model, the Low Interest Loan Model, and the Facilitation Model. Emphasis throughout is given to the promotion of solar domestic hot water (dhw) systems, which, along with swimming pool heating, is the solar technology in the most advanced stage of commercialization today.

1. <u>The Direct Service Model</u>

Under the Direct Service Model, the MSU assumes responsibility for the full range of functions involved in solar system delivery: hardware selection, warehousing, marketing (sale or lease of the solar equipment), system design, on-site installation, consumer financing, billings and collection, and on-going maintenance. These functions can be performed on an in-house basis, using city employees, or can be contracted out (e.g. installation work to local solar dealers; billings and collections to a commercial bank). This model involves operations most like those of other utilities.

The provision of solar systems on the Direct Service Model can improve the economics of solar usage for consumers in three ways:

- through cost savings achievable from bulk purchase and installation;

- by the provision of low cost lease or debt financing;

- by guaranteed maintenance and repair.

The potential cost reductions are greatest where installation is performed on an in-house basis. However, an in-house operation may prove impractical if the city does not already have a labor force with suitable skills. It may also prove politically vulnerable to charges of unfair competition from local solar dealers.

On balance, it makes more sense for the MSU to sell solar systems to consumers instead of leasing then, and to provide its customers with low cost debt financing and maintenance services. Purchasers of solar systems can claim substantial federal and state tax benefits which are not available to persons leasing solar equipment from a public entity.

In addition to lowering solar costs, and MSU Direct Service program can enlarge the market for solar systems by guaranteeing maintenance over the life of the system. However, to minimize its financial exposure, and MSU should offer maintenance help under a separate and optional contract. The contract would be renewed periodically with charges revised to reflect the costs actually incurred in providing the service.

2. Low Interest Loan Models

As an alternative to the Direct Service Model, an MSU can limit itself to providing financial assistance for the acquisition of solar systems. Local governments have developed a number of program models for financing home improvements which could be adapted to this purpose. These include:

- direct loans -- where the city itself acts as the lender;

- secondary purchase -- where the public agency purchases loans originated by a private lender.

- linked deposits -- the city deposits funds with a local bank or savings and loan on the condition that it make low interest loans available for a specified purpose.
- interest reduction -- the city makes payments to a private lender to compensate it for making loans at below-market rates.

In most situations, the "linked deposit" approach should prove the most suitable. It lends itself either to operation of the program on a self-supporting basis or to provision of a greater subsidy. Both the risk of default and administrative responsibility rests with the private lender.

3. The Facilitation Model

Under the State's federally mandated Residential Conservation Service (RCS) Program, the major public utilities will be responsible for providing consumers with home energy audits (including advice on solar energy usage) and for maintaining lists of qualified solar contractors and sources of financial assistance. The utilities are encouraged to contract with City agencies and non-profits to perform these services. This report outlines a number of activities that MSU's could undertake to supplement the mandated RCS functions, including basic consumer information and education, technical assistance to do-it-yourselfers, quality assurance, post-installation assistance, and general promotion of solar technologies.

C. MARKET POTENTIAL AND PROGRAM CAPACITY

In the short term, the prime market for MSU services will be solar swimming pool heaters and solar domestic hot water systems in single family homes, particularly those that now use electricity to heat water. Despite the fact that solar installations are generally more cost effective in apartment buildings, the multifamily market should prove harder to penetrate.

Market surveys conducted by the State suggest that about four percent of homeowners are quite favorably disposed toward the purchase of solar dhw systems. However, MSU sales are more likely to be constrained by program delivery capacity than by market demand.

Few local rehabilitation loan programs -- the major precedent for local government financial assistance to individual homeowners -- have achieved a loan volume of over 50 loans per year. By comparison, an MSU should confront fewer obstacles in streamlining its delivery system. Moreover, local MSU efforts will be reinforced by the solar demonstration financing program to be carried out by the State's major investor-owned utilities under a mandate from the California Public Utilities Commission. On balance, a well managed and aggressively marketed MSU solar loan program could conceivably achieve an installation rate of from 100 to 200 units per year. Where the MSU is itself installing systems, it will prove harder to achieve a comparable marketing pace.

C. CONSUMER PROTECTION

Under the Direct Service Model, the MSU will be directly responsible for the quality of the solar installation. Since it will be contracting in bulk for equipment, it may be able to negotiate favorable servicing and warranty commitments.

By contrast, under the Low Interest Loan approach, the MSU will maintain an "arm's length" relationship to the contract between the consumer and the solar supplier/installer. Adequate provision must be made for pre-screening eligible products and contractors, and in ensuring that suppliers and installers live up to their obligations to their customers. This type of consumer protection will be provided by the Residential Conservation Service program when fully operable. In addition, MSU's could help make available bonded warranties, extended warranty insurance and maintenance insurance contracts.

E. LEGAL ISSUES

1. Authority for MSU Services

The authority of charter cities in California should extend to all potential MSU activities. In general law cities, the municipality appears to have authority to acquire and install solar units, provided that the MSU retains ownership. Where a general law city proposes to pass ownership of solar systems to purchasers or to extend them low cost loans, the city should seek clarifying legislation.

2. Unfair Competition and Anti-Competitive Activities

On the assumption that the activities in which a city or MSU engages fall within the scope of "public utility services", no claim of unfair competition is likely to be upheld under California law. In a 1978 decision, the U.S. Supreme Court ruled that local governments are not automatically exempt from federal anti-trust laws. However, it is still unlikely that an MSU program would be found subject to anti-trust claims and there are several practical steps which a city (MSU) can take to minimize its liability to any such claims.

3. Liability Issues

- Liability for Consumer Information Programs

  The California Tort Claims Act (Gov. Code §810-895) generally provides immunity for public agencies involving judgments made by their employees in carrying out governmental policies, including the provision of information. Any residual liability can be minimized or avoided by procedures such as the use of disclaimers and reliance on documented evaluations from reputable third parties.

  Similar consideration should apply, where the MSU provides consumers with lists of qualified contractors and/or conducts post-installation inspections as part of a financial assistance program. However, to retain immunity under these circumstances, it must be clear that there is no contractual relationship between the MSU and the equipment supplier or installer.

- Liability for Work or Equipment of Independent Contractors on Contract to the MSU to Supply or Install Solar Systems

  In essence, the Tort Claims Act, §815.4, specifies that a public agency will be liable to the same extent as a private party contracting for the same services. As a general rule, the employer of an independent contractor is not liable for harm to others caused by the contractor. However, numerous exceptions to this rule can be found. Liability can be minimized through careful drafting of bid specifications and other consumer protection procedures.

- Liability for Equipment Furnished by the MSU and for Installation Work Performed by its Employees

  The MSU's liability will be essentially the same as any private supplier/installer of solar systems where it provides services directly.. However, the Tort Claims Act generally insulates the public agency from liability if its employee would not be liable. It is also unlikely that the "doctrine of implied warranty" (under which some distributors have been held liable for manufacturing defects) could be applied successfully to a public agency in California.

4. Revenue Bond Authority Under State Law

It is unlikely that general law cities can market revenue bonds to capitalize an MSU without specific enabling legislation.

5. Federal "Double-Dipping" Provisions

The Crude Oil Windfall Profits Tax Act of 1980 denies the federal residential energy tax credit to expenditures made with "subsidized energy financing" from a federal, state, or local program. This prohibition clearly applies to local programs capitalized with tax exempt bonds. It is also likely to apply to any program that makes loans available to consumers at an interest rate lower than that obtainable by a city on its own reserve funds.

OPTIONS IN ALTERNATIVE ENERGIES:

THE MUNICIPAL SOLAR UTILITY

Solar energy programs are entering a critical transitional period as they move from the initial marketing of solar technologies into a phase of widespread commercialization. California faces the dual challenge of installing enough solar systems to prove solar as a viable alternative or while trying to ensure the systems are designed and installed properly while providing the promised energy savings. These two barriers (1) high initial costs of solar relative to conventional energy forms and (2) inadequate protection of the public from the risks associated with establishment of a new industry, have been directly with the municipal solar utility program (MSU). Until the beginning of the Commission's program, the MSU concept had been confined to the one existing program started in 1976 by Santa Clara. Concentrating on solar pool heating, Santa Clara addressed the barriers by reducing the first costs of system purchase to installation costs alone ($300), by spreading this purchase price of the lifetime of the system on the consumer's monthly water utility bills ($14-$15), and finally, by insuring system reliability through a program of continued maintenance of the solar pool systems after installation. The solar utility payments are currently 30% to 30% less than the cost of natural gas to do the same job, and there is an added advantage of having a fixed rate of amorization (10 years at 7%) especially in the face of fluctuating interest rates and increasing conventional utility rates.

This initial concept prompted the Department of Energy to award grants to the California Energy Commission and City of Los Angeles to develop and implement broader alternative MSU mechanisms. The Commission will pass through its share of the federal monies , supplemented by state funds, to six communities chosen early in 1979. These six: Bakersfield, Oceanside, Palo Alto, San Dimas, Santa Monica, and Ukiah, together with Los Angeles, have formed the California Solar Utility Development Authority, and will develop a range of options and plans that local jurisdications can use as models for their own solar utility programs.

The name municipal solar utilities normally brings to mind a limited perspective of the varied role(s) the MSU can play in the community. The terms municipal, solar, and utility need not be restrictive, although activities to date have been aimed primarily at cities and limited to domestic solar hot water heating. Municipal can be expanded to include, counties or other governmental jurisdictions, community organizations (homeowner associations consumer or environmental groups and user co-ops) non-profit companies, profit making firmsor joint ventures between conventional utilities, installers, distributors and/or local governments, etc. Solar, too, is not restricted to active and passive applications only but includes conservation, wind, biomass, hydro at a later date, as well as photo electric.

Ideally, a municipal solar utility is the focus a community can begin to develop a total energy package for its citizens, with the utility being a chartered organization which performs one or more services to the community. These services may include the billing, owning, installation and maintenance of solar systems, job training, consumer protection, system financing and electricity generation. How the services are delivered depend on the individual jurisdiction and the purpose for establishing an MSU.

ISSUES

The MSU efforts in California are being prepared as not just conceptual studies, but as implementation plans of sufficient completeness so that operations of the solar utility can begin soon after the MSU plans are adopted by the community's governing board. To meet these conditions, three stringent design constraints must be incorporated within the MSU plans:

1. The MSU must provide its service that are both cost-competitive with current conventional utility services while not undercutting the private sector.

2. The MSU must be able to provide rates of return on invested capital with as little as risk as possible and provide substantial enough benefits to attract the initial monies required for the purchase of solar hardware, staffing and overhead.

3. The MSU must (under current Proposition 13 fiscal limitations) be self-supporting in meeting its operational expenses unless a subsidy is explicitly agreed upon by the community's governing board.

When viewed as incremental additions to existing community programs, the MSU's political acceptability is increased and the implementation of the concept accelerated. Designing MSUs to meet multiple objectives improves the MSU's overall benefit to cost ratio and increases the ability of communities to tap a broader array of potential sources of funding.

MARKETS

The MSU must be tailored to the markets existing in the community by combining the design constraints, community issues and desired mix of services. At present, background information on the six cities is being compiled such as income levels, type and current consumption of fossil fuels, family size, housing characteristics, climatic and insolation data. The six cities have focused their MSU efforts on specific target groups, the needs of those groups, the best organizational formats for reaching target groups, methods of information distribution, and best way to package the financing and consumer protection plans for the specific target groups.

Cost-effectiveness data specific to each city will be generated using a combination of F-chart and SOLFIN runs. Similar to Sol Cost, SOLFIN (solar financing) is a computerized economics/financing program capable of comparing life-cycle costs of a variety of solar and conservation applications to those of conventional fossil fuel energy systems.

Perhaps the most important marketing issues the seven jurisdictions must face over the next few months centers on the relationship of the MSU with the investor owned utility retrofit program required under the state's Residential Conservation Service Plans (RCS).

The RCS program, required by the National Energy Conservation Policy Act (NECPA), is designed to encourage a reduction of nonrenewable energy use in the nation's homes. Emphasis will be placed on increased application of conservation measures such as insulation/window caulking and the use of solar and wind energy systems to displace some conventional energy.

As presently conceived, the MSU can play a variety of roles depending on the community's and investor-owned utilities (IOU) needs. These roles can be approached as active competitors to the IOU's; as contractors for specified services (and its or post installation inspections); as contractors competing with other installers or financers on utility mast lists and as cooperative ventures between local governments and the utilities.

ORGANIZATIONAL FORMAT

A variety of alternative organizational formats are being developed by the communities with a number of legal considerations being addressed. These legalities of an MSU operations center on issues of municipal liability such as incurs when the city subcontracts for installations with private constractors; the accountability of providing comprehensive consumer information that includes performance data, cost benefit analysis, workmanship standards or warranties; possible regulation of the MSU by the California Public Utilities Commission if the MSU was a joint venture with an investor-owned utility; legal restrictions on use of city funds by Proposition 13.

The proposed organizational format must also pay particular concern to the existing governmental operations when the MSU is to be incorporated into an existing office or agency of the community. Unless supportive staff within the target agency advocates the inclusion of this program into the agencies' activities, the MSU will likely be perceived by the agency's management as an added burden on its already overworked personnel.

These problems have been mitigated by the seven jurisdictions through several approaches: First, is to develop an MSU in collaboration with the personnel of the agency that will operate the program; second, is designing benefits (such as revenues, not budget cut, prestige) for the target agency into the MSU to offset the initial and perceived costs; third, the MSU may be structured as a non-incremental change to city services. Although somewhat risky politically, the MSU can be created resembling a private or quasi public agency operating like a free market entity but under the direction and control of the city.

FINANCIAL REQUIREMENTS

The MSU may be thought of as a small business, and its survival depends on its ability to draw sufficient low-cost capital to fund its initial and on-going expenses and to insure an adequate and stable cash flow.
The advantage of municipal participation in the form of an MSU are several. First, the municipality is able to attract low cost capital through bonding mechanisms and take advantage of a variety of innovative, alternative bond forms. Secondly, the MSU can attract additional sources of capital through municipal investments in private banks. This can be done through reasonable, guaranteed rate of return to draw what limited venture capital might exist, through utility reserve funds or other municipal reserves and through a variety of state and federal grants or loan programs. The major consideration is one to insure that the methods of capitalization are legal and the business plan is attractive to investors.

To help answer the questions of financing, legalities and liabilities, the six cities have contracted with John M. Sanger and Associates as consultants. Specific decisions relating to the nature and extent of the utility proposed by each city will require the consultant work directly with each city.

Each of the six cities will present two options for MSU implementation for their respective city councils; one option was specified in general terms by the EC prior to city selection and the second option was left open to the discussion of the individual city. Two options insure that the city councils of each jurisdiction have some choices in providing the best program for the needs of their community as well as giving the CEC additional information on the political viability of one option versus another.

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MARKETING A MUNICIPAL SOLAR UTILITY

(The Economic Impact on the Consumer)

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ABSTRACT

The City of Santa Clara is now in its 5th year of operation of the nation's first solar utility. Santa Clara's municical utility services also include electric, water and sewer. The solar utility provides solar heating equipment which is owned and maintained by the utility, installed on private property and paid for through a rate that is, essentially, a monthly rental fee. The municipal solar utility subscriber pays an initial installation fee to cover the labor and permanent materials required. Monthly payments are set to amortize the cost of the solar equipment over the expected service life (with some added percentage for administrative overhead and routine service). The operational experiences of this period have proven out the original concept. To date, over 140 installations have been made.

1. INTRODUCTION

The advantages to the consumer in obtaining a solar heating system from the municipal solar utility are basically reduced to questions of (1) performance and reliability and (2) economics. The performance is, in effect, guaranteed by the utility. Proper design and installation is insured by the utility staff and the ongoing service and maintenance is a part of the lease contract. On the whole, the municipal utility seems to enjoy a greater degree of consumer confidence than private industry.

2. GENERAL ECONOMICS

Different economic considerations can affect various segments of the consumer market in a decision to obtain solar heating equipment. The high first cost of a solar heating system is a definite deterrent. Although the tax credit in the State of California can give a 55% return the first year, this is only good for those persons who would otherwise be paying that amount of state tax. People with low incomes or sufficient tax deductions who already have little state tax to pay, would not see much benefit from the state tax credit. Others, such as apartment dwellers and some owners of rental property, are excluded from the tax law. The advantage of the solar utility approach for this market is the possibility of immediate monthly savings in net utility payments. This is a result of the cost of the solar system being spread over the approximate life of the equipment. With the current natural gas rate structure, which hits a high of over $0.50 per therm, the cost for heating a swimming pool with a rented solar system is about half the cost of the natural gas required to do the same job. Of course, the solar system has an excess heating capacity for some times of the year; still, a typical subscriber to the solar utility will pay a fixed rate of about $200 for a 6-month season to eliminate a gas bill that would be $300 to $400 for the same season. Even in sunny California the nights are cool enough to reduce a pool's temperature by 6 to 8 F each night with some supplemental heating required to maintain comfortable temperatures.

Obviously, there are some risks in estimating the life of some of the equipment and the routine maintenance costs of a relatively new technology. The program experienced some high costs for replacing early equipment that did not prove to be as reliable as it should have been. However, with improved products and installation procedures, the past two years show a reduction in maintenance costs. Due to increases in material costs, the city had to raise the rates for swimming pool systems by about 15% for all customers as of July 1, 1979. This was the first such rate increase since the program was started in 1976. Since the increase was the first in four years and was considerably less than the latest increases for natural gas service (over 64% in September, 1978), it was well accepted by the utility subscribers.

2.1 Swimming Pool Heating Costs

The cost advantage for solar heating a residential pool is probably the most important reason for the popularity of the city's program. People are not "buying" energy conservation or installing solar heating equipment for the public good; rather, most are simply interested in a heated pool at the lowest possible cost. Although the direct purchase of a solar system for $3,000 (with a 5-year bank loan) will provide a net bonus of $800 the first year, as mentioned above, this only applies to those who would otherwise be paying over $1,600 in state taxes. For most households, this would not be the case, so the credit would have to be spread over several consecutive years. This dilutes the impact of the state's tax credit. For a state tax liability of $300 to $400, the homeowner would not see the full 55% tax credit for four to five years.

The lease payments for the solar utility program are less than the cost of natural gas to do the same job from the first month of a new service. With the inclusion of the installation fee, the cumulative cost of a leased solar system is still the best investment choice against the cost of gas or a direct purchase after the third year. At the end of ten years, of course, both the direct purchase and the utility lease program result in about the same cost to the consumer, and either option is less than half the projected natural gas costs over this period, for a substantial savings to the owners of a "typical" swimming pool. This does not include other potential savings, such as the reduced scaling and increased life of the gas heater or, in some instances, the savings in capital cost if no backup heater is installed. Also, older pool heaters are notoriously inefficient and, at 50% efficiency, every therm the solar system adds to the pool is worth two therms of gas saved.

2.2 Domestic Hot Water Costs

Solar heating for domestic hot water is a more difficult game to play; the rules change somewhat to the disadvantage of solar. The first major difference is that the cost of fuel for the average household is usually within the lifeline allotment of the bottom of the rate schedule (as opposed to the top of the scale for those heating swimming pools). This yields a cost of $0.22 per therm for natural gas (February, 1980). Even for 15 therms per month (to yield about 60 gallons of hot water per day) the cost would be $3.30. This is a rather tight budget for the consumer to use for paying back the capital cost of any energy conservation device.

At this point an argument can be made that the true comparison should be between the costs for solar equipment and the marginal costs of new sources of conventional fuel. For natural gas this has been stated at 50¢ to 60¢ per therm from the proposed LNG facility near Santa Barbara. For the above example of 15 therms per month, the current cost would be $9.00--still about 60% of the $14.50 per month charged by the solar utility for a solar water heater that provides, at best, 70% of the energy demand. Future higher rates for natural gas may improve the equation, but political considerations will probably prevent all of these costs from being passed through directly to the consumers. This is the rationale for government subsidies and incentives such as state and federal tax credits to encourage the use of solar equipment. As the State of California tax credit applies to the city's program, the first cost (for installation) and the principal recovery portion of the lease payments are eligible for the direct credit. The lease interest portion is, of course, already a deduction off the taxable income.

With the present cost of electricity, the economics are more favorable for solar versus electric water heating. An electric rate of $0.033/kWh would compare with $0.966/therm for natural gas. Although this higher rate is mitigated somewhat by the higher efficiency and reduced standby losses for an electric water heater, the same 60 gallons per day would cost about $12/month at the present rate.

The second difficulty in using solar for domestic hot water is the typical pattern of energy use. For swimming pools the seasonal demand for energy approximates the supply of available solar energy. With domestic hot water heating, the demand is fairly uniform annually with a surplus of solar energy at times in the summer and a large deficit in the winter months. There is also a "load management" problem for the solar household. The ideal would be to spread the use of hot water throughout the day; however, the opposite is often the case. In some households studied, 90% of the hot water use occurred between 5:00 p.m. and 8:00 a.m.

Still, assuming that 70% of the annual hot water use can be met by solar heating, it is difficult to convince the consumer to invest in solar energy equipment. In fact, the only option that would seem to have a chance for success would be the utility lease program, and even that is viable only with the state tax credit extended to such a program. Again, a case can be made for the comparison with the marginal costs of new generating capacity, but there are still unanswered the questions of whether the solar equipment is, in fact, replacing ~~peak load facilities~~, base load facilities, or merely the fuel cost component of our electric rate.

There are many even less tangible factors in this broad question of solar water heating. Concerns such as availability of fuel sources, interruptible service and the environmental effects of continued use of conventional energy sources may require additional subsidies and incentives to favor solar development. The answers to these questions are beyond the scope of this study. Various studies are now being conducted to answer these questions throughout the country. The results will be different for different regions, mostly depending upon whether the service area has a winter peak (for heating) or a summer peak (for cooling).

2.3 Working With the Investor-Owned Utility

Within the State of California the Public Utilities Commission has recently directed the four major investor-owned utilities to provide some mechanism to finance the installation of domestic hot water solar systems for 10% of the electric domestic hot water customers and 2% of the natural gas domestic hot water customers. This would require solar installations to serve about 180,000 households in California over the next 3 years.

Some of the more aggressive financing programs (no interest, installation costs to be paid back at time of resale) may severely limit the options of a municipal solar utility while not necessarily promoting the wise use of solar energy. In addition to financing, two of the primary reasons for the existence of the municipal solar utility are the assurance of a reliable solar system and provision for dependable service. These are not necessarily addressed by the offer of attractive financing.

Several options exist for continuing the service of the municipal solar utility while still allowing the investor-owned utilities to meet the request of the California Public Utilities Commission:

1. Municipal solar utility can support the investor-owned utility with system sizing, inspection and certification. A private company would still sell, install and maintain the systems. The customer would own the system and pay for maintenance.

2. Municipal solar utility can sell equipment, in addition to the service of inspection and certification. The investor-owned utility would finance the installation and pay the municipal solar utility. The installation and maintenance would be by either the municipal solar utility personnel or by private contractor. The customer would own the system and pay for maintenance.

3. Municipal solar utility can own the equipment and lease it to the customer, perhaps as a "maintenance contract". The investor-owned utility would pay for the initial installation fee (to the municipal solar utility). The municipal solar utility would be responsible for service on the equipment.

4. Municipal solar utility can operate a central clearinghouse of information on equipment, contractors and various financing options, including that offered by the investor-owned utility.

Since the Public Utilities Commission has ordered this pilot financing program to run for only three years with no assurance of continuation, the municipal solar utility concept has a much larger potential for providing ongoing service and financing for its customers.

In the interim, some mutually workable arrangement should be reached for the benefit of the customers, municipal solar utility and investor-owned utility. This arrangement will vary with different agencies and jurisdictions.

3. CONCLUSION

Still, the City of Santa Clara is continuing in the expansion of the solar utility program. With the expectation of future rate increases for conventional utility services, the solar utility will be prepared for marketing the appropriate energy saving devices as they become economically feasible. With the current service rate, the city's program is self-supporting and, with an ever increasing base, will be generating revenue for expanding the service to other applications for energy conservation. These practical uses of solar energy which Santa Clara is promoting now have an aggregate return of over 200,000 therms of natural gas saved annually. At a current average cost of about $0.32 per therm, this saves the city and the residents over $64,000 per year.

Appendix B

Solar Covenants and Ordinances

SOLAR COVENANTS AND ORDINANCES

At the present there are several means of providing solar-access protection. Although there is very little legal precedence, many states and communities have adopted some of these methods. There still exist questions concerning the constitutionality of these methods and questions related especially to enforcement of these methods and the exact nature of public benefit to private solar-access protection. Currently there are four methods of providing solar-access protection:

1. **Prior Appropriation.** Prior appropriation is basically a "first come, first serve" method of solar-access protection. It simply provides protection for existing and new buildings, primarily those with more critical solar energy needs.
2. **Private Remedies (Solar Covenants).** This method provides solar-access protection through an agreement between two parties or by a covenant, which may affect several parties. Refer to the sample solar covenant in this appendix.
3. **Public Permits (Solar Ordinances).** Public permits and/or zoning controls can give generalized solar-access protection. Projects must conform to local solar-access ordinances, or they can undergo a special review process in which a permit may be issued.
4. **Public Nuisance Laws.** This method may provide solar-access protection where shading of solar energy is considered to be a public nuisance.

Before examining two of these methods in detail, several issues and questions need to be raised. The practical implementation of solar-access appropriate municipal, county, or state authority or by the owner of the property suffering the aforementioned nuisance.

SOLAR ORDINANCES

Many communities are currently establishing land-use regulations to provide solar-access protection. To make a broad-brush approach to solar-access protection is difficult. The ordinance needs to be open enough not to inhibit development and devalue property. On the other hand, it needs to be tight enough to provide real protection for solar energy systems.

In 1982 the city of Boulder, Colorado, adopted an ordinance to protect the potential for the use of solar energy for home owners and renters while recognizing variations in density and topography. Three solar-access areas were created. The reason for designating three areas was to provide solar-access protection consistent with planned densities, topography, and lot configurations. Descriptions of the three areas follow:

1. **Solar-Access Area I.** This was designated to protect solar access principally for south yards, south walls, and rooftops in districts that currently enjoy such access. Low-density residential districts are included in this area. Zoning districts in area I include RR-E and LR-E.
2. **Solar-Access Area II.** This was designated to protect solar access principally for rooftops in districts where this level of solar access is already enjoyed due to the current level of development. Medium- and high-density residential districts are included in this area. Zoning dis-

tricts in area II include LR-D, MR-E, MR-D, MR-X, HR-D, HR-D, HR-X, I-E and I-D.

3. **Solar-Access Area III.** This was designated for districts where, because of density, topography, or lot configuration, uniform solar-access protection for south yards, walls, or rooftops may unduly restrict permissible development. Solar-access protection in this area can be obtained through the permit process. Zoning districts in area III include P-E, A-E, CB-E, CB-D, RB-E, RB-D, RB-X, TB-E, and TB-D.

The specific method for determining solar-access protection in these three areas is relatively simple. First of all, the duration of solar-access protection is 4 hours a day. This is especially important on December 21, the shortest day of the year. A solar fence or hypothetical obstruction is the vehicle designed to determine whether or not a building conforms to the solar-access ordinance. In area I a fence height of 12 feet is used; in area II a fence height of 25 feet is used; and in area III there is no fence—in other words, there is no solar-access protection provided through the ordinance. Refer to Figures B-1 and B-2 for illustrations of the solar fence.

A parcel of land can be developed and buildings erected within the bounds of the requirements set by the zoning district, including the buildable area of the site and height limit. A building or structure cannot exceed the specified height limit or a height that would cause the build-

protection is bound to occur with the tremendous growth in installation of solar energy systems in the residential sector especially in more urban contexts. Following are points worth considering before institutionalizing solar-access protection:

1. Does solar-access protection fall under the scope of public health, safety, and welfare; if so, does it justify use of police power?
2. Does one private user have the right to restrict another private user in order to gain solar-access protection?
3. Is the argument of private protection of solar access as a public savings of energy justifiable? Does a specific solar energy system really remove a burden upon public utilities?
4. Is solar-access protection included under the constitutional guarantees of equal protection under the law and due process?

SOLAR-ACCESS COVENANTS

Within the PUD and subdivision processes, solar-access covenants, or solar-rights covenants, can be established. In effect, covenants such as these can provide solar-access protection to individual unit owners. The type of protection may vary from project to project depending upon the level of solar-access protection required and the duration of solar access. When preparing a solar-rights covenant, consider carefully the desired duration of solar access, generate a complete listing of the kinds of solar-access obstructions, and identify the method of enforcing the covenant. The following is a typical solar-access covenant put together using information from the Urban Land Institute's *Residential Development Handbook*[72] and G. Boyer Hayes's *Solar Access Law*.[30]

Example Solar-Access Covenant

No building, part of a building, or structure of any nature, no vegetation or landscaping element, and no other object may be constructed, erected, or planted in such a manner as to intrude or encroach into the sky space, or solar window, designated for solar energy collection. The solar collection device or devices must be free of any shading whatsoever and must be exposed to direct solar radiation (that is, there must be a direct, unobstructed line-of-sight path of the sun to the solar collection device for that period of time commencing at 9 a.m. true solar time and continuing through 3 p.m. true solar time on each day of the year. There shall be no

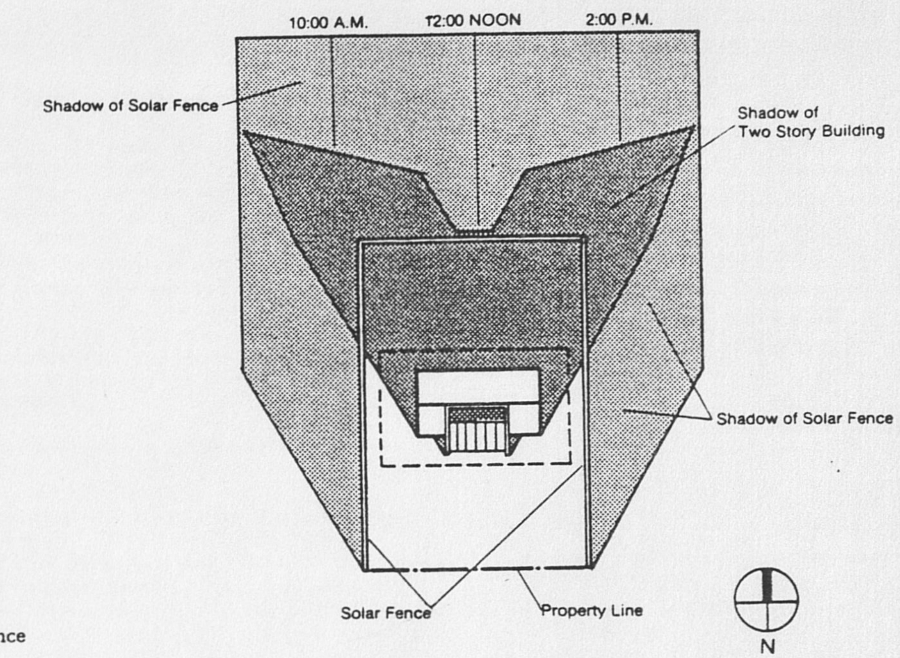

Figure B-1 Boulder solar-fence concept.

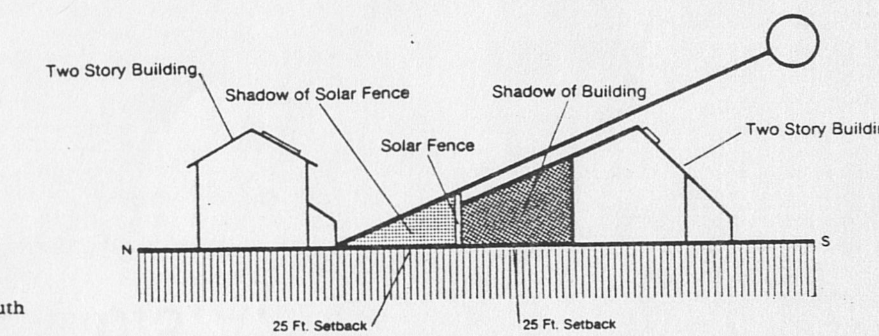

Figure B-2 North-south section.

obstruction of or interference with the necessary solar radiation during the time previously specified or with the efficient operation of said solar collection equipment or devices. In the event any building, building part, structure, vegetation, landscaping element, or object of any type is erected or constructed, maintained or cultivated in a manner as to violate the provisions of this covenant, then such violation shall be deemed a public and private nuisance and shall be subject to appropriate action and/or legal proceedings to prevent, enjoin, or remove such nuisance. Legal proceedings to prevent such nuisance may be commenced by the

ing to cast a shadow beyond that of the solar fence. Figure B-1 illustrates a single-family house in area I, where the solar fence is 12 feet in height. The solar fence bounds the east, north, and west sides of the site. The shadow for the fence was determined by 10 a.m., 12 noon, and 2 p.m. sun angles. Concurrently, the 10 a.m., 12 noon, and 2 p.m. shadows of the house are within the bounds of the fence shadows.[55a]

Solar-Access Permits

Solar-access permits may be obtained in order to afford opportunities for solar energy use in circumstances where the basic solar-access ordinance is inadequate. A permit may be obtained by a property owner who intends to construct a solar energy system or by one who already has one in operation. The permit may be obtained through the normal application process. No permit shall restrict use of other property beyond the extent reasonable to ensure efficient and economical beneficial use of solar energy by the permittee.

ASHLAND, OREGON'S SOLAR STRATEGY

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ABSTRACT

The paper outlines the conceptualization, implementation, and experiences of a small southern Oregon community in attempting to increase the energy efficiency of new residential developments. The two main ordinances used are 1) a city-wide solar access ordinance, which establishes a special "solar setback" in the city, and 2) a new development code for housing, which provides for powerful incentives for passive solar housing. Successes and insights gained from the experience are discussed.

1. INTRODUCTION

Ashland, Oregon, situated just 15 miles north of the Oregon-California border, is unique in several respects. It is a community in a beautiful setting, poised on the northern slopes of the Siskiyou Mountains, with a panoramic view of the Bear Creek Valley, and it is the home of Southern Oregon State College and the internationally reknown Oregon Shakespearean Festival. Perhaps because of its uniqueness and the unusual combinations of people who live there, Ashland has also been seeking ways to promote a transition from conventional energy sources to renewable energy sources. With its sunny climate, one of the first sources of energy which the city tried to encourage was the use of solar energy for space heating purposes.

Enthusiastically pursuing these efforts, Ashland, in 1978, made some quick changes to its policies, attempting to establish a municipal solar utility which would lease solar hot water heating equipment to homes, and implementing a crude solar access code, which simply increased the required setback on the north side of the building by 40%.

Both of these actions met with disappointing results. It was found that the Oregon State Constitution prohibited expenditures of public funds for private improvements, which effectively prohibited the city from developing a leasing program as it had desired. The solar access code was disappointing in its effects, requiring too great a setback in some cases and not enough in others to adequately protect solar access.

These actions, although unsuccessful, led to a community desire for action and a belief that, through use of a local community's power to enact laws and ordinances governing land use, a significant impact could be made on the way a community's energy use patterns develop. In December of 1979, the Citizens Planning Advisory Committee (CPAC) sat down to formulate laws and policies which would give good results with a minimum of problems.

The city decided on an action plan which would do the following:

a) Protect solar access to all properties throughout the city. This was deemed important in that the city was attempting to guarantee a reasonable amount of solar access so that investments in solar equipment could be guaranteed. As one participant put it: "Once you've made the investment in a solar house, shading someone's sun would be like cutting the utility lines or gas lines to a conventionally powered house."

b) Maximize solar energy use in all new developments of any size in the city. This was to be accomplished without the use of manditory measures, if possible.

The method developed to implement these plans was contained in two amendments to the city's Land Use Development Code. The first amendment provided for special setbacks in all areas of the city which would protect solar access to adjacent parcels. The second amendment was a revision of the city's Land Development Code which required that energy efficiency be considered in all phases of the development, and also provided a density bonus if developers were willing to build passive solar housing and install solar hot water heating. The bonus varied directly with the efficiency of the units, as determined by a standardized system of evaluating the energy consumption of the proposed units.

2. SOLAR ACCESS ORDINANCE

The first problem to tackle was amending the city's Land Development Code to ensure solar access throughout the city. Two excellent sources were used in developing this ordinance, namely The American Planning Association's "Protecting Solar Access for Residential Development: A Guidebook for Planning Officials," and "Solar Access Law," by Gail Boyer Hays. While these two sources provided a number of excellent ideas, there was not any single example of a working solar access code which could simply be adopted and implemented by the City of Ashland. We also found that the mathematical formulas on which to base a solar access ordinance were difficult to obtain.

CPAC and the Planning Commission wanted to formulate a code which would ensure a reasonable amount of access without greatly hindering existing development practices. The original concept was to use a simple approach, understood by all, and relatively easy to implement. However, this was found to be impossible to develop, as most simple approaches are plagued with inequities and do not guarantee solar access. The model for the code which was finally developed would ensure a shadow no higher than a 6-foot high fence at the property line. The trigonometric formulas to regulate setbacks by building height and the slope of the land were then derived by staff.

In choosing the day and hours for which protection would be guaranteed, Ashland chose from 10 a.m. to 2 p.m. on January 21st, since it was found that "ideal" hours of protection, i.e., 9 a.m. to 3 p.m. on December 21st, were too restrictive and would have been too radical a change in the development patterns of the city.

It was found that even this model would have to be modified to take into account the shadow lengths generated by even one-story buildings on north-facing slopes. As north slopes increase arithmetically, shadow lengths increase geometrically. We found that on north-facing slopes greater than 10%, 6-foot high shadows at the property line could not always be guaranteed and still provide a reasonable building height. The formula was modified so that the shadow height rose gradually from 6 feet high at a 10% north-facing slope to 9-1/4 feet high at a 20% slope. On slopes greater than 20%, the increases in the setback required were so dramatic that we simply decided that the properties would receive the same access as on a 20% slope. In addition, we had to make a provision that, if a 16-foot high building could not be constructed on a property due to the requirements of the solar access ordinance, the requirements for protection would be dropped from south-wall access to rooftop only access, and this would be guaranteed by a 16-foot high shadow at the property line. It was felt that, since properties on this kind of slope had such poor solar access to start with, the city could not guarantee complete protection in some areas.

Placing these modifications in ordinance format was difficult indeed. The ordinance was riddled with trigonometric formulas to determine a setback. We of course realized it was impossible to expect ordinary people to compute several different formulas to find their appropriate setback. To solve this problem, we developed a nomograph to be used to determine the setbacks required. By drawing vertical lines through the slope and a horizontal line through the building's height, the lines will intersect at a point which represents the building's setback. The setbacks are read in the same way topographic elevations are read off a topographic map. An explanation sheet was written as well, giving step-by-step "cookbook" instructions on how to compute the setback. This ordinance was adopted and became effective in August of 1980, making Ashland the first city in Oregon to adopt a solar access ordinance, and one of the first in the nation.

3. EXPERIENCE AND IMPLEMENTATION OF THE SOLAR ACCESS ORDINANCE

Once the ordinance was adopted, the first problem was to educate the public, especially the development community, about the solar setback, as it is called. At first there was some confusion, as buildings had been designed without knowledge of the code. However, as the fact that Ashland had adopted the solar access ordinance became well known, most builders began designing the homes on the lot with the ordinance in mind. It was found that, after a period of 3 or 4 months, the number of modifications necessary to meet the solar setback dropped dramatically.

There have been a number of effects attributable to the adoption of the code. The first is the increase in the awareness of solar access issues among builders and developers. While initially somewhat resentful of being required to compute the solar access setback, the nomograph and shadow plans required by the ordinance were simple enough that most builders acquired the necessary skills quickly. Builders then became increasingly quite aware of shadows cast by their buildings and also of the solar access available to their property. In addition, this seems to have increased the awareness of the potential for solar design in home plans. Before the solar access ordinance went into effect, there were only 10 solar houses in Ashland, but, since it went into effect, approximately 20% of all the dwelling units constructed in Ashland have had some solar application--either solar hot water, solar greenhouses, or full-blown passive solar design.

The problems with the ordinance are relatively minor, but we are considering a number of modifications. The use of a nomograph has been the key to the success. The ordinance is easy to understand once the initial shock of having to learn a new skill is over. However, the ordinance that was adopted contained trigonometric formulas. The trigonometric formulas are so intimidating to most people that they tend ti give up on understanding the ordinance after one look. In the future, when we amend the code, we intend to adopt the nomographs by reference, perhaps incorporating the formulas in a footnote, but certainly not in the text of the ordinance itself.

The second problem is that the ordinance needs to make some provisions for exempting areas which do not have enough solar access to warrant any solar development. For example, some areas in Ashland are in canyons which have very little sunlight in the wintertime. These areas do not need to be protected for solar access since they have very little appreciable solar gain. Thirdly, outright exemptions, we feel, need to be granted to areas where the north-facing slopes are so great that the ordinance does not allow reasonable building.

Even with these exemptions, about 90% or more of Ashland's homes in the future will have guaranteed solar access. We should note at this point that Ashland's method is more complex than most cities need because of our complex topography. However, simpler methods can be developed for cities which do not have complex topographies and achieve the same results.

4. PERFORMANCE STANDARDS

The second thrust of Ashland's strategy was to provide for a better system of development, one which would encourage solar planned unit developments rather than subdivisions. The city adopted a performance standards code to replace the subdivision code. Performance standards are similar to many cities' planned unit development ordinances in that they permit a very flexible system of development. There are no minimum lot sizes, minimum lot dimensions, or other arbitrary standards. Instead, the number of dwelling units is determined by the number of acres in the development. The primary concern is to retain the natural features and to create a pleasant residential environment, allowing for many different types of housing and many more different lot sizes than in conventional subdivisions. Performance standards are superior for solar development, because the flexibility of performance standards allows all units in a development to be oriented for maximum solar gain during the heating season without regard to the arbitrary geometric pattern imposed by subdivisions. To ensure that the new performance standards guidelines would be widely used, most of the vacant developable land was placed in an overlay zone, which made the performance standards manditory in those areas. This has created a significant impact on the new single-family residential development within Ashland.

The performance standards code contains several features which were used to encourage solar development. The first item is that one of the major "findings of fact" required of the developer is that "the maximum use is made of renewable energy sources, including solar, where practical." This means that all developments are required to address the energy use of the development. The developer is also required to make maximum use of the energy available from the sun. The second feature is that, since performance standards are based on density determined by the number of dwelling units per acre, it is relatively simple to allow bonuses for items which are considered desirable, but are not mandatory for all developments. Accordingly, the city included a density bonus section. Density bonuses are granted for:

a) Energy-efficient housing (up to 40% increased density),

b) Solar hot water (up to 5%),

c) Common open space (up to 15%),

d) Recreational facilities (up to 10%),

e) Low-cost housing (up to 10%), and

f) Good design features (up to 10%).

A maximum density bonus of 60% was established so the developers could pick and choose from those density bonuses which they felt to be most appropriate for their developments.

The energy-efficient density bonus was based on the expected thermal performance of the structure, rated in BTU's, per degree day, per square foot. A 10% bonus was given for structures which were less than 4 BTU/DD/FT^2, up to a 40% density bonus for structures which were less than 1 BTU/DD/FT^2. Most developers operating under the performance standards have had no problem receiving density bonuses of 20-25% using simple passive solar design. In addition to the ordinance, a set of guidelines was established to familiarize developers with the concept of performance standards and the benefits of passive solar design. These guidelines contained a simple set of rules that, if followed, would result in reasonably efficient homes. However, most builders, we felt, would want to design their own solutions. Therefore, the city arranged for Southern Oregon State College to provide, for a minimal charge ($5.00), a computer program which would estimate passive solar performance. This program, called PASFRAC, was developed by the Oregon Department of Energy for use in their tax credit program. The city modified it somewhat, including additional data necessary for processing under the performance standards code, and to date it has been used frequently by developers for both passive solar PUD's and individual, single-family homes to estimate the savings of passive solar construction methods.

5. RESULTS TO DATE

Unfortunately, since the passage of the performance standards code, the housing industry in Ashland has suffered a dramatic slow-down, because the market for financing is so poor. However, there have been four applications for projects for a total of 48 units. All of these projects opted for some energy-related density bonuses. Twenty-eight of the units are in an area which has extremely poor solar access, being in a canyon full of evergreen trees. These opted for extra insulation and heat pumps as an energy-saving option and received the minimum 10% bonus. The remainder opted for passive solar design homes and received from between 20% to 30% density bonuses.

It has been our experience in dealing with developers that the density bonus is a very powerful incentive. As the additional cost of building a passive solar home is quite small, the density bonus is an excellent incentive. The increased density has not affected the quality of developments, in our opinion, as the "base" density for performance standards was lower than that which was allowed in subdivisions. Due to this, projects which do not qualify for any density bonuses have less units than under the old subdivision code, while projects which receive density bonuses may be as much as 40% higher in density than under the old subdivision code. However, due to the superior design, the apparent density is less, since there is more open space.

6. FUTURE PROPOSALS FOR ACTION

The success of the density bonus program has led to a number of activities. First of all, the overall impact of this program is now being assessed. We estimate that approximately 80% of the housing built in Ashland will be built in the P-overlay zone in the next 20 years. Most of these developments will choose the density bonus option. Therefore, this simple act has made a significant impact on our future consumption of non-renewable energy resources. This success has inspired the city leadership to develop a comprehensive energy plan, now in draft form. This plan calls for several new initiatives: first, to extend the performance standards density bonus concept to multi-family as well as single-family housing, and, secondly, to establish a 10-year payback standard for energy conservation in commercial and industrial developments. This concept would require that an analysis be done for each development so that all energy conservation or solar options which have at least a 10-year payback or less can be implemented. This is not a density bonus, but a mandatory requirement.

Additional bonuses are being considered in multi-family, commercial, and industrial developments so that the city can offer incentives for outstanding performance by developers. In addition, the city is developing a comprehensive conservation program for weatherization of its housing and commercial building stock, as well as a subsidy program for solar hot water. Funding for these programs will come from the Bonneville Power Administration, from whom Ashland will be buying electrical power as of February, 1982.

7. CONCLUSION

Several conclusions can be drawn from Ashland's experiences. The first is that solar access is an essential ingredient to any community serious about developing solar energy as an alternative. Without assurances that access can be protected, the successful, widespread use of solar energy cannot be assured. Indeed, it has been our experience that many banks will not loan on a solar house unless solar access can be guaranteed. Secondly, communities should look to their development codes, whether conventional subdivisions or nonconventional performance standards or PUD codes, to develop no-cost financial incentives through density bonuses. The cost to the community is small and the benefits in terms of energy conservation are large. Thirdly, a community's power to make significant changes through a number of planning and zoning related codes is very significant. Communities should seriously investigate these alternative routes as ways to increase their community's energy efficiency in the future.

AN ARCHITECTURAL VISION OF MARYSVILLE, KANSAS: COMMUNITY ENERGY PLANNING AND DESIGN - A PROCESS TO ACHIEVE A SELF RELIANT, SUSTAINABLE FUTURE

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Abstract

As utility customers are forced to spend a higher portion of their budgets for basic energy needs, they will have fewer dollars for other goods and services. Local businesses will thus receive fewer consumer dollars at the same time their own expenses for energy are increasing. Businesses will pass on their utility costs to their customers in the form of higher prices, further eroding consumer purchasing power. Municipal governments will raise taxes to cover their increased costs. Household income will thus be cut even more, further depressing the local business economy and the economic stability of the community. Thus, community energy problems are also community economic problems.

Community Energy Planning is a process by which communities can address the energy/economic issues at the local level. This report looks at two scenarios of possible futures for Marysville, Kansas, Business-As-Usual and the Soft Energy Path. The Business-As-Usual approach, which relies on nonrenewable energy supply systems and current energy/economic theories, is shown to lead to serious household and community economic problems. The Soft Energy Path, involving the use of conservation and renewable energy technologies implemented through a grassroots process of community energy planning, offers Marysville the best hope of making the transition to an equitable, democratic and sustainable society in the Post-Petroleum age. These two scenarios, first developed during an energy study of Marysville in the fall semester of 1982 at Kansas State University, are summarized in this report.

Based on these studies a Comprehensive Energy-Based Land Use Plan is developed. Specific design proposals for land use, housing, commercial, industrial, and municipal development are included to illustrate the Soft Path approach to Community Energy Planning. It is concluded that by implementing such a Community Energy Planning Process Marysville could not only create a more economically stable future for individual households and the community as whole, but it could also become a greener, friendlier, and better place to live.

Although Marysville, Kansas provided the setting for this particular study, the general principles upon which this proposal is developed can be transferred to other communities as well. However, each community is unique in its structure and setting. In order to keep the process of Community Energy Planning within the control of the local citizens, each community would have to identify its own problems and develop appropriate solutions to the energy/economic problems based on their needs and opportunities.