

GLADSTONE COMPREHENSIVE PLAN

INVENTORY AND ANALYSIS

APRIL, 1979

GENERAL OUTLINE

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INTRODUCTION

THE CITY

Gladstone is a rapidly growing small city within the Portland Metropolitan Area, located at the confluence of the Willamette and Clackamas Rivers. The Willamette River bounds it on the west and the Clackamas River on the south and east. The Willamette is a tributary to the Columbia River and has its origin at the confluence of the Middle Fork and the Coast Fork near Eugene, Oregon. The Clackamas is a tributary to the Willamette River and originates in the Cascade Mountains.

The city's winters are mild but wet; its summers are warm and dry. The temperature ranges from an average monthly minimum of 33° F. in January to an average monthly maximum of 82° F. in July. Average annual precipitation is 45.3 inches, with 86% of it occurring from October to May.

Gladstone is just 12 miles south of Portland. It is served by Highway 99E and Freeway I-205. For many years the main access to the Willamette Valley, Highway 99E extends north and south through Gladstone. The city is bypassed by Freeway I-205, which when completed will connect Gladstone with Interstate Route 5 north of Vancouver, Washington, and will reduce travel time from Gladstone to the Portland International Airport to 20 minutes.

Freight and transportation is provided by the Southern Pacific Company, Greyhound Bus Lines and Tri-Met. One taxi company in Oregon City serves the tri-city area of Oregon City, West Linn and Gladstone. The Portland International Airport is 15 miles from Gladstone and is served by eight scheduled airlines.

Commercial development in Gladstone is mainly along Highway 99E, along Portland Avenue in the center of town, and along 82nd Drive by Freeway I-205. Most of the city's residential development lies northeast of Highway 99E.

Electric power is provided by Portland General Electric Company. Northwest Natural Gas Company supplies the city with gas. Telephone service is provided by Pacific Northwest Bell and direct dialing without toll charges is provided to Portland.

Gladstone has a volunteer fire department and a fire rating of 5. Its police department has 19 paid police personnel and three radio-dispatched patrol cars. The city has its own municipal soft water system that collects naturally filtered river water from under the Clackamas River

bed. The water capacity of the system is 2.5 million gallons per day. The city's sewage is treated by three sewer districts: Oregon City, Oak Lodge and Clackamas Sewer District #1.

There is one high school in the city, one middle school, and two elementary schools. In addition, the city is within commuting distance from other colleges and universities in the Portland Metropolitan Area. Gladstone has several convalescent care facilities and ready access to Oregon City's general hospital. There are several city parks and playgrounds, one public library and one theater. Moreover, it is approximately an hour's drive from the Mt. Hood Recreational Area and less than two hours drive from Oregon's beaches.

Gladstone has the council-city administrator form of government. It has a planning commission and the regional planning agency is the Columbia Region Association of Governments (CRAG). The principal local tax is the ad valorem property tax. The assessment value is 100 percent of market value for all classes of property.

THE PEOPLE

The earliest homesteads in the area were donation land claims granted by President Lincoln. The Willamette Valley received its first regular immigrants in 1841. The arrival of 111 persons that year doubled the number of the white population in the Willamette Valley. The Casons and the Rinearsons were the first settlers to receive their donation land claims in the area known now as Gladstone. Peter M. Rinearson and his family owned the land between Jennings Lodge and the Clackamas River, and between the Willamette River and Portland Avenue. The Fendal Casons, who came to Oregon in 1843, owned an area equal in size east of Portland Avenue, including the present Seventh Day Adventist (S.D.A.) Campground.

The white settlers lived alongside the area's Indians, who operated a ferry across the Clackamas River. The famous "Pow-Wow" maple tree marked the place where the different Indian tribes, mainly Clackamas and Multnomahs, met to make trading agreements, settle community affairs, and conduct wedding ceremonies. The tree still stands on Clackamas Boulevard, though a little battered. Adjacent to the "Pow-Wow" tree was an Indian racetrack that Peter Rinearson later used as an exercise and training ground for the racehorses he bred. In 1861, it was used as a parade ring for the First State Fair held on the Rinearson property, with the "Pow-Wow" tree marking the entrance.

Soon after the arrival of the Casons and the Rinearsons, the Indian ferry was replaced by a toll bridge across the Clackamas River where the present Park Place Bridge stands. This bridge was washed out by the waters of the 1856 flood, but it was soon rebuilt and finally purchased in 1861 by Ad Cason who operated it as a toll bridge. Ad's gunshop at the north end of

the bridge served as a coach stop for stages traveling between Portland and Oregon City. The same Ad Cason built the first school for Gladstone, Park Place and the Clackamas area, on his father's property in 1871. The district was formed with 27 taxpayers.

The founder of the City of Gladstone, however, was Harvey Edward Cross who named it after a British Statesman he admired, Sir William Ewert Gladstone. Cross purchased the 640 acre donation land claim from William, son of Fendal Cason, in 1883. He formed the Gladstone Real Estate Corporation and had it incorporated in 1889. In 1893, Harvey Cross had part of his land platted for a town and prepared lots for sale east of what is now Portland Avenue. He accepted the suggestion by his surveyor to name the streets running north and south toward the Clackamas River after American colleges and those crossing them east and west for English universities. The city was formally incorporated on January 10, 1911 (one year too late to be counted as a city in the 1910 census), and O. C. Freytag became its first mayor.

In 1894, Cross granted a fifty year lease on what is now the S.D.A. Camp-ground to the Willamette Valley Chautauqua Association for its annual summer assemblies. The originator of the idea was Mrs. C. I. (Eva Emory) Dye, with whom Harvey Cross concurred that such a project would be of great benefit to Gladstone and other towns and communities in the area. The first auditorium, built in 1895, seated 3000 people; the second, erected in 1917, seated more than twice as many.

Because of Chautauqua, Gladstone became a cultural and social center. Railroad and street cars brought people from Portland and other towns and communities for concerts, ball games and sermons by evangelists such as John Phillip Sousa, Billy Sunday and William Jennings Bryant. The first Clackamas County Fair (1907) was held on the Chautauqua Park grounds.

Gladstone's Chautauqua Park was the third largest permanent park in the United States. Its auditorium was often jammed with \$2.00 season ticket holders for morning, afternoon and evening sessions. Lake Chautauqua, described by one observer as "very silent and still," added to the beauty of an already beautiful and pleasant park.

What is perhaps most notable about Gladstone in those early days is the transportation system that provided access to, and from, the city. The railroad was brought by Ben Holladay, who hired 600 Chinese workers to build the bridge over the Clackamas River at what is now called "Hi-Rocks". Completed in 1869, rail transport became a popular mode of travel. Upon the establishment of the Chautauqua Park, Southern Pacific erected a station at the junction of Oatfield and River Roads and called it "Chautauqua."

Another very important mode of transportation made available to Chautauqua goers was the electric streetcar. Built in 1893, it ran from Portland to Oregon City. In Gladstone, streetcars ran on a spur along Dartmouth Street to the entrance of the Chautauqua Park on Oatfield Road. The train and the streetcar supplemented the private conveniences of horse-drawn vehicles. Much of the buggy and wagon, and later the automobile, traffic used the wagon bridge, originally built over the Clackamas River in 1860.

The decline in the popularity of Chautauqua was partly due to music and vaudeville acts which came to Portland; the two art types which played an important part in making it popular. Easier transportation provided other alternatives and had a lot to do with the termination of Chautauqua and the closure of the park in 1927. After Judge Cross passed away in 1929, the Chautauqua Park grounds and buildings were sold to the Seventh Day Adventist Church.

The death of Harvey Cross marked the end of a man's career whose influence was felt far beyond Gladstone and its immediate surroundings. In addition to founding the City of Gladstone and organizing the Chautauqua Association, Harvey Cross taught school, practiced law, became a member of the State Legislature, and, for many years, was County Judge of Clackamas County. Over a period of time, he donated property to the Chautauqua Association, the Baptist Church, the Christian Church, the Gladstone Elementary School and to the City of Gladstone for a park by the Clackamas River, known now as the Cross Memorial Park.

After Judge Cross and Chautauqua, Gladstone became a quiet, well-kept community with few local stores for families whose wage earners worked in the mills in Oregon City and West Linn. By 1920, Gladstone had a population of 1,069. Its population more than doubled by 1950. According to the Bureau of Census, Gladstone's 1977 population was 8,985.

PLANNING IN GLADSTONE

The first Planning Commission in Gladstone was created in November, 1947. Since then the commission has been reorganized twice, once in 1964 and again in 1974. At present the Gladstone Planning Commission is made up of seven council-appointed members, all residents of Gladstone. To guide the city staff and Planning Commission in land use decisions, a zoning ordinance was adopted in March, 1952. Later, in 1955, a subdivision ordinance was adopted. The zoning ordinance has since been revised three times: in 1968, 1971 and 1975. The subdivision ordinance was updated in 1952 and in 1974.

The first Gladstone Development Plan was completed in March, 1960. The plan was financed by an urban planning assistance grant from the U. S. Housing and Home Finance Agency. The plan briefly summarized existing land use and suggested future land use development patterns. However, the Gladstone Development Plan was not officially adopted.

Another plan titled "Preliminary Land Use Plan, Gladstone, Oregon," was completed in 1970. This plan was developed through a cooperative effort between the city, the Bureau of Governmental Research and Service at the University of Oregon, and the Clackamas County Planning Department. A sixteen-member Citizen Advisory Committee was appointed by the mayor to assist in the plan's development. But this plan, too, was not adopted by the city council.

In an effort to promote comprehensive land use planning within the State of Oregon, the state legislature passed Senate Bill 100, known also as the 1973 Land Use Act. The Act provided for a coordinated approach to planning. In addition, the Act required active citizen participation in the planning process.

Prior to the Land Use Act, comprehensive planning was guided by a set of broad goals and objectives for physical development through Oregon Revised Statutes Chapter 215.515. To guide local comprehensive planning under the new Land Use Act, the Land Conservation and Development Commission (LCDC) was directed to adopt statewide planning goals and guidelines by January 1, 1975. After a series of public hearings, the LCDC adopted fourteen goals with guidelines. In addition, the LCDC mandated that state agencies, cities, counties and special districts prepare comprehensive plans in accordance with the statewide goals. In response to this mandate, the City of Gladstone initiated its local comprehensive planning effort.

WHAT IS A COMPREHENSIVE PLAN?

A comprehensive plan is a long-range general policy guide in which a municipal government sets forth its major policies concerning desirable future development over a period of fifteen to twenty years. Being comprehensive, its scope extends to physical, social, economic, administrative and fiscal matters. Being general, it summarizes policies and proposals rather than indicates specific locations or detailed regulations.

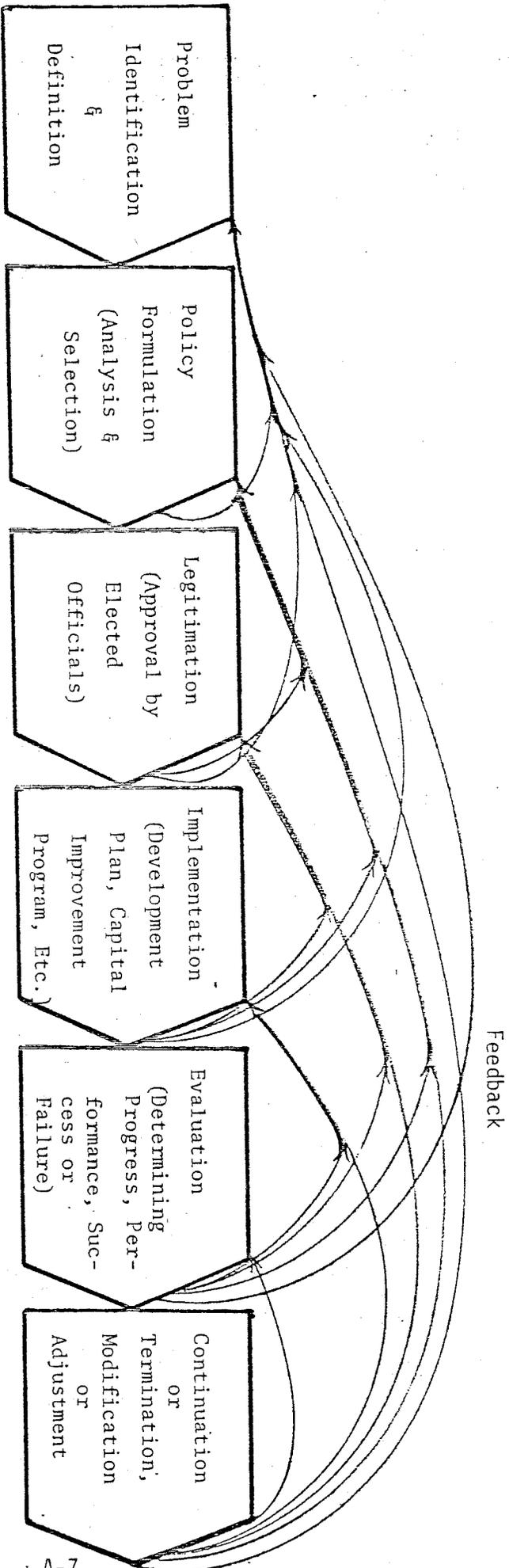
The comprehensive plan is not intended to provide answers to all the questions that come before a legislative body. A development plan, based on the comprehensive plan, fulfills this function by attempting to specify detailed development patterns for a particular area or function. Through the development plan, a series of steps, say five years at a time, focus attention on the well-being of the city at all times and not simply at some distant future date. Zoning ordinances, official maps, and subdivision regulations are not part of the comprehensive plan, but specific and detailed pieces of legislation intended to carry out the general plan proposals. Capital improvement programs and their accompanying budgets and special-purpose regulations are also tools meant to effectuate the plan. The comprehensive plan indicates only broad categories on general areas of the city, whereas these instruments delineate boundaries and specify regulations, procedures and costs.

Through the comprehensive plan, the legislative body considers and agrees upon a coherent, unified set of general and long-range policies for the development of the community. By focusing on the formulation of alternative proposals, it encourages the involvement of politicians and the public in the plan-making process. Here, an opportunity is provided for public discussion of the key issues facing the community. In this capacity, the plan

facilitates the clarification of ideas, on the part of both the public and the legislators, with regard to the type of community they are trying to create by their many specific decisions. Policies, both explicit and implicit, are brought out into the open to insure their determination through democratic processes.

As a continuous process, planning needs to stress the continued review and amendment of the plan. The plan should be easily adaptable to problem-solving methods which allow for a logical step-by-step progression toward decisions, so problem-specific components can be disaggregated, evaluated, accepted, or rejected individually. Since the city is viewed as a dynamic, open and interdependent system evolving in response to many influences, and thus undergoing constant change, it is only logical to suggest that plans for it be cast in a similar fashion.

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HOUSING ELEMENT

INTRODUCTION

Housing is the most significant feature of the City of Gladstone. Most of the area within the original city limits was platted in 1892 and 1893. This area can be recognized today by the grid street system and the typical 50' x 100' lots. When Gladstone was incorporated in 1911, there were approximately 200 housing units. The number of housing units in Gladstone now is 3268. Similarly, population has increased from 1,059 in 1920 to 8,300 in 1976, with higher growth rates being within the last fifteen years. For example, during the decade of the 1920's, the city experienced an increase in population from 1,059 to 1,348, or a 26% increase. Between 1960 and 1970, the population grew to 6,254 from 3,854, or a 62% increase.

The accelerating pace of residential development throughout the nation has presented most cities with problems which are beyond their capacities to deal with. The search for solutions has been intense, and housing problems and issues have been the subject of much study and debate. Some of these issues and problems are discussed below.

POPULATION GROWTH AND THE SCARCITY OF LAND

The 1970 Census indicates the Region had a population of 1,037,000. The most significant fact affecting the population increases in recent years is net migration accounting for 2/3 the population increase. Other factors include birth, death, and fertility rates. Even if there were an immediate zero net migration and a fertility rate of 2.11 births per woman (replacement level), the population of the Region would still increase to approximately 1.2 million by the year 2000 and 1.35 million by the year 2040. If the factors affecting population increases remain the same, the Region may have to accommodate a population of approximately 2 million by the year 2000. Thus, continued growth in the foreseeable future is inevitable.

The obvious problem here is that, while populations increase, land resources do not. Crop lands in the United States have been shrinking by 5 million acres per year. Of this 5 million acres, 2 million are lost to urbanization, 1 million are lost to floods, reservoirs, etc., and 2 million are taken out of production because the land is cut off, made too small, or surrounded, making the land no longer viable for farm use. In Oregon, in spite of the 100,000 acres of crop land added annually in Eastern Oregon, 418,000 acres are lost each year.

Urbanization often converts prime agricultural land. Only .003% of Oregon's land is of Class I soil (soils are classed by the Soil Conservation Service as Class I, II, III, etc., from prime agricultural land to poor land), and only 15% are Class I - IV soils. Thus we are forced to convert marginal land for farming, a process that requires much energy and water, irrigation equipment, high investment costs, etc. At the same time, our crop yields per acre are stabilizing and decreasing for major crops. Consequently, these yields will no longer offset the loss in acreage and in production. If we are to preserve our agricultural land for food production, therefore, and to accommodate the anticipated population increases, higher density living in urban areas is inevitable.

HOME OWNERSHIP

The American dream of owning one's own home may be just that - a dream. Of the 27,000 new households formed each week in this country, only 15% can afford a new home. During the 1960's, approximately two out of three Americans owned a home. In Gladstone, home ownership increased from one in two, to three out of four during the same decade.

The median sales price of a new home has jumped from \$21,400 in 1966 to \$40,800 in 1975. This represents a 95% increase which has kept pace with the increase in disposable income, also at 95%. Where is the problem? Increases in mortgage rates mean that 92¢ of each \$1.00 of the monthly payment goes to interest compared to 67¢ twenty years ago. Add to this the 341% increase in property taxes, 321% increase in hazard insurance costs, 269% increase in home maintenance and repairs, and the ever increasing costs of utilities and local government services. The net result is a marked decline in the home buying power of the American family.

The high cost of new homes coupled with the shrinking availability of buildable lands has resulted in placing a premium price on all housing stock. Over 40% of the U. S. population pay an excessive amount for housing (paying over 25% of their annual household income toward housing is considered excessive, as established by the Department of Housing and Urban Development). Over 30% pay over 35% of their income towards housing. These facts reveal the disturbing condition of our housing supply.

Given the anticipated increases in population, limited buildable lands, and the rising costs of natural resources, the plight of those seeking shelter within their economic means appears quite dim. To those who do find shelter, a change in life style from the owner-occupied to renter-occupied can be expected.

OWNERS vs RENTERS

Renters have been, and continue to be, looked upon as second-class citizens. In the main, renters have been characterized as transient, low-class citizens who care little about the environment, community or municipality in which they reside. Thus, in those areas not economically feasible for commercial or industrial development and impacted by too much noise for single family home living, apartments have been the answer. Most zoning maps mirror this perception. Gladstone zoning has established high density as a buffer between commercial development and single family development. But as life styles continue to change due to, among other things, rising housing costs and the need for higher

densities, single family homes may become a minority rather than the majority of dwelling structures.

A sympathetic understanding of the need to develop residential neighborhoods regardless of the type of structure or density being developed is therefore essential. The basic tenet of a good neighborhood is maintaining a quiet, safe and pleasant atmosphere within reasonable distance to schools, parks, recreation facilities and local retail shopping. If there are sectors within the city which do not meet these criteria and therefore are not suitable for single family development, this lack of neighborhood quality should also prohibit the construction of multi-family units or mobile home parks within the same area.

Not only should multi-family housing be located in a quality environment, which has been the domain of single family homes, but the renter should also be provided with a choice in size, density, design and amenities.

FAIR-SHARE HOUSING

Since the 1926 Aucid vs Ambler Case establishing zoning as a justifiable exercise of the State's police power, municipalities throughout the country have enacted exclusionary zoning statutes. These exclusionary practices such as requiring large minimum lot sizes, minimum house sizes, or prohibiting mobile home parks, etc., were almost universally upheld by the courts until the late 1950's. The validity of exclusionary zoning was challenged in 1959 in the case of the Board of County Supervisors of Fairfax County vs Carpe. The court determined that the County's minimum two acre lot sizes were illegal; that it did, in effect, exclude low income people from living in the area.

In 1967, the courts went a step further in the case of Lake Shore Bluff, Inc., vs County of Will, Illinois, to declare that "where certain land uses are concerned, the term 'general welfare' cannot be interpreted solely as the local municipalities general welfare, but must be defined more broadly to meet the exigencies of urban society".

Not only must municipalities allow for the residing of low and moderate income households, but the allocation strategy must be just. Courts in recent years have prohibited the use of Federal Funds for housing that increases or perpetuates racial concentrations. In the Gantreaux vs Chicago Highway Authority case, the court condemned a public housing policy that resulted in high minority occupancy. The mood of the courts, then, is one that directs municipalities to develop a housing policy that integrates according to a regional allocation strategy. The general welfare does not stop at each municipality's boundaries. Each municipality must accept its "fair share" by allowing for flexibility in housing location, type, price and rent ranges for the residents of the region.

The basic legal theory underlying the courts decisions includes:

1. Equal protection clause of the Constitution declaring equality of rights in access to housing and good residential land.
2. General welfare interpretation to include housing need on a metropolitan level and that the "general welfare" must align zoning laws.
3. Right to travel and settle in various parts of the country.

Thus, based on statutory and constitutional concepts, each municipality must address the issues of fair share housing.

In developing plans to meet the housing needs of the low and moderate income groups of the region, a spirit of negativism or reluctance (such as "we don't want them, but we'll take them") develops an atmosphere of antagonism and distrust, which is counter to the principle of social integration the fair share program is designed to uphold and sustain. A positive approach is one that realizes the latent opportunities in developing a diverse populace. A diverse populace will significantly contribute to the social and cultural growth of this country. This "melting pot" can foster behavioral patterns and attitudes that allow for positive interaction and individual development. Such an environment not only develops pluralistic values, but in turn creates an atmosphere of vitality and diversity. Such diversity itself permits and stimulates more diversity.

THE HOUSING ENVIRONMENT

The housing environment encompasses a territory within which one seeks physical, psychological, social and cultural sustenance. A house is only one of a number of factors affecting this environment and, in turn, only one of a number of factors affecting people's level of satisfaction with their housing unit. An elegant home located in a very barren and forbidding desert would be, for most people, a poor place to live, yet a modest home located in a rich, diversified and accessible neighborhood would be in many ways an excellent place to live.

The housing environment involves people, settings, areas of interaction, areas of solitude, places to shop, medical facilities, educational opportunities, aesthetics, symbolisms, connections with the past and hints of the future. A city should strive to offer each citizen a place of vitality and interest where there is a wide range of life's experiences, a setting where every walk and encounter offers several experiences.

I N V E N T O R Y A N D A N A L Y S I S

The preceding introduction has outlined some of the problems and issues underlying any serious consideration of housing plans for a city like Gladstone. In it, the relationship of housing planning to social policy and comprehensive planning in a regional setting has been briefly discussed. The ultimate objective, of course, is to arrive at a set of integrated housing policies specific to Gladstone, but also in concert with State and Regional Housing Goals. But to do so, housing conditions in Gladstone must first be adequately assessed in order to identify existing problems, deficiencies, and future housing potentials.

HOUSING SUPPLY AND DEMAND

Housing Mix

Gladstone's residents are primarily single family home owners. Though typically suburban, the housing mix in Gladstone compares favorably with that of Clackamas County and the State. Table I below shows that Gladstone has more than its fair share of multi-family and mobile home units.

T A B L E I

HOUSING MIX: STATE, CLACKAMAS COUNTY, GLADSTONE, 1960,70,75

	STATE			CLACKAMAS COUNTY			GLADSTONE		
	1960	1970	1975	1960	1970	1975	1960	1970	1975
Single Family	98%	96%	85%		83%	N/A	87%	72%	73%
Multi-Family	2%	3%	15%		11%	N/A	12%	16%	19%
Mobile Homes	0%	1%	1%		6%	N/A	1%	11%	8%

SOURCE: U. S. Census and City Records.

Of a total of 3,268 housing units in Gladstone, 588 are multi-family and 249 are mobile home units. It should be recognized, however, that Gladstone is part of an urbanized area which is expected to have a relatively higher percentage of multi-family and mobile home units than rural areas. It should also be recognized that the dominance of owner-occupied single family homes is being challenged as pressures for higher densities accelerate. The City of Portland, for example,

has 36% in multi-family units and 64% in single family; mobile homes are not allowed within the city limits of Portland. Other cities and communities within the metropolitan area compensate for Portland's lack of mobile homes, such as Wood Village in Multnomah County which has approximately 43% in mobile homes, and Johnson City in Clackamas County which consists almost entirely of mobile homes.

Gladstone's more-than-fair-share of multi-family and mobile home units is further illustrated in Table II below, which compares Gladstone with its neighboring cities.

T A B L E I I
COMPARISON OF TYPE OF STRUCTURE
FOR MILWAUKIE, OREGON CITY, WEST LINN, AND GLADSTONE
1970

TYPE OF STRUCTURE	MILWAUKIE	OREGON CITY	WEST LINN	GLADSTONE
Single Family	81.3%	77.9%	90.6%	72.3%
Multi-Family	18.7%	22.0%	9.3%	16.4%
Mobile Homes	0.0%	0.1%	0.0%	11.2%

SOURCE: U. S. Census and City Records

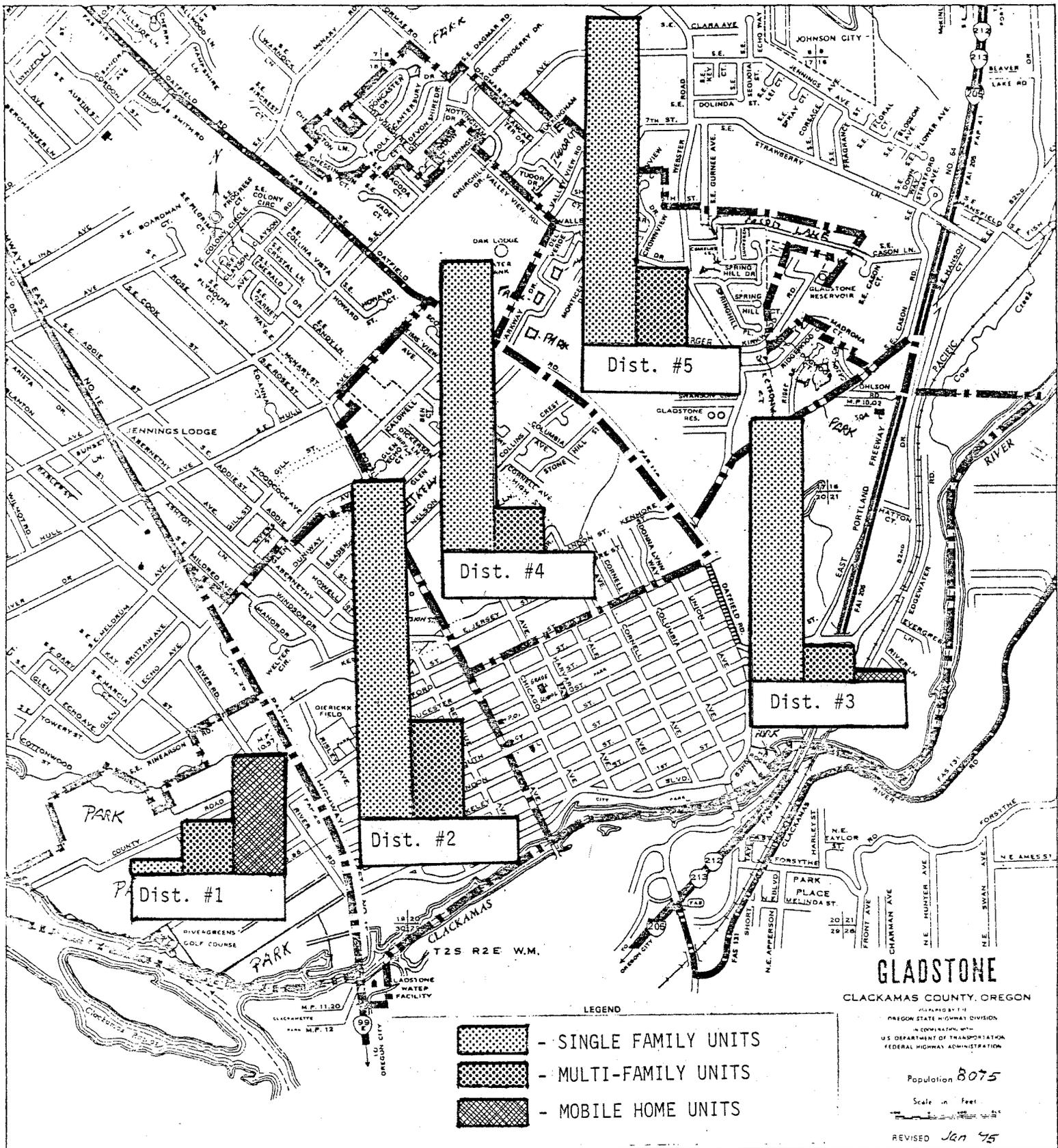
Housing Distribution

According to Table III, Planning District #1 (see Map I) contains approximately 93% of Gladstone's mobile homes and only 1.2% of the city's single family units. The largest number of single family units (31.46%) is located in District #2. This district also has the largest number of multi-family dwelling units, and thus the largest number of renters. District #3 contains about 7% of Gladstone's mobile homes and the smallest number of multi-family units, or 11.5% of the total number of multi-family units in Gladstone. Districts #4 and #5, like District #2, have no mobile homes. However, District #5 contains the second largest number (25.51%) of multi-family units; District #4 has the second lowest percentage (14.29%) of multi-family units. District #5 also contains the second largest number of single family units among the five city districts.

T A B L E I I I
TOTAL HOUSING UNITS BY DISTRICT

DISTRICT	SF	% OF TOTAL	MF	% OF TOTAL	MH	% OF TOTAL	TOTAL	% OF TOTAL
#1	29	1.2%	101	17.2%	231	92.7%	361	11%
#2	658	27%	185	31.5%			843	26%
#3	541	22.3%	68	11.5%	18	7.23%	627	19%
#4	566	23.3%	84	14.3%			650	20%
#5	637	26.2%	150	25.5%			787	24%
	2,431	100%	588	100%	249	100%	3,268	100%

SOURCE: City Survey, 1977



MAP I
HOUSING DISTRIBUTION
BY PLANNING DISTRICT

Table IV below shows the relationship between dwelling unit types within planning districts and throughout the city.

T A B L E I V
UNIT-TYPE RELATIONSHIPS

DISTRICT	SF	MF	SF	MH	MF	MH
#1	1	3.48	1	8	1	2.3
#2	3.56	1				
#3	7.96	1	30	1	3.8	1
#4	6.74	1				
#5	4.25	1				
	4	1	10	1	2.35	1

SOURCE: City-Wide 1977 Data

About 70% of single family households in District #1 own their homes, and 23 of this district's 29 single family homes have a market value of \$25,000 or more. The average market value of a single family unit is lowest in District #2. Single family units with the highest market value are in Districts #4 and #5. The average market value of a single family dwelling unit in these two districts is about \$40,000. Of single family households in District #4, 89% own their homes; a rate of ownership that is higher than the rest of the city (see Table V below).

T A B L E V
MARKET VALUE AND TENURE

DISTRICT	HOUSING UNIT MARKET VALUE - SF				OWNER-RENTER RELATIONSHIPS						
	\$12,500 or less	% OF TOTAL	\$12,501-25,000	% OF TOTAL	\$25,000 & OVER	% OF TOTAL	OWN	% OF TOTAL	RENT	% OF TOTAL	O R
#1	1	1%	5	0.7%	23	2%	562	70%	241	30%	2+:1
#2	55	61%	296	40.5%	248	18%	1431	68%	674	32%	2+:1
#3	24	27%	276	38%	244	18%	1524	86%	248	14%	6+:1
#4	10	11%	145	20%	290	21%	1315	89%	163	11%	8 :1
#5	0	0%	7	1%	560	41%	1618	84%	308	16%	5+:1
TOTAL	90	100%	729	100.2%	1365	100%	6450		1634		4 :1
% OF TOTAL	4+		33.5%		62.5%		80%		20%		

SOURCE: City-Wide Survey, 1975

With the exception of mobile home concentration in District #1, there does not appear to be any over concentration of housing units of one type in any one district. However, District #5 has over 40% of single family units priced above \$25,000. Moreover, renters seem to concentrate in Districts #1 and #2. Concentration of

single family housing units priced below \$25,000, especially those less than \$12,500, seems to occur in District #2 and in #3 in particular.

Housing Condition

The 1970 U. S. Census found 73 crowded housing units in Gladstone out of a total of 2,192, and 21 units which lacked one or more plumbing facilities. Residents surveyed in 1975 were asked to assess the adequacy of their housing units. The highest proportion of dissatisfied owners was in District #2; the highest proportion of dissatisfied renters was in District #5. 7% of all households rating their dwellings as inadequate gave "too small" as the reason, followed by "poor plumbing" with 3%, and 1% each for "too old" and "poor heating". Districts #2 and #3 had the largest number of households claiming inadequacy, especially in terms of age of the units, plumbing and heating facilities (see Table VI below).

T A B L E V I
HOUSEHOLDS FINDING HOUSING INADEQUATE

DISTRICT	TENURE	ADEQUATE HOUSING		TOO SMALL	TOO OLD	POOR PLUMBING	POOR HEATING
		YES	NO				
Plan. Dist. #1	Own	250	10	8	--	2	--
	Rent	77	24	12	5	5	2
Plan. Dist. #2	Own	503	96	50	12	25	9
	Rent	123	41	24	4	4	9
Plan. Dist. #3	Own	503	56	24	4	14	14
	Rent	51	17	5	5	5	3
Plan. Dist. #4	Own	418	27	11	11	--	5
	Rent	75	8	6	--	--	2
Plan. Dist. #5	Own	539	28	28	--	--	--
	Rent	109	41	41	--	--	--
Sub-Total	Own	2213	217	121	27	64	28
	Rent	435	131	88	14	14	16
Total		2648	348	209	41	78	44
Percent of Total Units		88%	12%	7%	1%	3%	1%

SOURCE: City-Wide Survey, 1975

Table VII below provides further data on the condition of housing units in Gladstone. District #2, at the time of the 1975 survey, had the highest number of deteriorating and delapidated single family housing units. District #1 had the largest number of deteriorating and delapidated multi-family units.

T A B L E V I I
CONDITION OF RESIDENTIAL STRUCTURES

DISTRICT	SF			MF		
	SOUND	DETERIORATING	DELAPIDATED	SOUND	DETERIORATING	DELAPIDATED
#1	28	0	1	86	10	5
#2	580	12	7	164	0	0
#3	537	2	5	61	9	0
#4	440	3	2	83	0	0
#5	566		1	150		
Total	2,151	17	16	544	19	5

SOURCE: Land Use Survey, 1975

A 1977 windshield survey conducted by Portland State University Students (see Table VIII) rated dwellings on a three-step subjective scale of "good", "fair", or "poor". No "fair" or "poor" dwelling units were found in District #1. District #2 had the highest percentage of "fair" units. The largest number of "poor" dwelling units were found in District #3. In Districts #4 and #5, very few dwelling units were found to be in the "fair" or "poor" categories. Nearly all dwelling units in areas just outside city limits were judged "good" or "fair".

T A B L E V I I I
HOUSING CONDITION

DISTRICT	"POOR"	"FAIR"	"GOOD"	TOTAL
#1	0	0	361	361
#2	8	78	757	843
#3	9	16	602	627
#4	7	19	624	650
#5	3	16	768	787
	27	129	3,112	3,268

SOURCE: Windshield Survey, 1977 - PSU Planning Workshop Students

Housing units which were considered too old, having poor plumbing, and/or poor heating were largely concentrated in the older sections of town. These inadequacies in Gladstone's housing stock tend to reflect a need for rehabilitation, which is probably more than Tables VII and VIII reflect since they are based on a cursory examination of only the exterior of structures. Moreover, it is important to note that housing conditions are worst in the older sections of town, where residents are least capable financially to deal with them.

In relative terms, however, the number of deteriorating and delapidated housing units is small. Table IX below shows the number of units for rehabilitation or removal.

T A B L E I X

HOUSING UNITS NEEDING UPGRADING OR REMOVAL

DISTRICT	SF		MF	
	REHABILITATE	REMOVE	REHABILITATE	REMOVE
#1	0	0	10	5
#2	12	7	0	0
#3	4	3	9	0
#4	1	4	0	0
#5	0	1	0	0
	17	16	19	5

SOURCE: City Windshield Survey, 1975

The number of units needing rehabilitation or removal may be more or less than 57. The subjective nature of the survey and its cursory examination of the exterior of structures cannot be depended upon to yield accurate and uncontestable figures. It is more likely, however, that the need for rehabilitation or removal is greater than indicated above. For example, 12% of the households surveyed in 1975 found their housing to be inadequate for various reasons. These represent more than 400 units. 209 of these were considered too small. If these 209 units were subtracted from 400, a balance of close to 200 units would remain requiring some rehabilitation.

A review of building permits issued in 1970 through 1975 reveals that rehabilitation of single family homes has been taking place in all districts except District #1 (see Table X below). No rehabilitation of multi-family units has been taking place during this period.

T A B L E X
REHABILITATION ACTIVITY
SF

DISTRICT	1970	1971	1972	1973	1974	1975	TOTAL
#1	0	0	0	0	0	0	0
#2	2	1	6	2	5	4	20
#3	8	3	2	4	5	5	27
#4	3	0	6	1	5	4	19
#5	1	1	3	1	2	3	11
TOTAL	14	5	17	8	17	16	77

SOURCE: City Building Permit Reports, 1970-75

Table VII above shows that District #1 has the highest number of deteriorating and delapidated multi-family units. These units are located in the CG (General Commercial) Zone, suggesting that deterioration will probably continue unchecked until their probable replacement by commercial developments.

Housing Costs

Rising housing costs (including labor, land, financing and materials) have constrained the free flow of the housing market. As a result, a growing number of households are being forced to remain in their present units or pay a higher proportion of income on housing. Moreover, inflation has resulted in reduced mortgage financing for residential construction and in very high interest rates. Both rising costs and inflation, therefore, have led to a housing shortage at all levels.

In Gladstone, construction costs for single family homes rose more than 26% between 1970 and 1975. Multi-family housing construction costs increased 109% during the same period (see Table XI below).

T A B L E X I
HOUSING CONSTRUCTION COSTS
GLADSTONE

YEAR	SF AVERAGE COSTS	% INCREASE	MF AVERAGE COSTS	% INCREASE
1975	\$26,421		\$15,142	
1970	20,920		7,250	
INCREASE	\$ 5,501	26.3%	7,892	109%

SOURCE: City Building Permit Reports, 1970 - 1975

Vacancy Rates

Resource availability has to date aligned itself with demand. The gap between demand and supply is reflected in the area's vacancy rates. Table XII below shows that vacancy rates for all housing types are low. Single family homes have a 2.52% vacancy rate, while multi-family units have a 1.41% rate, and no vacancies in mobile homes. District #4 has the highest vacancy rate and District #1 the lowest, followed by Districts #5, #3 and #2 in that order.

T A B L E X I I

VACANCY RATES BY HOUSING TYPE AND DISTRICT

Dist.	SF		MF		MH		Total # Units	Total # Vacant	Vacancy Rate
	# Units	# Vacant	# Units	# Vacant	# Units	# Vacant			
#1	29	1	101	2	203	0	361	3	0.83%
#2	599	16	164	2	0	0	763	18	2.36%
#3	544	14	68	0	15	0	627	14	2.23%
#4	445	13	83	2	0	0	528	15	2.84%
#5	567	11	150	2	0	0	717	13	1.81%
Total	2184	55	566	8	246	0	2996	63	
Vacancy Rate		2.52%		1.41%		0%		2.10%	2.10%

SOURCE: City-Wide Survey, 1975

The rather low vacancy rates of Districts #1 and #5 cannot be construed to represent residential stability in those two districts since the results of a recent survey show Districts #2 and #3 to have a lower turnover rate and thus greater stability (see Table XIII). District #5 is relatively new, however, and thus cannot be expected to have long-established residents as in the other districts.

T A B L E X I I I

TURNOVER

DISTRICT	# OF YEARS AT SAME ADDRESS
#1	5.6
#2	9.6
#3	8.75
#4	7.2
#5	3.4

SOURCE: City Household Survey, 1977

Table XIV below compares Gladstone's vacancy rates with those of the metropolitan area. The much lower vacancy rates for Gladstone's multi-family and mobile home units indicate a significantly greater demand for those units in Gladstone than in the metropolitan area as a whole.

T A B L E X I V

COMPARATIVE VACANCY RATES

AREA	SF	MF	MH
Gladstone	2.5%	1.4%	0%
Metropolitan Area	2%	6%	5%

SOURCE: City-Wide Survey, 1975, and Portland Metropolitan Real Estate Research Committee, Inc., Real Estate Trends, 1975.

Zoning

The Gladstone Zoning Ordinance of 1975, #848, designates three residential zones: Low Density Residential (RL), Medium Density Residential (RM), and High Density Residential (RH). The RL zone permits single family units outright and duplexes as Conditional Use. The majority of new subdivisions are exclusively single family developments. Most duplexes are located in the older sections of town which include District #2, #3 and the southern portion of District #4. The majority of duplexes have been built in the last ten to twenty years, either on individual lots or cluster developments. Most of the older duplexes are converted single family structures. The duplexes in District #5 are cluster developments constructed within the last five years. Thus, the older parts of town offer a mix of single family and two-to-four unit complexes; whereas the new areas of town, which include Districts #4 and #5, are exclusively single family with some cluster duplex development (see Table XV below).

T A B L E X V

DISTRIBUTION OF 2-4 UNIT COMPLEXES BY PLANNING DISTRICT

DISTRICT	DUPLEX	THREE-PLEX	FOUR-PLEX	TOTAL UNITS
#1	1	---	1	4
#2	12	---	1	28
#3	9	1	1	25
#4	8	1	---	19
#5	6	---	---	12
Total	35	2	3	88

SOURCE: City of Gladstone Survey, 1975.

Areas zoned RM (Medium Density Residential) are limited to Districts #2 and #3, and an isolated sector in District #5, along the Webster Road/Los Verdes multi-family development area. The RM zones allow for approximately ten units per acre. Single family units and duplexes are permitted outright, while multi-family structures are permitted as Conditional Use. Multi-family dwellings in the RM zone are very limited with duplexes predominant but dispersed.

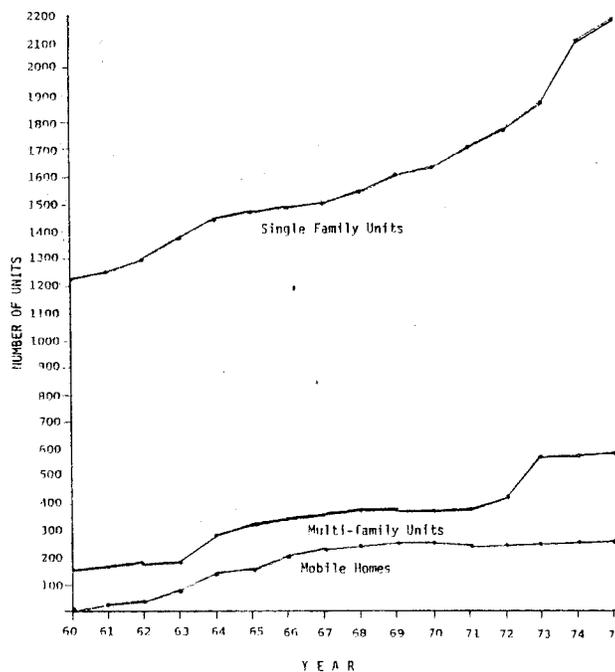
RH (High Density Residential) zones in Gladstone are located so as to act as a buffer between low/medium residential zones and commercial development. RH zoning allows for a maximum of twelve units per acre which is not significantly different from the RM. It does not typify most high density zoning, which normally allows for from fifteen to thirty units per acre.

For all intents and purposes, therefore, Gladstone does not have a high density zone. To date, RH zoning has not been an effective tool in encouraging multi-family development in the downtown area.

Housing Capacity

As indicated earlier, Gladstone has tended to allow for a relatively fair mix of housing types at various locations and price/rent ranges. Given present trends, Gladstone should, perhaps, continue to provide a variety of housing types with special emphasis on multi-family developments. Chart I below shows the growth pattern in residential units by type of structure between 1960 and 1975 in Gladstone.

CHART I
RESIDENTIAL GROWTH BY TYPE OF STRUCTURE
GLADSTONE



SOURCE: City Records, 1975

Table XVI shows an increase in the percentage of owner-occupied units from 1960 to 1970 in Gladstone. This is consistent with the trend in Clackamas County, but it is not consistent with the State trend of more renter than owner-occupied units. The shift to owner-occupied housing is understandable when looking at the total number of single family structures built from 1960 to 1970. Single family units constructed during this time period increased by 414; whereas, multi-family and mobile homes increased by 109 and 245 respectively.

T A B L E X V I

PERCENT CHANGE IN OWNER/RENTER OCCUPIED HOUSING 1960-70

	1960		1970	
	OWNER	RENTER	OWNER	RENTER
State	69%	31%	66%	34%
Clackamas County*	66.8%	30.6%	74.6%	25.4%
Gladstone**	62.6%	36.0%	72.3%	27.7%

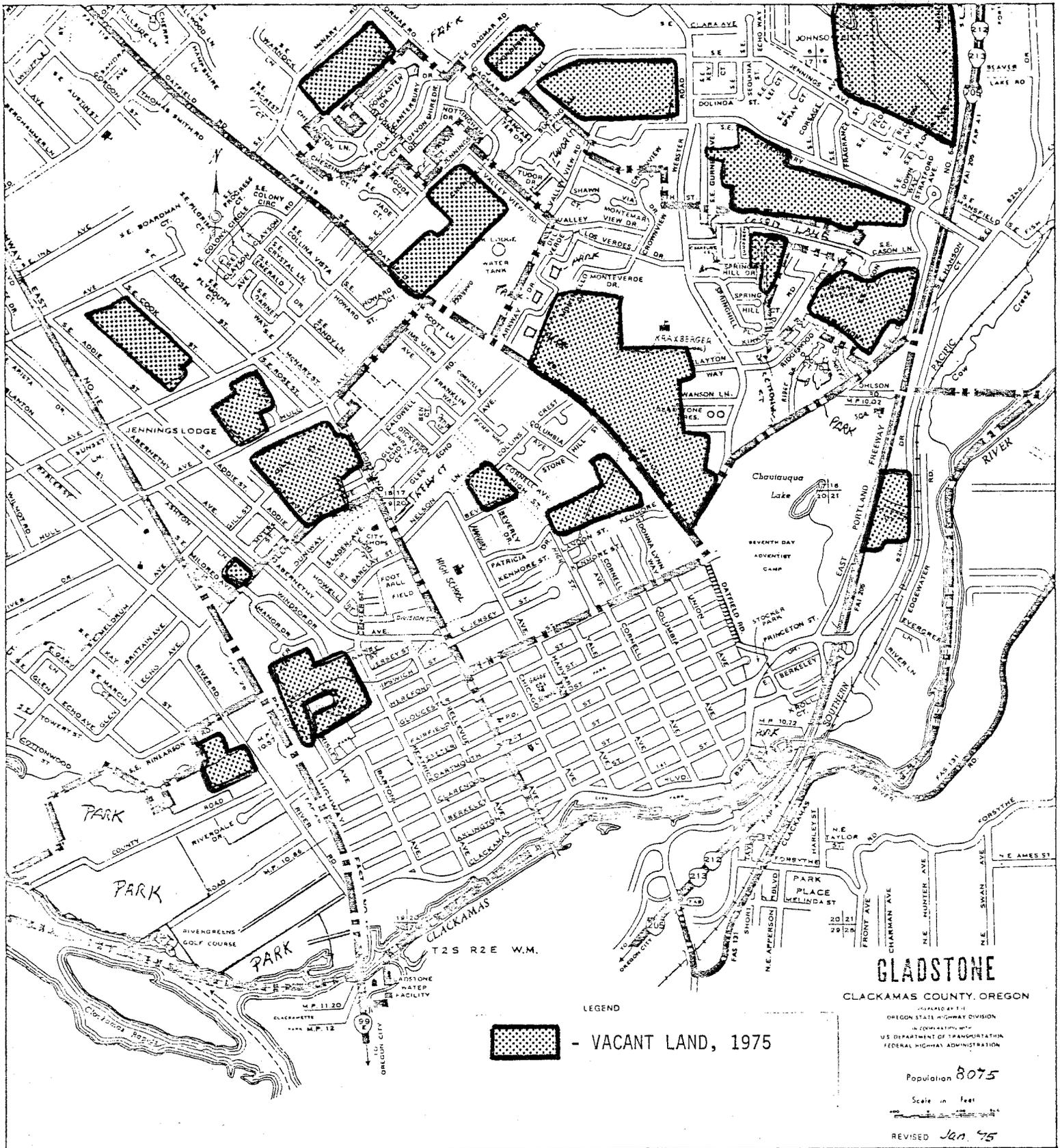
*Vacant units equal 2.6% for 1960

**Vacant units equal 1.4% for 1960

SOURCE: U. S. Census

Another determinant of housing capacity is buildable land. Relatively large parcels of vacant land, within the Gladstone city limits, exist in Districts #2, #4 and #5 (see Map II). A number of smaller, isolated vacant lots are also found in established residential neighborhoods throughout the city. Most vacant land in Gladstone is zoned residential, particularly low-density residential (RL). Map II shows several existing large parcels of vacant land just outside city limits, which are zoned low density residential by Clackamas County.

Results from the 1975 city-wide land use inventory indicate that Gladstone has approximately 317.16 acres (see Table XVII) of vacant land with 283.10 acres identified as buildable (Buildable Lands - lands in urban areas that are suitable, available and necessary for residential use...CRAG definition). Given the present zoning for the city, the following construction could be expected during the coming years: Single family units = 964, Duplexes = 19, Apartments (3 or more units) = 266 units. This is an anticipated growth total of 1249 additional residential units. Since mobile home parks are a Conditional Use and applications for such developments have not been forthcoming, further mobile home park development is not anticipated.



MAP II
VACANT RESIDENTIAL LAND

T A B L E X V I I

VACANT BUILDABLE LAND WITHIN THE CITY OF GLADSTONE

TOTAL VACANT LAND = 317.16 Ac.

HOUSING UNIT POTENTIAL*

Single Family	=	964 units
Duplexes**	=	19 units
Apartments (3+)	=	266 units
TOTAL	=	1,249 units

Zoning of Vacant Land:	Not Buildable Due to Limitations	Buildable Land
RL = 244.14	31.34	212.80***
RM = 15.12	---	15.12
RH = 24.06	1.26	22.80
RC = ---	---	---
CL = 26.04	---	26.04
CG = 4.73	---	4.73
IL = 3.07	1.46	1.61
IG = ---	---	---
Total	34.06 Ac.	283.10 Ac.

Vacant Land Not Buildable Due to the Following Limitations:

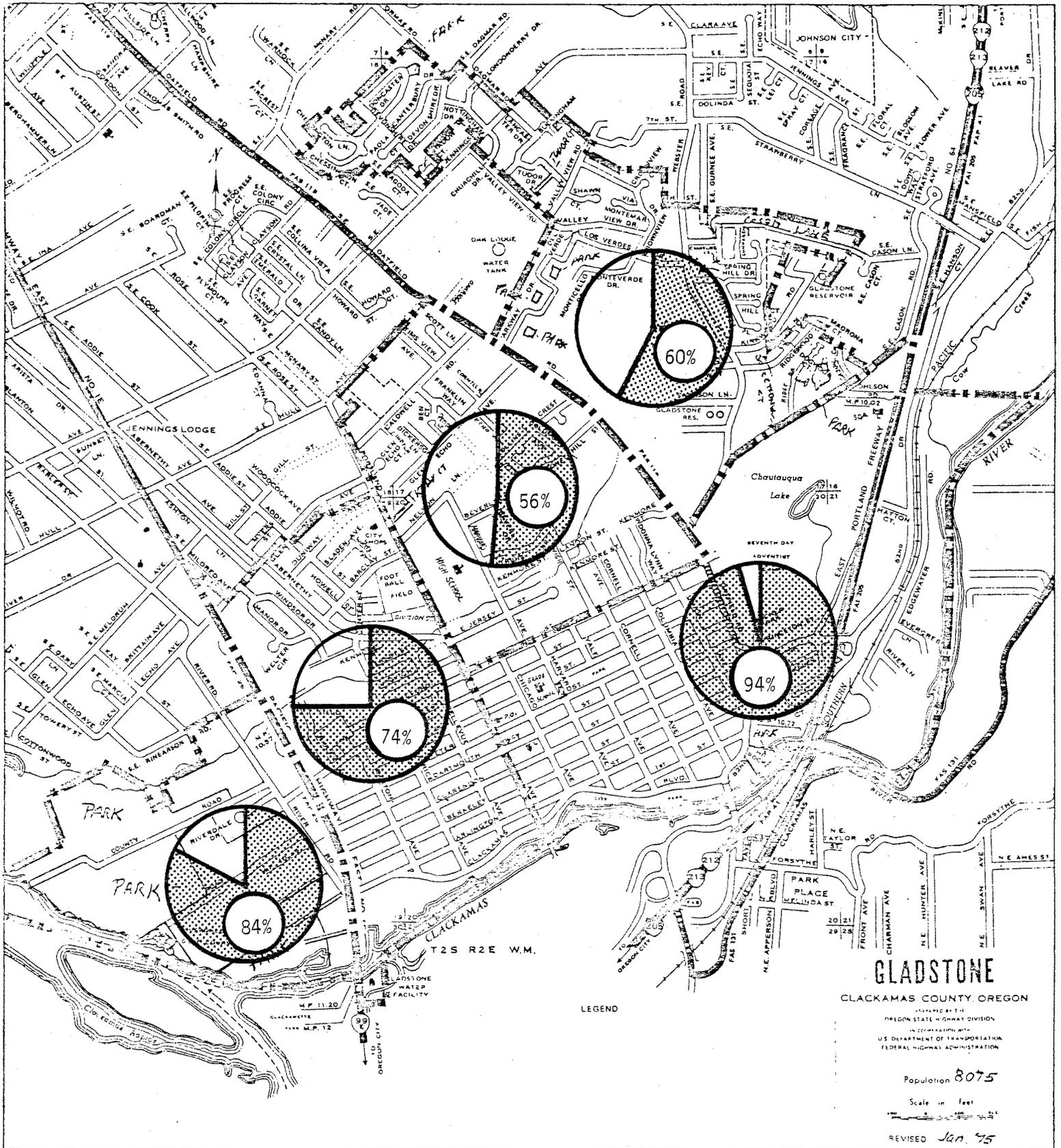
Flood Hazard = 16.87 Ac.
 High Water Table/Seasonal Flooding = 3.46 Ac.
 Landlocked = 12.26 Ac.
 Slope 50%+ = 1.47 Ac.

Total = 34.06 Ac.

*These housing unit figures were derived by dividing the square footage of vacant land by the allowable minimum square footage as specified in the Gladstone Zoning Ordinance (i.e. 7200 square feet for single family dwellings in an RL Zone; 6000 square feet and 3600 square feet for single family and duplexes in an RM Zone, 6000 square feet and 3600 square feet for single family and multi-family dwellings in an RH zone). Housing counts were conducted on an individual site basis for areas already partitioned into salable lands and having access (old town area). For larger tracts of land, 16% of the area was subtracted for streets and the remaining acreage was divided by the minimum square footage as allowed within each residential zone.

**This figure includes only housing potential on vacant land and does not include possible conversions of single family units into duplex units which is allowed in an RM and RH zone.

***This figure includes three acres zoned RH-FL, buildable provided that it meets the Flood Hazard Zoning Requirements but must be on 1/2 acre lots due to septic tank limitations.



MAP III
PERCENT OF DEVELOPED
HOUSING CAPACITY

If recent State trends are any indication, urban areas can expect an accelerating rate of growth in the number of multi-family and mobile home units. The trend established by the Oregon State Housing Authority over the last five years provides the basis for the following projections over the next two or three years: single family unit construction = 42%, multi-family unit construction = 34%, and mobile home unit construction = 24%. The City of Gladstone, despite its presently balanced "fair share", should anticipate pressures for the addition of more multi-family and mobile home units.

As shown on Map III, Planning District #4, followed closely by Planning District #5, will experience the highest rate of growth in the coming years. Most of the new construction to take place in the older sections of town will be just infill.

Preliminary estimates by CRAG indicate that North Clackamas could accommodate an ultimate gross density of approximately 4300 people per square mile, meaning that Gladstone could anticipate an ultimate population of approximately 10,500 and the region 1.6 million. However, given the development of all residential land within the existing city limits under current zoning regulations, Gladstone could accommodate more people. Table XVIII below shows a possible addition of 1249 housing units, reflecting an increase in the percentage of single family and multi-family home development and a decrease in the percentage of mobile homes in Gladstone.

T A B L E X V I I I

H O U S I N G C A P A C I T Y

UNIT TYPE	EXISTING UNITS	POSSIBLE UNITS	CAPACITY	PERCENT
SF	2184	964	3148	74.11%
MF	566	285	851	20.03%
MH	249	0	249	5.86%
TOTAL	2999	1249	4248	100%
PERCENT	70.60%	29.40%	100%	

SOURCE: Based on 1975 Data

At the present rate of growth, given current zoning allocations, maximum housing saturation of existing buildable land will be reached by about 1990-1995. Any annexation will, of course, alter both these projections and vacant buildable land figures. The future disposition of the SDA property will also have a similar, though less, effect. Should no annexation take place and should the SDA Church decide to retain its property indefinitely, the maximum population size that Gladstone could attain would be approximately 11,812 (see Table XIX).

T A B L E X I X

POPULATION CAPACITY

UNIT TYPE	SATURATION LEVEL	HOUSEHOLD SIZE	POPULATION CAPACITY
SF	3,148	3.07	9,664
MF	851	2.08	1,770
MH	249	1.52	378
	4,248		11,812

SOURCE: City Surveys, 1975 and 1977

Table XX below compares the above projections with those made by the Bureau of the Census.

T A B L E X X

POPULATION PROJECTIONS

YEAR	POPULATION
1970	6,254
1975	8,075
1980	9,509
1985	10,638
1990	11,278
1995	11,650
2000	12,000

SOURCE: U. S. Census, 1975.

Household Characteristics

The population of Gladstone increased substantially (62.3%) between 1960 and 1970. This compares with 18% for the State and 46% for Clackamas County. These figures reflect the expansion of the Portland Metropolitan Area with its heaviest growth impact on outlying areas like Gladstone. According to Table XXI below, the largest age group consists of individuals 24 years of age or younger. Yet there has been an upward trend in the median age and the 65-and-over age groups. The fact that Gladstone was once an attractive retirement community, coupled with the extended life span for most persons and the expansion of the city's convalescent care centers, may account for this increase in the 65-and-over age group.

T A B L E X X I
PERCENT AGE GROUP DISTRIBUTION

YEAR	AGE GROUPS				MEDIAN AGE
	0 - 24	24 - 44	45 - 64	65 & OVER	
1960	42.3%	25.31%	19.05%	13.31%	30.7%
1970	39.6%	22.4%	22.8%	15.1%	33.0%
1975	38%	22%	25%	15%	N/A

SOURCE: U. S. Census, 1970.

Gladstone's significance as a retirement community in 1960 is also reflected in Table XXII, which shows a 10% widowed rate for Gladstone as compared to 6.7% for the Clackamas County Urban Area. The Gladstone divorce rate of 3.0% is likewise higher than the urban area average of 2.7%.

T A B L E X X I I
PERCENT DISTRIBUTION
MARRIAGE STATUS OF CLACKAMAS
COUNTY'S POPULATION WITHIN AREAS OF THE COUNTY
1960
(14 YEARS OR OLDER)

URBAN AREA	SINGLE	MARRIED	WIDOWED	DIVORCED
Gladstone	15.6	71.4	10.0	3.0
Oregon City	18.7	66.7	10.5	4.1
Park Place	18.9	71.8	6.5	2.8
Mt. Scott	15.5	78.6	3.6	2.3
Clackamas	17.3	74.5	5.3	2.9
Jennings Lodge	16.0	75.0	6.5	2.5
Oak Grove	16.9	71.4	9.1	2.6
Milwaukie	16.0	74.5	6.7	2.8
West Linn	17.2	73.6	6.5	2.7
Rosemont	30.5	63.6	4.0	1.8
Oswego	18.4	73.8	5.5	2.4
Average	18.3	72.3	6.7	2.7

SOURCE: U. S. Census

The average household size in Oregon has decreased to 2.94 in 1970 from 3.09 in 1960. According to Table XXIII, Gladstone's average household size appears to follow this trend.

T A B L E X X I I I

CHANGES IN HOUSEHOLD COMPOSITION AND HOUSING SUPPLY
IN GLADSTONE

	1960 NUMBER	1970 NUMBER	1975 NUMBER	% CHANGE 1960-70	% CHANGE 1970-75
Population in Household	3854	6254	8120	62%	30%
Occupied Housing	1183	2103	2877	78%	37%
Total Housing Units	1955	2192	2996	12%	37%
Average Household Size	3.26	2.97	2.82	N/A	N/A

SOURCE: Bureau of Census, 1960, 1970 and City-Wide Survey, 1975.

The significance of this change in the average household size can be better amplified through the following example: If we were to have had the present day average household size of 2.82 in 1960, we would have needed an additional 184 housing units in 1960 to house the same number of people. To put it another way, if we were to have an average household size of 3.26 (1960 average household size) in 1970, we would have needed 500 less housing units to house the same number of people.

Of the age groups in Table XXI above, the 45-to-65 age group increased most significantly. An examination of some of the events which took place in Gladstone between 1960 and 1970 may serve as an explanation for the increase in this age group. The Gladstone High School was completed in 1965 with the first students attending in 1967. The construction of these two schools changed the character of the Gladstone area from a retirement community to a community for families with school-age children. During this same period, suburban single family home development began, such as the Los Verdes Estates in 1966. The age group most able to afford the new suburban home during this time period was the 45-64 age group, thus accounting for the increase in this age group.

Given the continued single family home development and the replacement of retired couples and individuals by young families in the older sections of town, a stabilization of the percentage of elderly within the city is anticipated, with some increases in the 0-to-24 and 25-to-44 groups.

Table XXIV below shows that about 80% of single family households in District #1 earn more than \$10,000 annually. The average yearly income of a single family household is lowest in District #2. District #3 has the highest percentage of single family households having a yearly income of between \$10,000 and \$15,000. The most households with yearly incomes of \$15,000 or more are located in Districts #4 and #5.

T A B L E X X I V

INCOME LEVELS BY DISTRICT - SF HOUSEHOLDS

DISTRICT	\$0 - 5,000	% OF TOTAL	\$5,001- 10,000	% OF TOTAL	\$10,000- 15,000	% OF TOTAL	\$15,000+	% OF TOTAL	TOTAL
#1	0	0%	6	20.69%	13	44.83%	10	34.48%	29
#2	124	20.70%	186	31.05%	162	27.05%	127	21.20%	599
#3	92	16.91%	134	24.63%	162	29.78%	156	28.68%	544
#4	22	4.94%	74	16.63%	128	28.76%	221	49.66%	445
#5	6	1.06%	27	4.67%	95	16.75%	439	77.43%	567
Total	244		427		560		953		2184
% of Total	11.17%		19.55%		25.64%		43.64%		100%

SOURCE: City-Wide Survey, 1975

The general picture portrayed by the above figures is quite favorable: close to 44% of Gladstone's households have annual incomes equal to or in excess of \$15,000, and about 26% earn between \$10,000 and \$15,000 annually. 75% of Gladstone's households then have yearly incomes of \$10,000 or more. This generally favorable income picture is further demonstrated by the following comparative figures for Oregon City, Portland, and Clackamas County, despite the fact that the median income for Gladstone's households is lower than that of Clackamas County.

T A B L E X X V

COMPARATIVE INCOME

	GLADSTONE	OREGON CITY	PORTLAND	CLACKAMAS COUNTY
Median Income	10,320	9,534	9,794	12,882
% Families Below Poverty Level	5.0%	10.2%	8.1%	6.6%
% Families Receiving Social Security	19.4%	22.0%	22.7%	22.7%
Mean Income of Families Receiving Social Security	1,957	2,227	1,812	1,721

SOURCE: U. S. Census, 1970.

HOUSING NEED

Owner-Occupied Housing Need

By pairing the owner-occupied household income/affordable price range (two times annual income) with the price of existing single family units, a rough estimate of need can be ascertained. Chart II shows that single family home living is a reasonable housing option for those households with incomes over \$7500 per year within the Gladstone area. For those households earning less than \$7500 annually, single family living requires the household to pay an amount in excess of 25% of their gross annual income for housing.

Figures from Table XXVI below support the relationship between household income and the type of structure a family could occupy. Single family homes normally serve families with household incomes from \$15,000 to \$24,999, with multi-family structures serving families with incomes from \$7,000 to \$9,999 and mobile homes serving families with household incomes from \$3,000 to \$4,999. Thus, the type of housing constructed in the city tends to dictate the income characteristics of the residents.

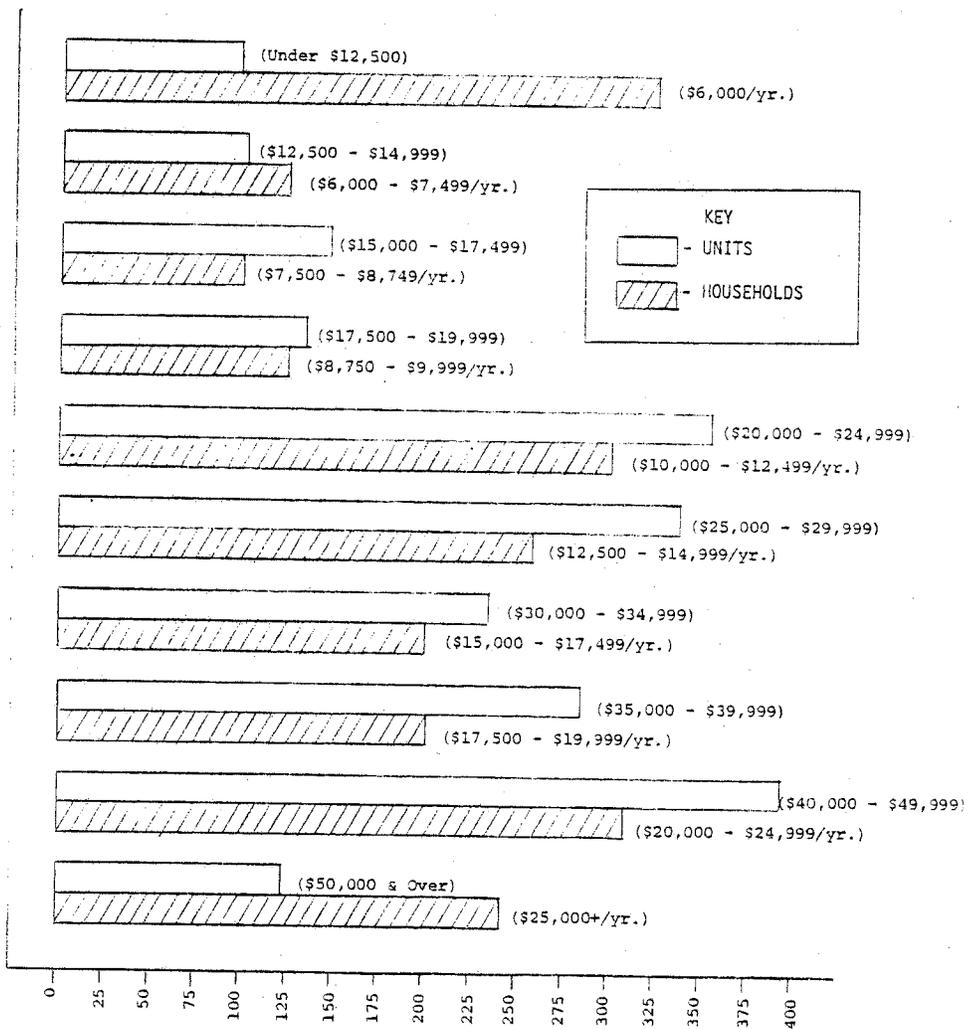
T A B L E X X V I
I N C O M E B Y H O U S E H O L D T Y P E

Unit Type	I N C O M E							TOTAL HOUSEHOLDS
	\$-0- 2,999	\$3,000- 4,999	\$5,000- 6,999	\$7,000- 9,999	\$10,000- 14,999	\$15,000- 24,999	\$25,000+	
SF	88	156	163	264	560	712	241	2,184
MF	57	113	74	136	130	28	28	566
MH	5	76	47	67	12	27	12	245
Total Households	150	345	284	467	702	767	281	2,996
% of Total	5%	12%	9%	16%	23%	26%	9%	100%

SOURCE: City-Wide Survey, 1975

Further analysis of the increase in single family households by planning district (see Table XXVII) shows that most of the newly constructed single family homes meet the needs of families with incomes from \$15,000 to \$24,999. Yet for District #3, and especially District #2 (old town), the older housing stock meets the needs of lower income families.

C H A R T I I
OWNER-OCCUPIED HOUSING
NEED



SOURCE: City Wide Survey, 1975

TABLE XXVII
CITY OF GLADSTONE

INCOME BY SINGLE FAMILY HOUSEHOLDS

DIST.	INCOME						TOTAL HOUSEHOLDS	
	\$-2999	\$3000-4999	\$5000-6999	\$7000-9999	\$10,000-14,999	\$15,000-24,999		\$25,000+
Dist. #1	0	0	3	3	13	10	0	29
Dist. #2	41	83	83	103	162	103	24	599
Dist. #3	43	49	37	97	162	113	43	544
Dist. #4	4	18	35	39	128	199	22	445
Dist. #5	0	6	5	22	95	287	152	567
Total Households	88	156	163	264	560	712	241	2184
Percentage	4%	7%	7%	12%	26%	33%	11%	100%

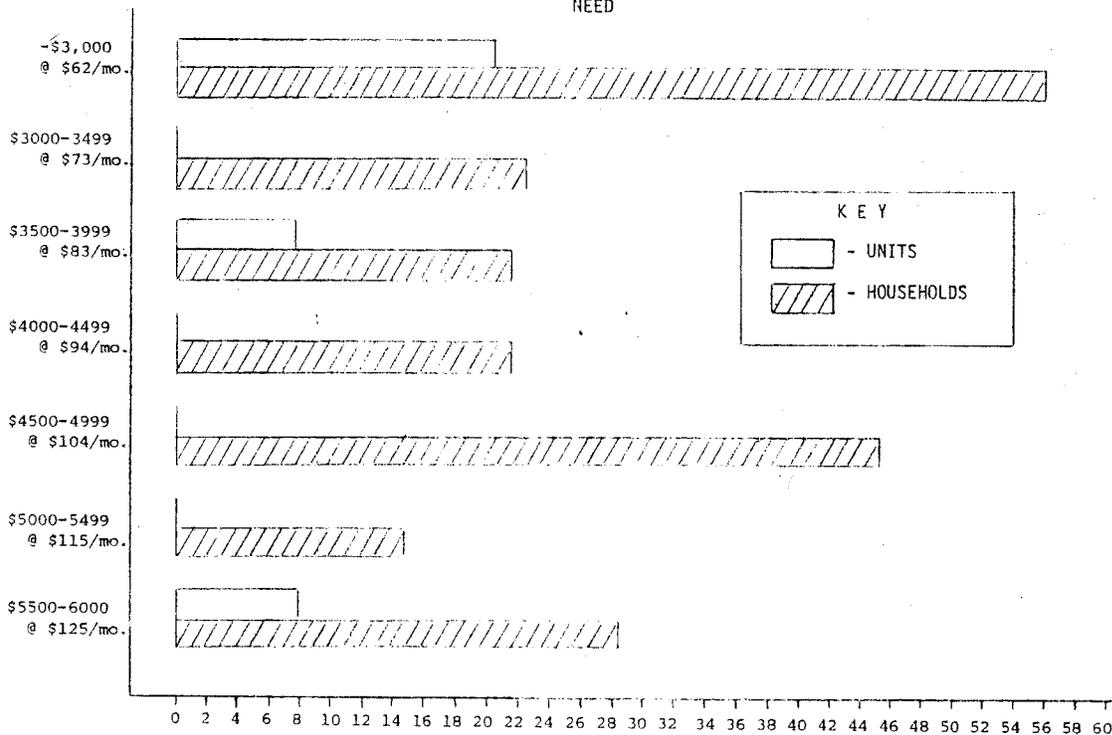
SOURCE: City-Wide Survey, 1975

Renter-Occupied-Housing Need

By pairing the annual household income/affordable rent (25% of income) with units available for rent, coupled with the active federal assistance housing programs for the area, we can assess Gladstone's rental housing needs. Chart III and Table XXVIII provide a rough estimate of rental housing shortages by rent levels in Gladstone.

CHART III

RENTAL HOUSING NEED



SOURCE: City-Wide Survey, 1975

TABLE XXVIII
HOUSING NEED BY HOUSEHOLD INCOME

INCOME	\$2999	\$3000-3499	\$3500-3999	\$4000-4499	\$4500-4900	\$5000-5499	\$5500-5499	\$6000-6500
Households	57	23	22	22	46	15	29	13
Affordable Monthly Rent	\$62	\$73	\$83	\$94	\$104	\$115	\$125	\$135
Units Available	--	--	8	--	--	--	8	47
Households Provided with 236 Assistance*	20	6	2	5	4	1	4	--
Households provided with rent supplement in addition to 236 Assistance	9	--	--	--	--	--	--	--
Households provided with Section 8 Assistance	10	--	--	--	--	--	--	--
Need (Balance)	36	23	14	22	46	15	21	

NOTE: Need is defined as those households paying in excess of 25% of their income for housing.

*Although these households receive housing assistance, all but eleven (11) households (the eleven households earn less than \$2999) are still paying over 25% of their household income for housing.

SOURCE: City Wide Survey, 1975

There appears to be an over supply of multi-family units in the rent range of \$135.00 per month and over. The low vacancy rate suggests, however, that units rented for \$135.00/month or more are occupied by a significant number of households paying rents in excess of their affordable range because of high demand (see Table XXIX).

TABLE XXIX
RENT BY NUMBER OF BEDROOMS

	<u>STUDIO</u>	<u>ONE BEDROOM</u>	<u>TWO BEDROOM</u>	<u>THREE BEDROOM</u>
Mean	\$129	\$138	\$162	\$210
Median	135	140	150	199
Range	\$118 - \$135	\$75 - \$155	\$129 - \$205	\$180 - \$265

SOURCE: City-Wide Survey, 1976

Although 42 households are receiving 236 Assistance coupled with nine receiving rent supplements and eight receiving Section 8 Assistance, only eleven households are not paying over 25% of their income towards housing (see section below on Federally-Assisted Housing). Thus, although federal assistance is being offered to several households, these same households are still in need of further assistance. Excluding those households receiving some kind of federal assistance reveals a balance of approximately 150 households needing, but not receiving, any kind of housing assistance.

Renter-occupied single family data does not exist. However, most single-family rental units are above the \$135.00/month and over range; therefore, they would not necessarily meet the needs of households with incomes less than \$6,000 per year.

Rehabilitation

Housing conditions have been described earlier in this report. An analysis of the 1975 city-wide survey showed that 4% (approximately 135 units) were too old, poorly heated, or had poor plumbing. Another phase of the same survey showed that there were 36 deteriorating units and 21 delapidated ones. More recently, a 1977 survey indicated the existence of 177 housing units needing some upgrading and some 33 units which should be removed.

Efforts at rehabilitation on the part of the private sector appear to have reduced the number of substandard units. However, there remain some 30-35 housing units which should be replaced, and some 180 units needing varying degrees of rehabilitation. This rehabilitation activity by the private sector is commendable, but not enough. In light of the results of the 1977 windshield survey, Gladstone would do well to initiate a more aggressive effort at rehabilitation, and perhaps a publicly-supported rehabilitation program. Though the present situation does not appear to be alarming, a continued lack of a concerted effort at rehabilitation is likely to lead to further deterioration and neglect, especially in those districts of the city where rehabilitation is most needed.

Crowding

Out of a total of 2192 housing units in Gladstone in 1970, 73 were found to be crowded by the U. S. Census. The 1975 City-Wide Survey found 7% crowded units out of a total of 2996. This means that, in 1975, there were about 210 crowded housing units in Gladstone. Table XXX below compares crowding conditions in Gladstone with those in Clackamas County and the State (a housing unit is considered crowded if it is occupied by more than one person per room; bathrooms, closets, unfurnished basements, etc., are excluded).

T A B L E X X X
C R O W D E D H O U S I N G U N I T S

AREA	# UNITS	% OF TOTAL
Gladstone	73	3.5%
Clackamas County	2,726	5.3%
State	38,629	5.5%

SOURCE: U. S. Census, 1970.

Updated data for Gladstone does not exist to reflect changes in crowdedness. Given the present high unemployment rate and the high cost of housing, it is probable that crowding could exceed the 3.5% of 1970. Table VI indicates a general desire for larger living space. This desire may be an outcome of some crowding, but may also be the result of rising expectations.

Housing Needs of the Physically Handicapped and Elderly

An issue not generally addressed in a housing plan concerns the removal of architectural barriers and/or the installation of physical aides for the physically handicapped and elderly. Persons victim to a stroke, muscular dystrophy, a broken leg or lack of physical strength due to aging may find a flight of stairs a formidable barrier. Persons utilizing wheelchairs or walkers may require that their porch steps be replaced by a ramp and narrow doorways to be widened and hand railings installed in bathrooms. These structural alterations and physical aides are necessary requirements if their home is to meet their specific housing needs.

The Division of Vocational Rehabilitation has estimated Clackamas County's total number of physically handicapped for 1975 to be 25,439, or 13%. The Community Service Program in Salem has estimated the number of physically handicapped for the County to be 7.4%. Even if Gladstone were to apply the conservative estimate of 7.4% to the Gladstone area, it would appear that Gladstone has approximately 614 persons who are physically handicapped. Since Gladstone has a high percentage of elderly (65 years and older), this figure is probably higher. Thus, there are well over 600 Gladstone citizens requiring special housing facilities to accommodate their individual physical limitations.

Not only the home, but likewise the neighborhood and the city must provide special facilities for this group of people. Public restrooms, benches, curb cuts and safe crosswalks all add to the physically handicapped and elderly's satisfaction with their housing environment. The need for this latter concern is further dramatized for the Gladstone area when one adds the 176 ambulatory convalescent care center patients to the physically handicapped, for a city total of approximately 790 persons requiring special facilities within the city.

Federally-Assisted Housing Programs

Resources available to meet the demand for low-income housing include a joint program between the private and public sector, or complete initiation by the public sector. The federally assisted housing programs available to the Gladstone area include Section 8 - Housing Assistance Payment Program, Traditional Public Housing, Section 235 - Home ownership and Community Development Block Grant Funds.

Section 8 is available to private and public housing agencies designed to provide housing to low and moderate income families with the provision that no family should pay more than 25% of their gross income for rent. Traditional Public Housing has a program exclusively undertaken by public housing agencies designed to provide housing for low and moderate income families with the same 25% income limitation. Section 235 Home Ownership is designed to offer home ownership by moderate income families through reduced interest rates.

Section 236 - Multi-Family Rental Housing, although on its way out, is continuing to fund projects already in existence. This program offers FHA Mortgage Insurance, federal interest rate reduction payments and assistance payments to sponsors of very low income families.

Community Development Block Grant Funds are designed to encompass the benefits of a number of federal programs for rehabilitation and urban renewal.

REGIONAL FAIR SHARE

Low and Moderate Income Household Distribution

There are several allocation formulas which can be used to establish each jurisdiction's "fair-share" of low and moderate income housing. Some of the factors to be considered in any such formula include demand and supply of low and moderate income housing, concentrations, accessibility, household income levels and population densities. Due to the lack of an adequate fair-share formula for the region, the City of Gladstone, for purposes of analysis only, will subscribe to a balanced distribution model.

The median income level for the CRAG Region, as indicated in the 1970 Census, was \$10,463.00. Low-to-moderate income is defined as 80% of the median income, or \$8,374.00. Very low income is defined as 50% of the median income, or \$5,232.00. Table XXXI below shows that Gladstone has more than its "fair-share" of low and moderate income families.

T A B L E X X X I

PERCENT DISTRIBUTION OF LOW AND MODERATE INCOME FAMILIES
BY JURISDICTION

	CRAG	PORTLAND	CLACKAMAS COUNTY	GLADSTONE	MILWAUKIE	OREGON CITY	WEST LINN	LAKE OSWEGO	
Low to Moderate	25.35	41.20	33.06	39.02	30.25	41.91	26.37	12.60	(%)
Very Low	16.46	17.06	15.81	19.01	12.07	23.07	11.64	6.20	

SOURCE: U. S. Census, 1970

Due to better accessibility to jobs and shopping facilities, higher percent distributions are anticipated in Portland, Milwaukie and Oregon City. Gladstone could be considered a support community to the Oregon City employment center; yet West Linn, which would likewise assume the supporting community role, is significantly below the "fair-share" allocation formula. West Linn does, however, have a significant number of unrelated individuals with low incomes, as indicated in Table XXXII below.

T A B L E X X X I I

MEDIAN INCOMES OF UNRELATED INDIVIDUALS
BY JURISDICTION

CRAG	PORTLAND	CLACKAMAS COUNTY	GLADSTONE	MILWAUKIE	OREGON CITY	WEST LINN	LAKE OSWEGO
\$2,899	\$2,976	\$2,920	\$2,393	\$2,864	\$3,101	\$1,439	\$5,241

SOURCE: U. S. Census, 1970.

Density

Another factor considered in fair-share housing is population density. Each community, theoretically, must allow for higher density within the urbanized area for the region in order to accommodate anticipated increases in population.

T A B L E X X X I I I

GROSS DENSITY (POPULATION/SQUARE MILE) BY JURISDICTION, 1972

CRAG	PORTLAND	CLACKAMAS COUNTY	GLADSTONE	MILWAUKIE	OREGON CITY	WEST LINN	LAKE OSWEGO
2882	4118	1682	2860	3608	2219	1288	1963

SOURCE: CRAG Framework Data Supplement, 1975.

In order that the region may accommodate 1.6 to 2.0 million population by the year 1990, total gross densities must range between 3800 people per square mile to 4800 people per square mile. Gladstone's present density is 3451 people per square mile (1975). If the city is to accommodate the anticipated influx of people within the region, a density range of from 3800 people per square mile to 4800 people per square mile would accommodate an ultimate population of 8892 to 11,232 for Gladstone by the year 1990. Since the city's saturation level is approximately 11,812, Gladstone is accommodating its fair-share of the population influx into the region.

NEIGHBORHOOD ENVIRONMENT

The quality of the housing environment is determined by a countless number of factors, the most important of which, perhaps, are safety and security, the presence and location of recreational, educational and public facilities, community and neighborhood identity and tranquility, and other physical, social and aesthetic features and values. Special attention is given here to the problems of safety, security, noise, convenience and accessibility, and the compatibility of surrounding land uses.

Safety and Security

One of the most prominent hazards in residential areas is traffic. This issue has been dealt with extensively in the transportation element. The provision of pedestrian and bicycle facilities, an important safety factor, has likewise been addressed in the transportation plan. An important factor in traffic safety, pedestrian and bicycle security and crime deterrent is roadway lighting. This issue has been addressed briefly in the "Traffic Safety Operation Improvement Program, 1974". Generally, the city is providing adequate roadway lighting. Other factors determining the degree of safety or security within the Gladstone area are beyond the scope of this plan element.

Noise

Vehicle and train traffic are the two main noise generators within the Gladstone area. The acceptable noise levels for residential areas usually range between 50-60 decibels (dBA). The Federal Highway Administration has set their acceptable noise levels for residential areas at 70 dBA. The Department of Housing and Urban Development at 65 dBA, and the City of Portland at 55 dBA. For purposes of analysis, Gladstone will use 60 dBA as the acceptable noise level for residential areas.

With assistance from the Department of Environmental Quality in Seattle, and the City of Portland, the City of Gladstone conducted a noise level study along Highway 99E and I-205. Results from this study indicate that land within 350 feet from the centerline of the near lane of Highway 99E could experience a noise level exceeding 60 dBA. This level is based on a 1976 traffic count of 26,000 average daily traffic (ADT). For 1990, with an expected traffic volume of 35,000 ADT, this distance could increase to approximately 600 feet.

For I-205, land within 500 feet of the centerline of the near lane could experience a noise level exceeding 60 dBA, based on the present traffic volume of 20,000 ADT. By the year 1990, traffic volumes should increase to 70,000 ADT, thus increasing the noise impact area to 800 feet from the centerline of the near lane. Map IV illustrates these noise impact areas on the two transportation corridors.

Several methods can be utilized to reduce noise levels within the noise impact area. These include:

1. Acoustical site planning such as locating noise sensitive activities away from the noise source and locating noise compatible activities between the noise source and the sensitive activity, or using buildings as barriers.

2. Accoustical architectural design such as building height limitations and window placement.
3. Accoustical construction such as the use of dense materials and double pane windows.
4. Noise barriers such as berms, walls and fences.

To a limited extent, the commercial buildings located along Highway 99E act as an adequate noise buffer between highway traffic noise and abutting residential developments. A two or three story structure such as an apartment house, however, would not benefit from a one-story commercial building between the highway and the apartment building.

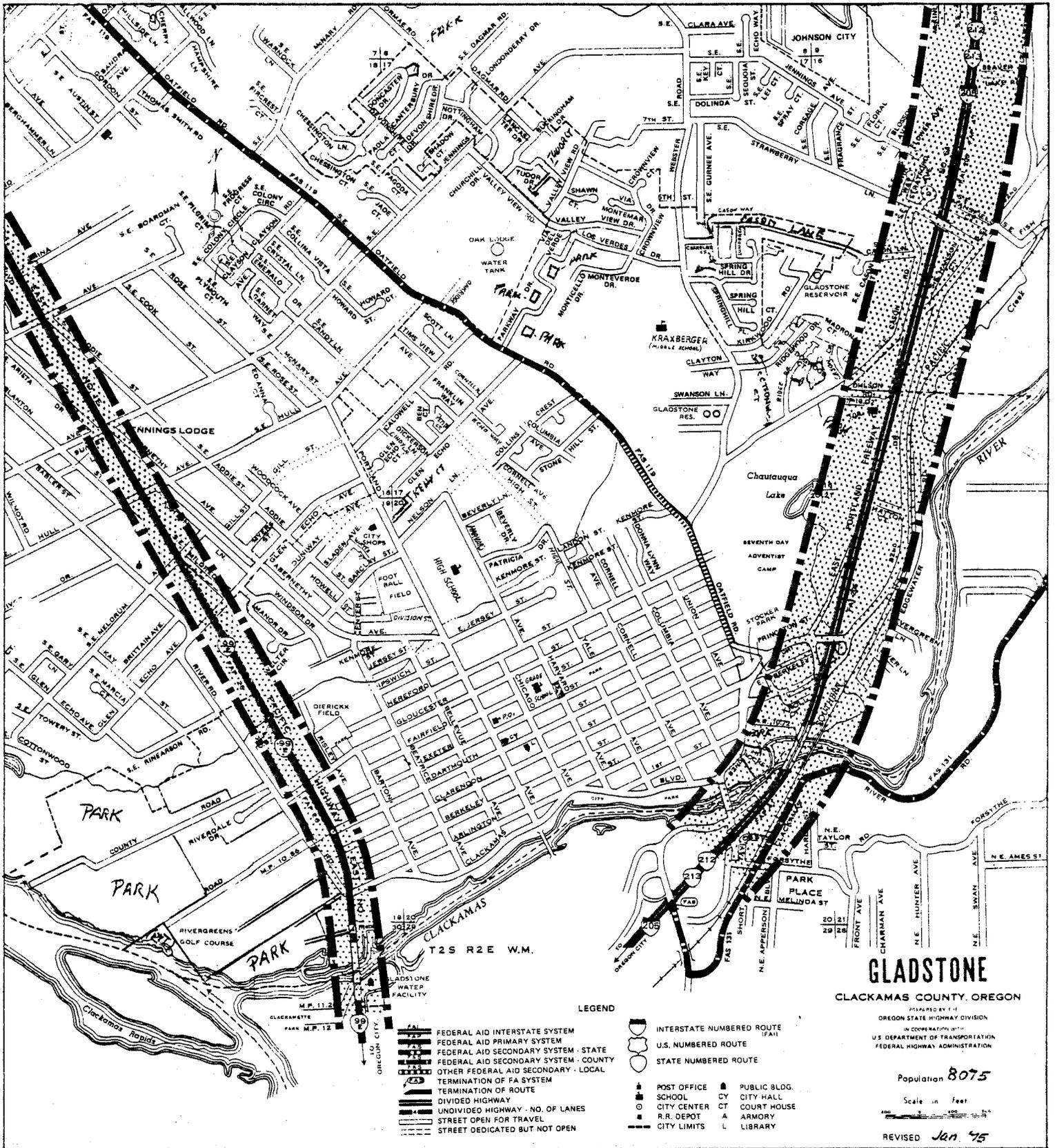
Train noise along 82nd Drive and Edgewater Road reaches maximum levels of 94 dBA. It is because of the I-205 traffic noise and the Southern Pacific train noise that this area between I-205 and 82nd is incompatible with residential development. Due to the sloping topography East of Edgewater Road, this area is probably suitable for single family development.

Unacceptable noise levels are perhaps reached along most arterials and collectors during peak hours in the Gladstone area. Section 29, sub-section 3, of the Gladstone Subdivision Ordinance, allows the Planning Commission to require a ten foot planting screen along the line of building sites abutting such traffic arterials. To date, however, this provision has not been utilized.

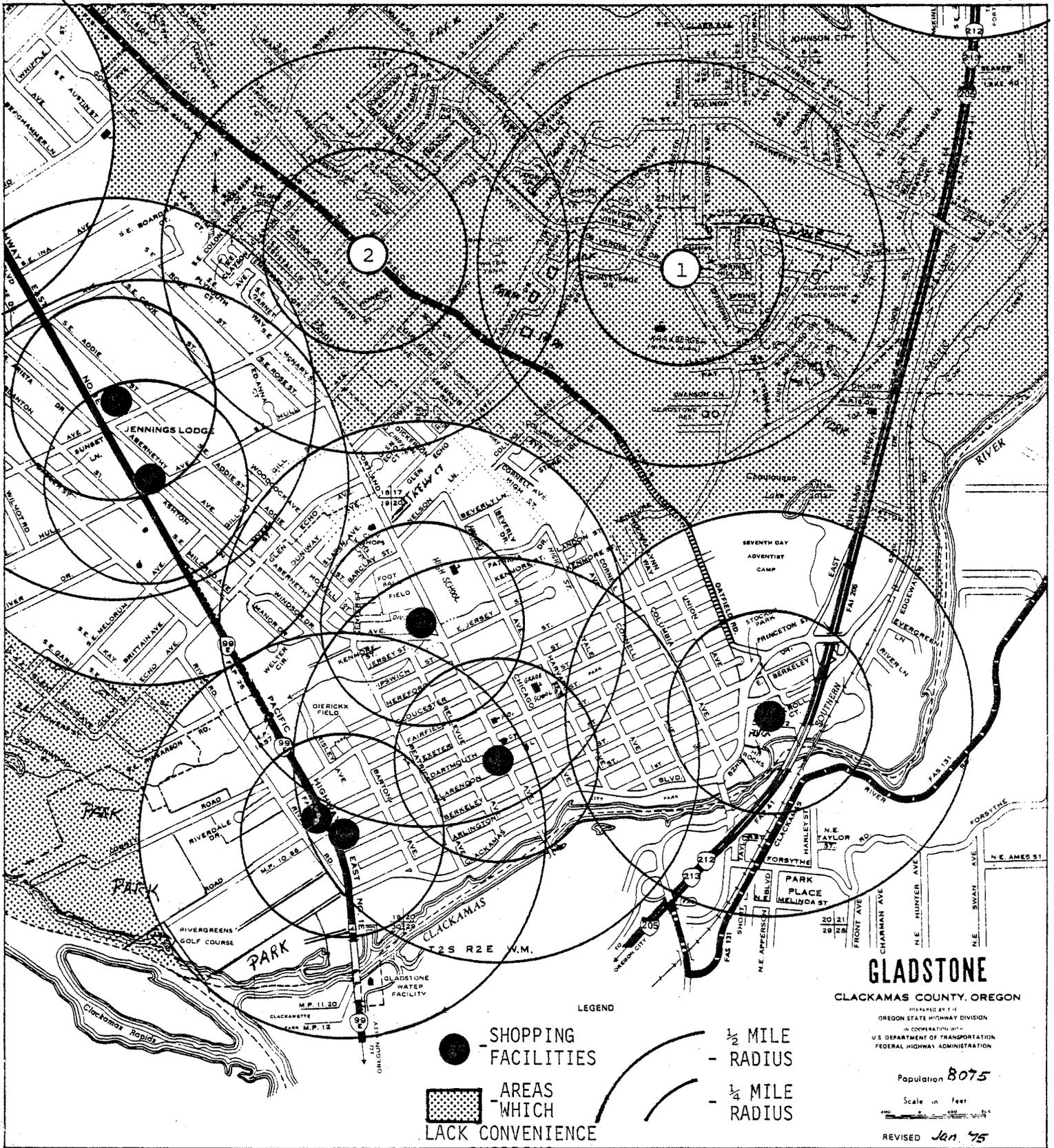
Convenience and Accessibility

The majority of multi-family developments in the city are within walking distance ($\frac{1}{2}$ to $\frac{1}{4}$ mile) from shopping and recreational activities, except the following: Hidden Springs Apartments on Caldwell Road (64 units) and Los Verdes/Webster Road apartment and duplex complexes (150 units). (The multi-family dwellings of the area are dispersed except for a high concentration in the Webster Road/Los Verdes area.) This concentration does not support commercial development in the area nor does it reasonably support mass-transit since Route #72, which serves the Gladstone CBD and Oregon City, is not routed North on Highway 99E, where the majority of work-generated traffic is directed. A transfer from bus #72 to #33 is possible at the Gladstone CBD, but this is not likely since bus ridership must compete with the private automobile. Given our present zoning, a concentration of high density development could also be anticipated along Risley Avenue and River Road. These anticipated concentrations would also be inadequately served by public services and facilities.

Map V shows the location of various convenient shopping areas within the Gladstone area. Two concentric circles are drawn showing $\frac{1}{4}$ mile distance and $\frac{1}{2}$ mile distance from store locations. While this is considered to be a reasonable walking distance, patrons are likely to use their cars rather than walk. Map V suggests two possible locations for needed shopping facilities:
(1) Webster Road/Los Verdes Drive, and (2) Oatfield Road/Jennings Avenue.



MAP IV
NOISE IMPACTED AREA



MAP V

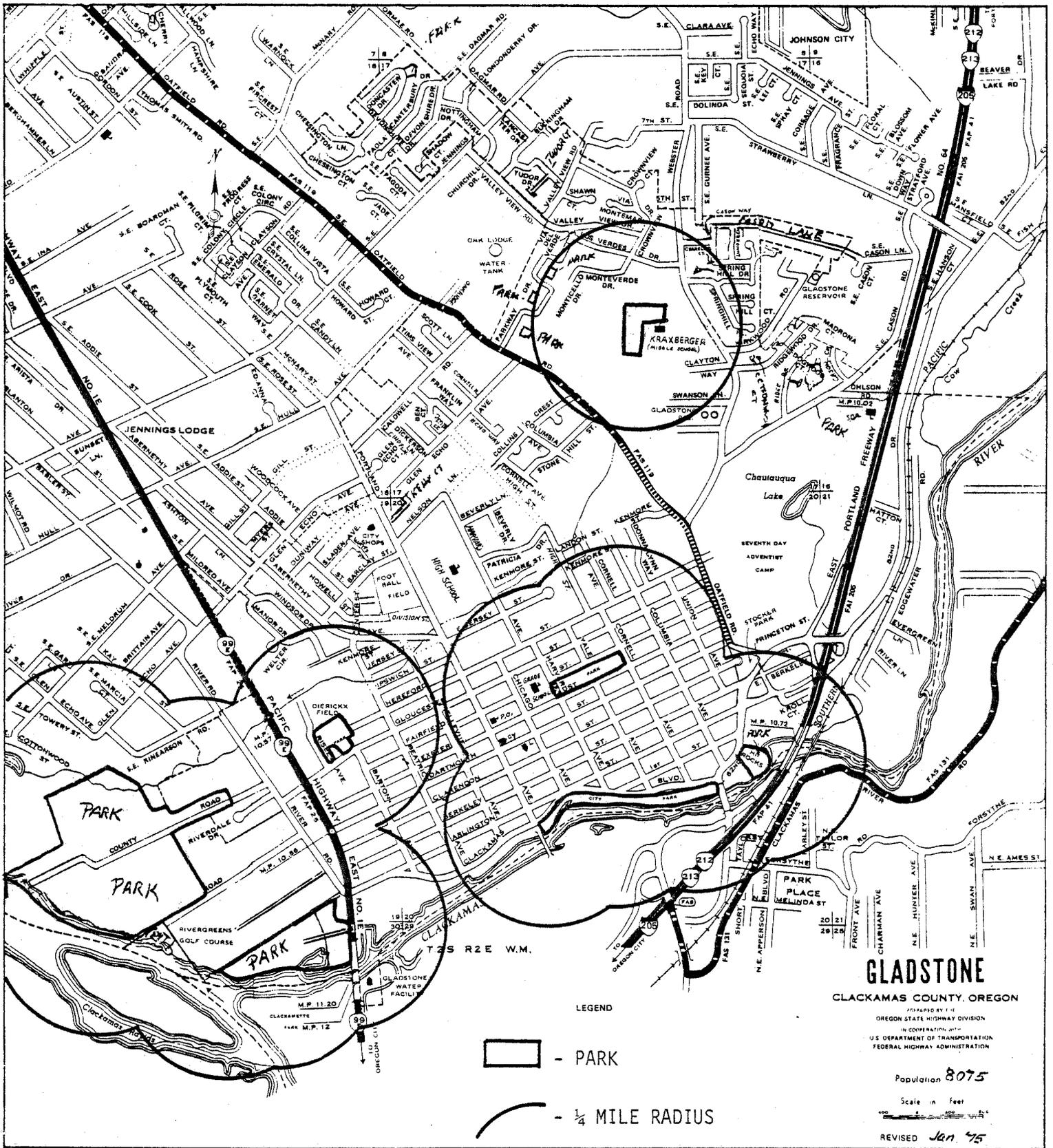
CONVENIENCE SHOPPING SERVICE AREAS

Residential neighborhoods should also be close to parks and schools. Given the school bus system and the unlikelihood of additional schools within the Gladstone area, the distance to school is adequate. Close proximity to parks, however, is limited to those areas in old town, with the exception of possible park development in the Kraxberger School area. In addition, each park supports different types of activities and different age groups. Thus, although a park may be within walking distance, it may not adequately serve the variety of potential users. Walking distance to parks becomes especially critical when considering high density housing locations (see Map VI).

Public hearings have accentuated the importance of aesthetics with regard to multi-family and commercial developments. Most multi-family units come under a conditional use process which provides the city with the opportunity to review site plans and structural design. The design review option, however, is likely to be beyond the experience and knowledge of most Planning Commission members. Yet the city does not have a design review board. The same hearings have also identified the lack of proper maintenance of existing multi-family developments as another problem. In addition to improving the appearance of housing developments, good design can also serve as an effective deterrent to crime. Results of a study by the Project for the Security Design of Urban Residential Areas show that there is a significant relationship between design and the criminal vulnerability of inhabitants. Equally important is city and neighborhood identity, which the City of Gladstone lacks; one cannot readily tell where the city begins or ends.

Compatibility of Surrounding Land Uses

Unacceptable noise levels resulting from high volumes of traffic are definitely incompatible with abutting residential development. Other incompatible land uses include commercial and/or industrial development within close proximity to residential areas. Coral Corporation and Whitlow Recreational Vehicle Storage, both located along Portland Avenue, are classified as industrial land uses, and are likewise incompatible with the surrounding residential development. The area next to the city shop, presently the site of the RV Vehicle Storage, is zoned light industrial (I-L), which permits outright such incompatible uses as freight depots, or terminals, heavy equipment outlets, ice or cold storage plants, manufacture, compounding, processing or packaging plants, welding, sheet metal or machine shop, kennels, or catteries. Such inappropriate zoning should be changed in order that a pleasant neighborhood environment can be realized.



MAP VI
 NEIGHBORHOOD PARK SERVICE AREAS

LEGEND

- PARK
 - 1/4 MILE RADIUS

GLADSTONE
 CLACKAMAS COUNTY, OREGON

PREPARED BY THE
 OREGON STATE HIGHWAY DIVISION
 IN COOPERATION WITH
 THE U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION

Population 8075
 Scale in feet
 1" = 1000'
 REVISED Jan. '75

FINDINGS

The preceding analysis has identified a number of housing problems, deficiencies and potentials to be addressed by the Gladstone policy plan. These are summarized below.

1. Continuous growth is inevitable within the foreseeable future. The population of Gladstone is growing at the rate of 6% per year. Given limited land resources, higher density living is also inevitable.
2. Average household size has decreased from 3.2 in 1960 to 2.77 in 1977.
3. The percentage of owner-occupied units has increased between 1960 and 1970. Single family units have increased at a higher rate than multi-family units, which is contrary to the state trend.
4. Given present zoning and available buildable land, Gladstone will reach maximum housing capacity by about 1995.
5. Organized neighborhood groups have expressed strong opposition to multi-family unit construction in order to preserve the single-family residential character of the city.
6. Housing prices have soared beyond the reach of many residents. Housing is in a particularly short supply in price ranges affordable by low-income households.
7. Gladstone has a high property tax, the second highest in the county.
8. Families receiving federal housing assistance are in need of further assistance because they are paying more than 25% of their income toward housing. 150 additional households need but are not receiving assistance.
9. 250 units need to be rehabilitated or replaced. Planning Districts #1 and #2 have the largest number of deteriorating and delapidated units. Rehabilitation needs are being partially met by the private sector, but low-income households have not been financially able to meet this need.
10. About 210 households found their housing units to be too small in 1975.
11. Special housing facilities are needed for over 600 residents with physical limitations. In addition, there are about 190 ambulatory care patients who also need special facilities within the city.
12. Some land uses are incompatible with land uses surrounding them. Housing units near Freeway I-205 and Highway 99E are experiencing considerable noise levels. These levels are likely to increase. Multi-family housing developments are not located so as to lend direct support to commercial development and mass transit.
13. Gladstone accommodates its regional fair share of low-income households, population density, and multi-family and mobile-home units.

STATE AND REGIONAL GOALS

The Gladstone policy plan must also address the housing goal of the Oregon Land Conservation and Development Commission (LCDC), as well as the stated housing goal and objectives of the Columbia Region Association of Governments (CRAG).

LCDC GOAL

"To provide for the housing needs of citizens of the state.

"Buildable lands for residential use shall be inventoried and plans shall encourage the availability of adequate numbers of housing units at price ranges and rent levels which are commensurate with the financial capabilities of Oregon households and allow for flexibility of housing location, type and density."

CRAG GOAL AND OBJECTIVES

The CRAG goal directs that the plan shall foster "housing choice for the region's residents".

Substantive Objectives

- a. "Support of Land Use Classifications. Regional housing planning shall support development of a variety of housing types, price ranges and rent levels appropriate to Urban and Rural land use classifications.
- b. "Provide Housing. The regional plan shall promote adequate housing construction, rehabilitation and maintenance of existing housing.
- c. "Housing Choice. The regional plan will promote public policies which will encourage a diversity of housing types and optimum utilization of housing resources to meet the needs of all segments of the population.
- d. "Special Need Groups. Provision of housing for population groups with special needs, such as low income and disadvantaged persons, shall be promoted by the public sector and encouraged in the private sector.
- e. "Neighborhood Preservation. Policies designed to preserve and enhance the character of existing residential neighborhoods and communities shall be promoted.
- f. "Diversity. Innovative site planning and aesthetic housing design shall be encouraged in order to provide visual diversity and interest, foster social and economic choice, preserve special environmental features and offer a variety of residential building types.
- g. "Buildable Lands. Lands for housing shall be designated which are both compatible with land uses in Urban Areas and convenient to commercial and industrial centers, adequate existing or planned transportation facilities, recreation opportunities and schools."

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TRANSPORTATION ELEMENT

INTRODUCTION

In earlier days, Gladstone's transportation facilities included steam boats and trains in addition to horse-drawn carriages. Included also was a toll bridge astride the Clackamas River and access to a county road system that had more miles of improved roads, at one time, than any other county in the State. Electric rail came to Gladstone in 1890 and continued providing passenger service until the mid 1950's. Since then, however, the city has witnessed the decline and eventual phasing out of electric rail service and development of the Cascade Highway and its extension, I-205, and Super Highway (99E) to accommodate motorized vehicles.

Although Gladstone is a small city and does not experience the magnitude of problems faced by large cities, it is part of the Portland Metropolitan Area and therefore its planning should reflect this relationship. The regional transportation issues and perspectives discussed below highlight certain aspects of this relationship.

CHOICE AND OPPORTUNITY

The major benefit to be derived from the metropolitan area is the infinite range in activities made possible through the specialization of production and service sectors. The success of these sectors, however, have led to large scale, spatially segregated activity centers which contribute to the separation of people and activities. Thus, the major advantage of the urban environment - that of readily accessible opportunity - is inhibited and eventually lost.

This separation of people and activities is being encouraged by the success of our present day highway and road system. Gladstone's transportation system should therefore support a regional system which provides this link between people and activities. This link (mobility) should be extended to all people regardless of their socio-economic status with the understanding that when one's mobility is enhanced, the quality of urban life is likewise enhanced.

CONCENTRATION/CLUSTERING OR SPRAWL

The 1973-74 Oil Embargo has reaffirmed earlier decisions to examine alternative modes of transportation to the private automobile. Mass transit, being a likely solution, would effectively address the need to conserve energy, while at the same time serve to maintain and enhance air quality. Such a system, however, calls for concentrated population centers in cluster developments vs. the existing dispersed settlement pattern.

The increasing cost of municipal services may also necessitate concentration and/or clustering. No longer can municipalities afford to extend services to outlying areas where costs are out of proportion to the number of people being served, nor can municipalities afford to promote fringe developments to the attrition of the central cities, like Portland, and the vast resource commitments that have been made.

TRANSPORTATION MODES

If efforts are directed at discouraging the use of the automobile, other modes of transportation are inherently promoted. A balanced transportation system is one that is multi-modal, one which avoids principal reliance on any one mode of transportation. It is readily recognized that the continued intensive use of the automobile by area residents, coupled with anticipated increases in population, will definitely affect the livability of the area.

How then can reliance on the private automobile be retarded? Or, to put it differently, how can other modes of transportation be more effectively promoted? It is known that high density areas support walking as a mode of travel, whereas walking is not feasible in low density areas. It is also known that concentrations of destinations (i.e. places of work and shopping) tend to support mass transit. If Gladstone is to support decreased reliance on the private automobile, a land use plan must be developed that promotes concentration.

TRANSPORTATION AND LAND USE

A transportation system should serve to integrate various land use developments. The system should encourage the development and maintenance of neighborhoods that are quiet, relatively free of traffic, close to schools and parks and with ready access to shopping centers and public facilities. In addition, a transportation system should complement efforts at integrating, diversifying and stimulating commercial areas of the city.

Today's road systems, however, have, in many instances, divided neighborhoods, isolated commercial districts from population centers, destroyed scenic values along waterfronts, deprived communities of recreational opportunities, and frustrated efforts at obtaining community identity. Highway 99E and I-205, which bisect Gladstone, are appropriate examples. A transportation plan should reflect an understanding of the relationship between the functional objectives of various types of land use and the transportation system, as well as the socio-economic ramifications each entails. Such a plan should reflect the complex interdependency between all aspects of community development.

TRANSPORTATION DISADVANTAGED

According to the 1970 U. S. Census, 24.6% of U. S. households owned two (2) or more cars; yet 20% of American families had no car at all. Among the latter, 45% of the families were headed by persons over 65 years of age. In Gladstone, 15% of the population does not have access to an automobile.

What then are the transportation alternatives open to those who do not own or have access to a car? Walking can be an alternative to some. However, in an age of mobility, walking can compress and restrict a person's life space and the

variety of life's experiences which can occur. For the elderly and physically limited, walking can also place them in a situation which is potentially dangerous. Of pedestrian deaths occurring in this country, 25% were persons 65 years or older. In Gladstone, 15% of the population is 65 years or older.

Mass transit may be an alternative to some of the transportation disadvantaged. Most transit systems, however, are not designed to meet the specific needs of the physically and mentally disadvantaged. As an example, most buses are not designed with a wheel chair lift and, for some elderly, the first step is just too high for boarding purposes.

Another possible alternative for the transportation disadvantaged is that of asking friends or family for a ride. However, the problem here is of forced dependency upon other people. People normally enjoy being independent; dependence on other people may work to cripple their attempt at self projection and self assertion as free and unencumbered individuals.

A transportation system is needed which fulfills the varied transportation needs of all people. Mobility is a value, if not a right, which is sought by all.

INVENTORY AND ANALYSIS

The existing Circulation System includes facilities for automobile and truck traffic, mass transit, bicycle and pedestrian movement. Automobile and truck traffic is the most significant element of the existing system. The arterial system defines specific routes for traffic and these routes should be physically defined. The Gladstone area is penetrated by two major transportation corridors, Highway 99E and I-205, establishing the city as a connecting link between the two and thus creating traffic through the city. Ready access to any street from Highway 99E or Oatfield Road/82nd encourages through traffic on all "old town" streets. This situation causes potential conflict between pedestrian/bicycle movement and the automobile; it disrupts the livability of residential neighborhoods; it creates several points of potential traffic hazards, particularly intersections along Portland Avenue; and increases maintenance costs. It becomes necessary, therefore, to define and determine the functions of these streets as they are now fulfilling functions for which they were not intended.

STREETS

Functionally defined, streets can be classified as local streets, collector streets, minor arterials, major arterials, and freeways.

LOCAL STREETS

These streets provide access to abutting property; they accommodate minor traffic volumes; they provide easements for utilities, open space between buildings and temporary parking space. These streets were never meant to be routes for through traffic, for buses or trucks. Restricting traffic through residential areas preserves neighborhoods and housing stock. Heavy traffic can be prevented by keeping access streets relatively short with no access to arterials. Since street function designation will not of itself provide that exclusive function and, considering that people tend to take the most convenient route, a street function must be defined physically.

Some of Gladstone's local streets are presently being used for functions other than their intended use. Several of these streets are experiencing undesirable heavy through traffic.

COLLECTOR STREETS

The primary function of collector streets is to serve as access roads between neighborhoods and arterials, in addition to serving local parks, commercial and institutional areas. Collectors also serve as easements for utilities, as open space, and as part of the urban design function. Normally these streets are spaced about one-half mile apart. They may delineate neighbor-

hood boundaries and may even accommodate mass transit. Through traffic, other than that with an origin or destination within the immediate area, should be discouraged. To avoid potential friction points and traffic obstructions, residential driveways should also be discouraged along collector streets. pedestrian/bicycle ways should be provided along these streets where appropriate.

The following streets were identified in the 1974 Gladstone Traffic Safety Study as collectors: Gloucester, Caldwell, Glen Echo (between Pacific and Mildred), Abernethy, Portland (North of Abernethy), Cason, Jennings, First and Clackamas.

West Gloucester signalization at Highway 99E defines it as an entrance into the city and makes it an important collector street. East Gloucester, however, abutts an Elementary School and duplicates Hereford Street's function. Hereford serves as a collector street because of its relationship to Donna Lynn Way, Columbia Avenue, Cornell Avenue, High Street and Harvard Avenue

and the fact that it is the first street on Oatfield Road traveling south. The use of these two streets as collectors creates two points of friction along Portland Avenue whereas one is desirable.

Caldwell does not serve as a route between arterials and, being within close proximity to Jennings Avenue, does not meet the guideline of spacing collectors one-half mile apart. Moreover, through the widening of Oatfield Road, a hazardous slope has been created at the intersection of Caldwell Road and Oatfield Road.

Glen Echo serves as the connecting link between Highway 99E and Abernethy Lane, between Highway 99E and Portland Avenue and between Portland Avenue and Oatfield Road. The latter functions create two friction points along Portland Avenue.

Abernethy Lane serves as an important link between Glen Echo/99E and Portland Avenue. Its problem is that it has a narrow right-of-way (30 feet) and thus provides no room for pedestrians or bicyclists unless the Portland Traction Company Right-of-way is utilized. The majority of traffic is along Portland Avenue and yet the right-of-way at the intersection of Portland Avenue and Abernethy Lane is given to those utilizing Abernethy.

Portland Avenue (North of Abernethy) in addition to serving as a collector street, provides access to Gladstone High School.

First Street, though basically an access street, is currently functioning as a collector and truck route that abutts Clackamas Terrace Care Facility and Cross Park, both pedestrian generating activity areas. Moreover, it is not optimally spaced from other collectors.

Clackamas Boulevard directs traffic along a pedestrian generating park site. Between Harvard and 82nd, three streets serve the same function - a situation that generates undue noise and road maintenance costs.

MINOR ARTERIALS

These are connecting links between collector streets and principal traffic generators. They also facilitate through traffic and channel it around

homogeneous land uses such as commercial districts, parks, schools, and other institutional areas. The development or expansion of minor arterials along rivers and scenic waterways should be discouraged. Due to relatively heavy traffic and high speeds, private entrances from residential units and parking should also be discouraged. Channelization should be provided at major intersections. Minor arterials should also include pedestrian/bicycle ways, as well as landscaping, to function as a barrier for the protection of adjacent properties from noise and dust.

The 1974 Gladstone Traffic Safety Study lists the following streets as minor arterials: Arlington, Portland (South of Abernethy), 82nd, River, Oatfield and Webster.

River Road between Arlington and Glen Echo serves as a parallel route to Highway 99E. Through traffic on it abutts residential developments which house many elderly residents who need to shop at businesses located along Highway 99E. Crossing River Road is potentially hazardous, especially for the elderly. Pedestrian movement is further aggravated by the absence of sidewalks.

Oatfield Road has been improved recently. It has been widened and provided with bicycle paths. All "old town" streets, including Clackamas to Hereford, have access to Oatfield and 82nd. These intersections create several hazardous friction points.

MAJOR ARTERIALS

The primary function of major arterials is to serve as avenues for high volume traffic traveling at relatively high speeds. Major arterials should be connected and accessible only by major traffic generators (i.e. minor arterials and collectors). They should not be located where they divide homogeneous land use areas, nor should they be developed or expanded along river and scenic waterways. Here also pedestrian/bicycle ways should be provided. To minimize friction points and the slowing of arterial traffic, parking should be prohibited and driveway entrances from residential and commercial land uses should be kept to a minimum. All intersections should be provided with signals and channelized grade crossings.

Highway 99E is the major arterial serving the area. It carries the highest volume of traffic of any highway in Clackamas County. Left turns are allowed at almost any location creating potential traffic hazard. This highway has facilitated strip commercial development abutting it and has encouraged the continued dependence on the automobile. The advantage, however, is that commercial development provides a buffer between the highway and residential land uses.

FREEWAYS

The primary function of freeways is to act as avenues for unimpeded traffic flow between distant points within the State or Region, as well as between and within the metropolitan area. Freeways should have full access control at all points with a multi-lane divided road. They should not bisect neighborhoods, public parks, shopping centers or other homogeneous areas, and should not develop or expand along rivers and scenic waterways. Where freeways abutt residential development, adequate buffers should be provided.

I-205 Freeway serves the area well, but like Highway 99E, it bisects the City of Gladstone. It impedes access to Clackamas River and introduces a noise problem that calls for solutions. Its planned completion will no doubt further aggravate the problem.

According to the Oregon State Highway Division, daily traffic volumes on I-205 and 99E for the present and 1990 are estimated to be as follows:

T A B L E I

TRAFFIC VOLUME ESTIMATES FOR I-205 AND 99E

I-205	1976 - 30,000	1990 - 70,000
99E	1976 - 26,000	1990 - 35,000

SOURCE: Oregon State Highway Division

The Highway Division has based these estimates on the following assumptions:

- Assumed light rail transit from Portland to Oregon City
- Oregon City Bypass - South Oregon City & Park Place
- Completion of I-205

NOTE: If any or all assumptions do not come to pass, traffic volumes can be expected to increase proportionately.

The State Highway Division provided the following projections with regard to noise:

"Noise levels, based on these volumes, also assumed 10% vehicles use during the peak hour of which 5% were trucks. I-205 speed was estimated at 55 mph and 99E at 40 mph. The L_{10} 70dBA levels for I-205 were computed to be 188 feet from the centerline of the near lane 1976 and 300 feet for the year 1990. 99E was computed to be 200 feet, 1976 and 230 feet, 1990. These were also based on flat/level terrain with no obstacles."

S P E C I A L C I R C U L A T I O N D I S T R I C T S

Activity centers, because of their unique needs, traffic generation and/or location, require special traffic circulation systems. Downtown business districts naturally generate automobile traffic and must be served by delivery trucks. However, the accommodation of these needs should not negate other needs of the district such as maintaining a pedestrian oriented center which is safe and relatively free of traffic and exhaust fumes. In the development of special circulation systems, both sets of needs, which may appear to be mutually exclusive, should be addressed.

Other activity centers requiring special circulation districts may include parks, schools or convalescent care facilities. Often these activity centers are located within neighborhood areas on streets not functionally designed to handle the increased traffic. In addition, these centers are pedestrian generators, thus setting the stage for potential hazards between the pedestrian and the automobile.

For the Gladstone area the activity centers requiring special circulation systems

include the Portland Avenue commercial district, Gladstone Elementary School/ City Park area, Cross Park, Gladstone High School and Clackamas Terrace Care Center.

Portland Avenue serves as the main street for Gladstone's central business district, while at the same time serving as a main thoroughfare for Gladstone residents. The commercial district is thus car dominated and lacks a pedestrian atmosphere that is conducive to social and cultural activities.

The Gladstone Elementary School/City Park area should be accessible to all Gladstone residents. The school generates bus and automobile traffic in an area that is characterized by heavy pedestrian traffic. Such intensive activity has the potential to destroy the residential character of the area. Exeter, Fairfield, and Gloucester become logical streets to provide access to this activity center. Fairfield Street, because of its interruption by the Gladstone Elementary School, serves as a route to the school/park area, while at the same time discouraging through traffic. Exeter and Gloucester Streets, however, lack sufficient deterrents to through traffic, thus disrupting the livability of the area.

Clackamas Boulevard, because of its uninterrupted traffic flow from West Arlington to 82nd and its designation as a truck route, becomes a heavily traveled thoroughfare. Since Cross Park tends to serve as a Regional Park, the mode of travel to the park is normally via the automobile. Cross Park, by its very nature, becomes a pedestrian oriented activity center. The potential hazards between the pedestrian and the vehicular traffic are readily apparent given the existing circulation system.

The Clackamas Terrace Care Center is bordered by Arlington Street on the North, which is a through street with traffic volumes exceeding 3600 vehicles per day, and First Street on the South, the designated truck route for Gladstone. With approximately 50% of the Care Center's patients being ambulatory and therefore able to utilize Cross Park to the South, the entire area becomes pedestrian oriented. However, there are inherent hazards which exist between the pedestrian activity and the area's vehicular traffic.

The inherent conflicts of these circulation districts with the surrounding land uses should be recognized and dealt with so that a circulation system can be developed which serves all land uses equitably.

TRUCK ROUTES

In several cities the truck route serves as a through traffic route which circumvents various activity centers. For the Gladstone area, however, the majority of through truck traffic utilizes the 99E/I-205 Interchange and thus the majority of truck traffic traversing the Gladstone area has a destination or origin within that area. Thus, the Gladstone Truck Route should serve exclusively as a "Delivery Route;" this route should link truck traffic generators such as various commercial areas, schools and convalescent care facilities, while at the same time circumventing any homogeneous land uses and avoid pedestrian generating nodes to preserve the residential character of the area.

Although Clackamas Blvd./First Street truck route is posted, trucks can be seen utilizing several downtown area streets. The problem is not necessarily lack of enforcement but rather a physical definition of the truck route. To compound the adverse impact of truck traffic, today's delivery trucks are semis and the volume of sales for commercial businesses far exceeds those of yesteryear, thus more frequent deliveries.

Delivery trucks serving Gladstone ingress and egress from Highway 99E, Oatfield Road, I-205, and Webster Road. Activity generators are located along Highway 99E, portions of River Road, Portland Avenue and 82nd Street. In order to economically serve these generators, an East/West delivery route link is essential.

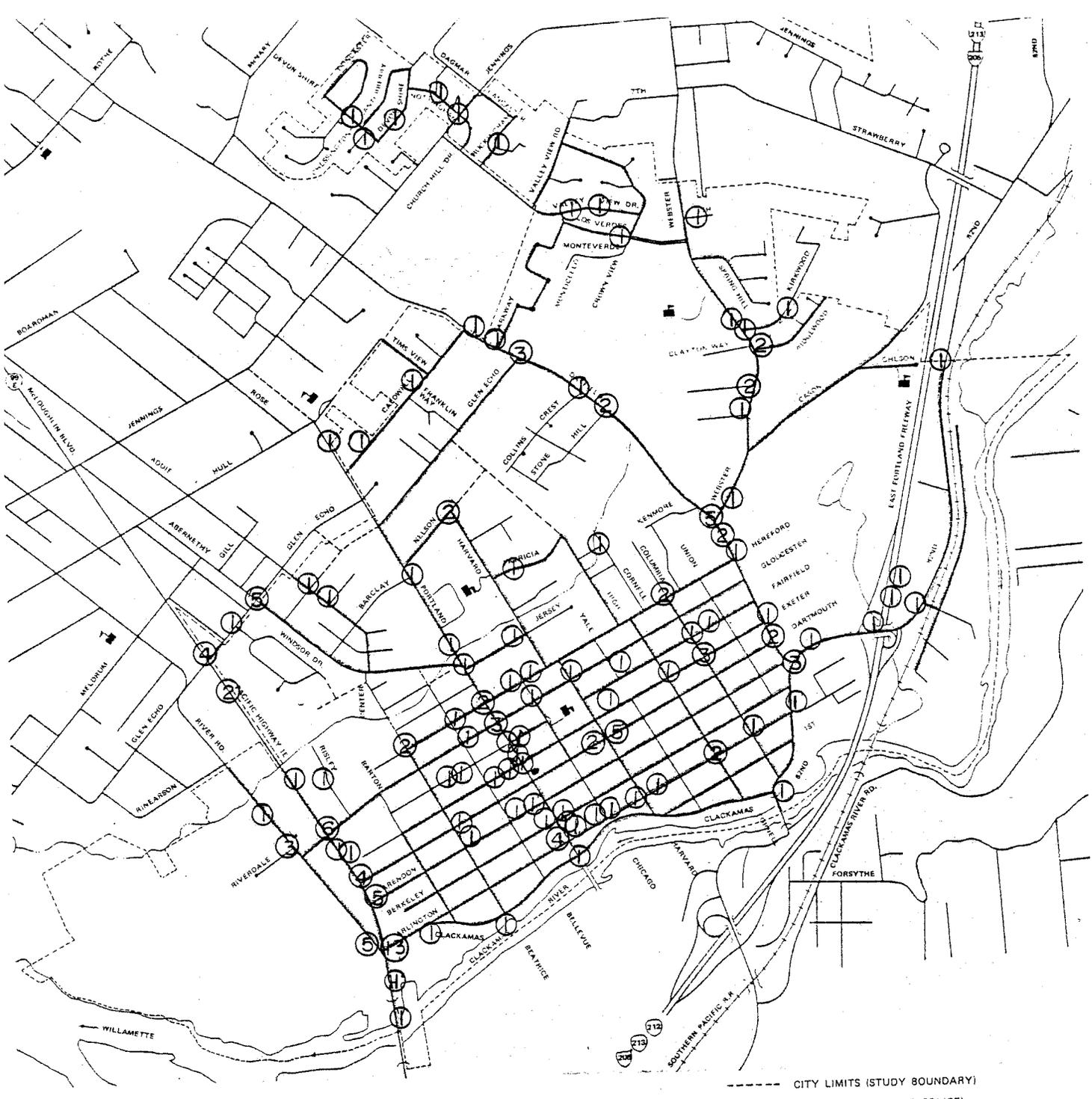
The Clackamas Blvd./First Street truck route presently provides this link. However, there are some inherent problems with this route. The route directs truck traffic by three pedestrian generating areas - Cross Park, Hi Rocks Park, and Clackamas Terrace Care Center. To compound the problem, a blind corner exists for drivers traveling East from Clackamas Blvd. onto First Street. Clackamas Terrace Care Center is located at this intersection with their parking facilities and Cross Park directly across the street, thus creating a frequently used pedestrian cross walk. Drivers heading East cannot see pedestrians at this location until they have nearly entered First Street, which is dangerously late. An obstructed vision area also exists for drivers heading West at the intersection of Clackamas Blvd. and West Arlington, due to the acute angle of vision. Arlington Street, Clackamas Blvd. and First Street receive a relatively high volume of traffic that disrupts three residential streets. These serve the same East/West link and require maintaining three streets rather than one.

S T R E E T D E S I G N

One of the many functions of city streets is to serve as an element of urban design through the effective use of vegetation, sidewalks, street furniture, etc. Streets can project an image of the city, create forums that encourage social interaction and define homogeneous land use areas.

The image of Gladstone most often projected to people passing through is that of the Highway 99E commercial area - an active strip commercial development dominated by the automobile. When one passes through Gladstone, there is no sense of where the city begins or ends. The unique location of Gladstone, being at the confluence of the Clackamas and Willamette Rivers, is not at all reflected in the area's design.

Likewise, the Portland Avenue commercial district is car dominated, lacks a sense of unity, both because of the dispersed activity and variety of it's architecture, and does not take advantage of it's most potential design feature, the Clackamas River. The downtown area which also encompasses the high school, city park, city hall and library, must not only serve a commercial function,



— STUDY STREETS

- CITY LIMITS (STUDY BOUNDARY)
- CITY HALL (FIRE AND POLICE)
- SCHOOLS (PUBLIC AND PRIVATE)

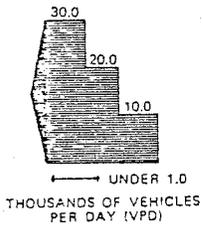
MAP I I

TRAFFIC ACCIDENTS

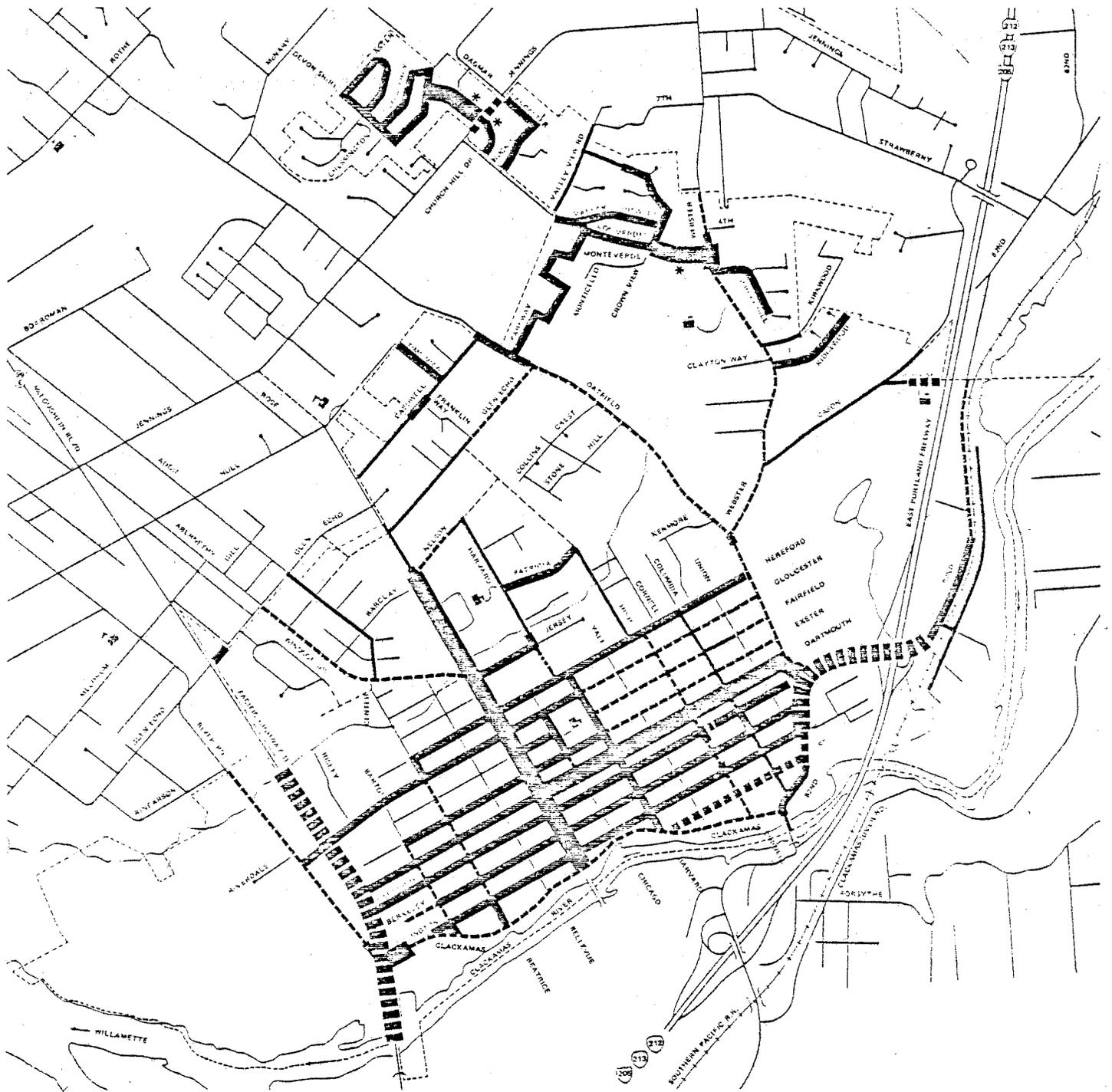
1976



STUDY STREETS

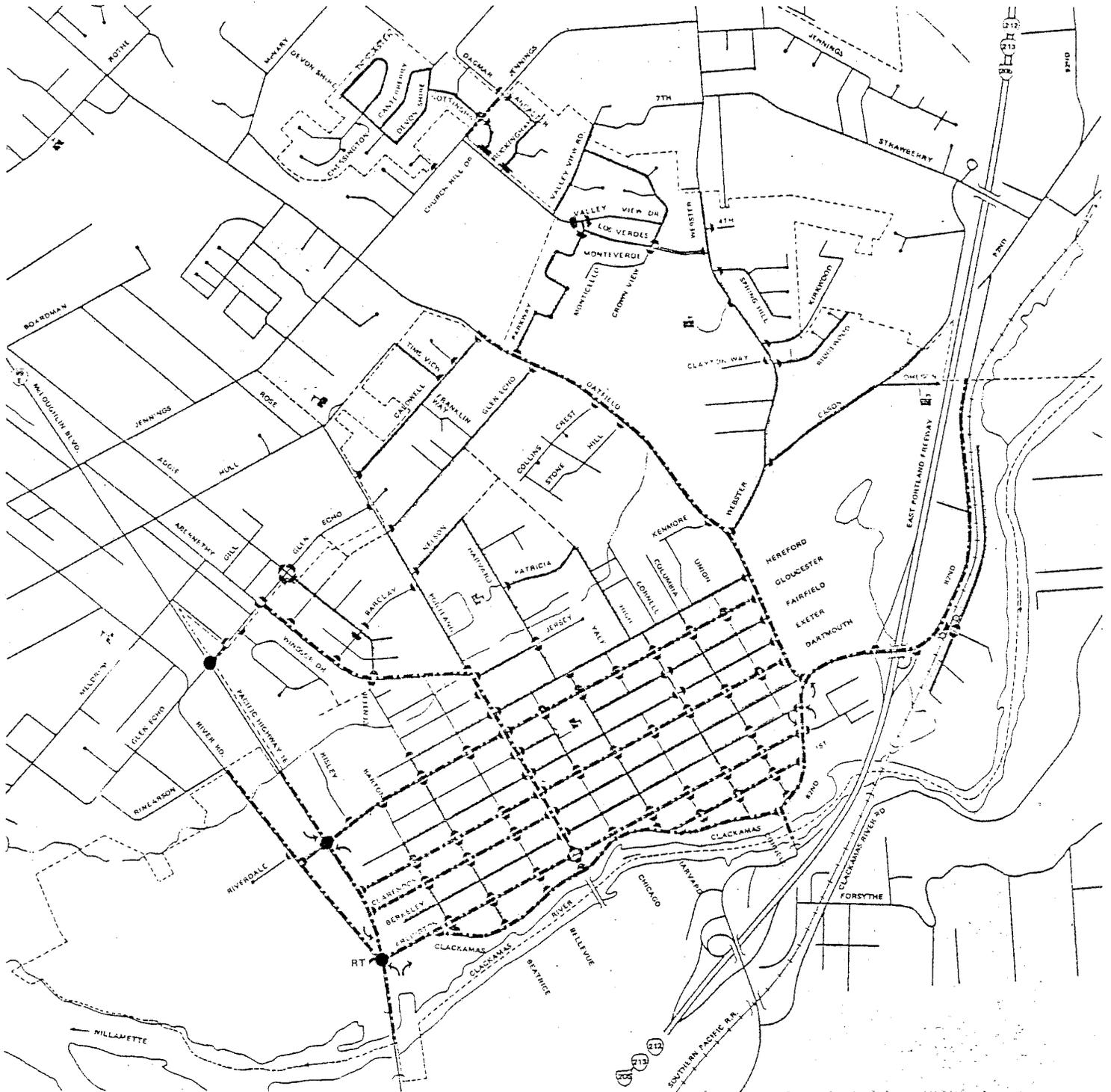


MAP III
TRAFFIC VOLUMES



- PAVEMENT WIDTH RANGE
- LESS THAN 20 FEET
 - - - 20-29 FEET
 - ▬ 30-39 FEET
 - ▨ 40-49 FEET
 - ▩ 50-59 FEET
 - ▧ 60 FEET AND OVER
 - * DIVIDED ROADWAY (MEDIAN)

MAP IV
STREET WIDTHS



NOTE
 THE OREGON DIVISION OF HIGHWAYS MARKED
 A TWO-WAY MEDIUM LEFT-TURN LANE ON
 MC LOUGHLIN BOULEVARD IN SEPTEMBER 1973

- FULL TRAFFIC ACTUATED SIGNAL
- STOP SIGN
- PAVEMENT CENTER LINE MARKINGS
- SPECIAL TURN LANE MARKINGS
- STOP SIGN WITH SUPPLEMENTAL MESSAGE "RIGHT TURN PERMITTED AFTER STOPPING"
- RAILROAD CROSSING PROTECTION GATE

MAP V
TRAFFIC CONTROL DEVICES

but also a social and cultural function. Yet the area lacks adequate forums for social and cultural pursuits.

The 82nd Avenue commercial district is also automobile dominated, reflecting no orientation toward or knowledge of the Clackamas River and lacks a sense of cohesiveness.

City streets say a lot about the interest and vitality of a city. If the streets look dull, the city looks dull and impersonal.

M A S S T R A N S I T

Extremely heavy reliance on the private automobile for transportation has led to the general neglect or abandonment of other means of transportation. However, present saturation levels of automobile ownership and use have created demands for new solutions. Bus service, light rail and train service are possible alternatives to the automobile. To date, Tri-Met's main focus has been to serve the Portland Central Business District (CBD). It is becoming apparent, however, that the Portland CBD is no longer the employer of the majority of the work force. Outlying areas are providing more and more unskilled and semi-skilled job opportunities, while the CBD offers increasing employment opportunities for skilled and professional people.

An examination of Gladstone's work force, where they work and the mode of travel used reveals some inadequacies in our present mass transportation system.

T A B L E I I

GLADSTONE WORK FORCE BY JOB LOCATION

JOB LOCATION	% OF TOTAL
Gladstone	11%
Oregon City	16%
West Linn	3%
Lake Oswego	2%
Milwaukie	13%
Portland	37%
--CBD	--22% or 8% of total
--SW	--13% or 5% of total
--NW	--13% or 5% of total
--SE	--29% or 11% of total
--NE	--23% or 8% of total
Other	18%
	100%

NOTE: These figures include both employed and/or students. The students account for less than 5% of the work force.

SOURCE: Gladstone Survey, 1975

BUS SERVICE

Tri-Met serves the Portland Metropolitan Districts. Although Tri-Met's highest concentration of trip ends are in Portland CBD, only 8% of the total Gladstone work force is employed in the CBD. An analysis of those using Tri-Met indicates that for those who work in the Portland CBD, the mass transportation system is a viable alternative to the private automobile. 26% of the total work force utilizing Tri-Met services, which is the largest ridership group, are employed in the Portland CBD. The majority of those working in Portland, however, are employed in the Southeast area which accounts for only 1% of the total ridership. Clearly, the present Tri-Met system needs to be improved so that it more equitably serves the needs of the metropolitan area.

T A B L E I I I
WORK LOCATION BY MODE

WORK PLACE	MODE				TOTAL
	TRI-MET BUS	CAR POOL	CAR	OTHER	
Gladstone	2%	0%	93%	5%	100%
Oregon City	7	7	83	3	100
West Linn	0	14	66	20	100
Lake Oswego	15	6	79	0	100
Milwaukie	3	9	87	1	100
Portland CBD	26	10	59	5	100
SW	16	22	62	0	100
NW	5	14	81	0	100
SE	1	4	93	2	100
NE	6	17	74	3	100
Other	3	5	66	26	100
Total Work Force	6%	8%	77%	9%	100%

NOTE: These figures include both employes and/or students. The students account for less than 5% of the work force.

SOURCE: City-Wide Survey, 1975.

Upon examination of route patterns of the Gladstone work force, an emphasis of an I-205/82nd Avenue Corridor, as well as the Highway 99E/Oregon City Corridor, is warranted. Of those persons in the Gladstone work force, 39% travel via Highway 99E and 16% travel via I-205. Should I-205 be completed, the ridership along this route is likely to increase sharply. If a mass transit system is to effectively and efficiently serve Gladstone residents, two corridors must be emphasized.

T A B L E I V

GLADSTONE WORK FORCE BY ROUTE

ROUTE	% OF TOTAL
Highway 99E	39%
I-205	16%
Park Place Bridge	8%
Oatfield Road	10%
Webster Road	11%
Other	16%
	100%

SOURCE: Gladstone Survey, 1975

The fact that only 8% of the total Gladstone work force utilizes the Park Place Bridge and that traffic volumes for the bridge are approaching 7,000 vehicles per day, suggests that the bridge does serve as an intercity route, but in fact is of limited importance as a route to and from work.

Bus routes which serve the Gladstone area include Route #33, Highway 99E; #33, Oatfield Road; #34, River Road; and #72, 82nd Drive. #33 and #72 bus routes serve the 99E and 82nd/I-205 corridors. Because of the barrier effect of 99E, isolating River Road residents from the central city, Route #34 could serve as an important link. Yet #34 is the only route serving the area that does not serve the Gladstone CBD.

Routes #33, #34 and #72 show an annual increase in ridership of 32%, 13% and 48% respectively. With the exception of Route #34, ridership increases have exceeded those of the total Tri-Met ridership which is approximately 24% increase per year.

T A B L E V

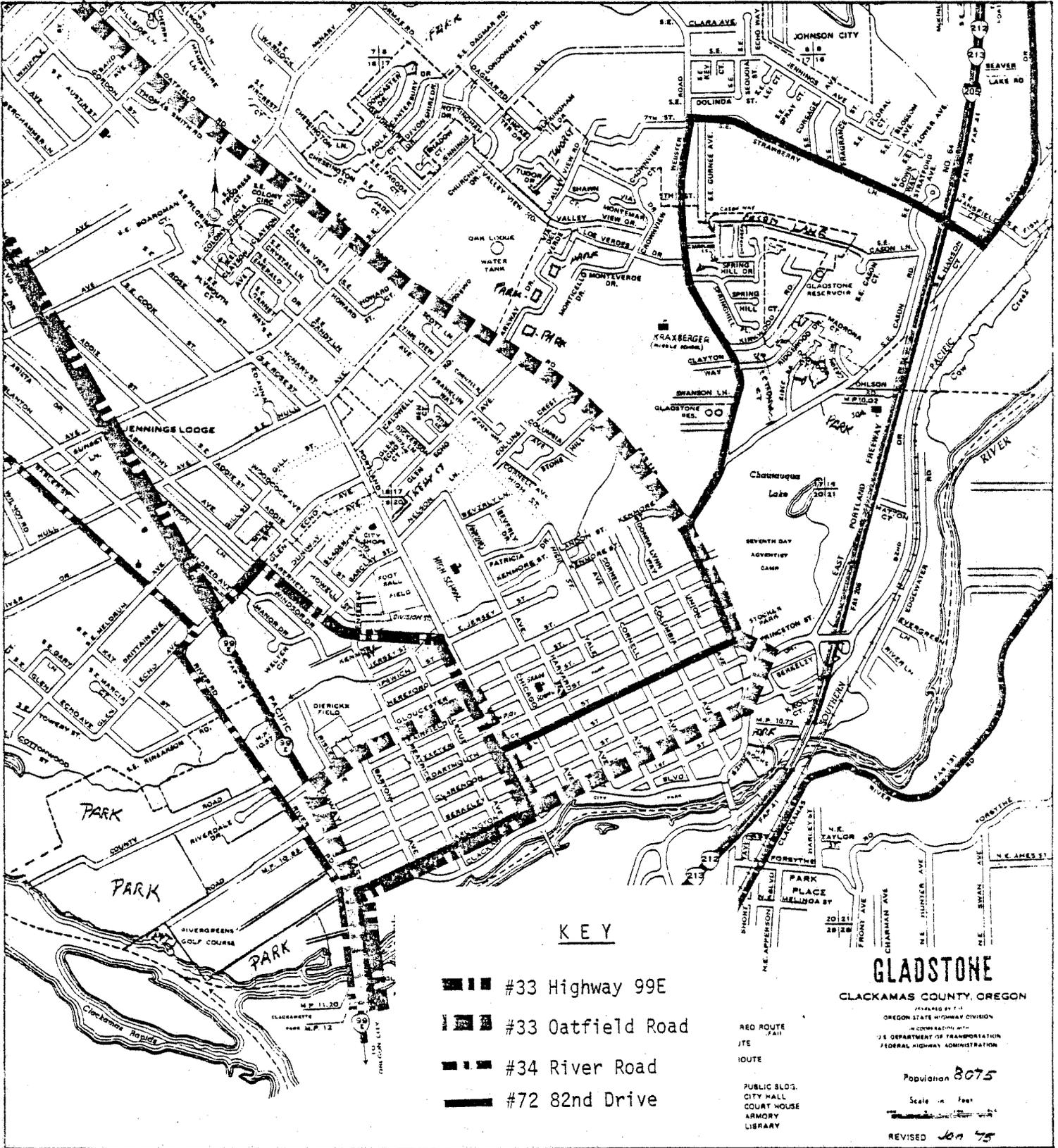
TRI-MET BUS RIDERSHIP BY ROUTE

AVERAGE WEEKDAY TOTAL RIDERS:

	Fall '74	Winter	Spring	Summer	Fall '75	Winter	Spring	Summer	
#33	1480	2083	2398	2369	3435	3324	3439	N/A	57% increase or 32%/yr.
#34	1136	1467	1416	1409	1774	1797	1816	1534	26% increase or 13%/yr.
#72	N/A	N/A	N/A	501	749	1188	1383	1213	59% increase or 48%/yr.

NOTE: 2/3 of ridership, above, occurs North of Milwaukie

SOURCE: Tri-Met Offices



- KEY**
-  #33 Highway 99E
 -  #33 Oatfield Road
 -  #34 River Road
 -  #72 82nd Drive

GLADSTONE
 CLACKAMAS COUNTY, OREGON

PREPARED BY THE
 OREGON STATE HIGHWAY DIVISION
 IN COOPERATION WITH
 THE DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION

Population 8075

Scale 1" = 1/2 mi

REVISED Jan 55

MAP VI
 TRI-MET BUS ROUTES
 C-18

T A B L E V I

PASSENGER DISTRIBUTION BY TIME OF DAY: SPRING, 1976

	To 7 A.M.	7 to 9 A.M.	9 A.M. to 4 P.M.	4 to 7 P.M.	After 7 P.M.
#33	400	699	1232	993	117
#34	117	312	862	399	126
#72	N/A	N/A	N/A	N/A	N/A

SOURCE: Tri-Met Offices

RAPID TRANSIT

Rapid Transit is defined as a public transportation system which operates on a grade separated right-of-way, as distinguished from the present Tri-Met bus system which operates in the traffic stream on conventional streets. The adopted "1990 Interim Transportation Plan for the Portland/Vancouver Region" calls for such an express system within the Oregon City Corridor which runs from the Portland CBD to the Oregon City CBD. Presently Tri-Met is undertaking Oregon City Corridor feasibility studies examining the various express transportation options. These options include both bus and light rail to run on either the Portland Traction Company Right-of-way, McLoughlin Blvd., or a combination of the two routes. The impetus for the study began when the transfer of Mt. Hood Freeway funds became imminent.

The Oregon City Transit Corridor Plan, as proposed, suggests a mainline rapid transit system to run linearly from Oregon City CBD to Portland CBD with from seven to eight transfer stations located along the route. Each transfer station will be coupled with feeder buses which will radiate out from the various stations. The mainline rapid transit system can be served by either a light rail system or bus rapid system.

Should such a rapid transit system be implemented, possible impacts to be anticipated would include: 1) bringing a large number of people to the Gladstone CBD, 2) increasing the business activity of the Gladstone CBD, 3) creating a need for high density within the CBD area, 4) better serving Gladstone through a more balanced transportation "system", 5) causing possible CBD parking problems resulting from park and ride patrons, 6) possibly requiring the elimination of parking along Portland Avenue, 7) complementing efforts to conserve energy and maintain a high standard of air quality, 8) introducing conflicts between LRT, bus, auto, and bicycle traffic along Portland Avenue, and 9) requiring a transfer station to be conveniently and strategically located in Gladstone.

Recognizing that the light rail transit system requires several years before actual operation and/or that the establishment of an LRT may prove to be fiscally impractical at this time, it must be recognized that the development of a bus rapid transit system can serve as a first stage to a rail system or act as an interim transit system.

PARATRANSIT

Paratransit is defined as those types of public transportation between the private automobile and conventional transit. Paratransit modes include taxi-cab service, dial-a-ride bus service, daily and short term rental cars, subscription buses, car pools and van pools. The paratransit role is often a neglected range of transportation options. These modes of travel can play an important role in serving peak hour travel, in meeting low travel demands and providing short access trips to convenient transit terminals, and in serving the special transportation needs of those persons with limited mobility.

Results from surveys conducted in thirty-three SMSA's (Standard Metropolitan Statistical Areas - cities with 50,000 and over population) confirm the significance of fleet taxi cabs as part of the metropolitan transportation system. Fleet taxi cabs serve almost 40% more passengers than all U. S. rapid transit systems and about 60% as many passengers as all bus transit systems.

The Gladstone area is presently served by the Oregon City Cab Company. The Oregon City Cab Company is operating four vehicles on a twenty-four hour basis, making approximately thirty to forty trips per day to the Gladstone area.

Due to the dispersed character of the residential and commercial development of the area, taxi cabs can better serve as an origin-to-destination service than the present Tri-Met bus system.

Surveys conducted in SMSA's also revealed a 1% increase from 1960 to 1970 in the number of households without access to an automobile. In Gladstone, approximately 15% of the population does not have access to an automobile. This is especially significant in the older areas of town where a high percentage of elderly reside. Over 50% of all taxi cab trips to the Gladstone area serve the elderly and the handicapped.

T A B L E V I I

PERCENT OF PERSONS 18 & OVER NOT HAVING A DRIVERS LICENSE AND/OR
ACCESS TO AN AUTOMOBILE BY PLANNING DISTRICT

AREA	NO LICENSE	NO CAR
Planning District #1	15%	14%
Planning District #2	17%	20%
Planning District #3	14%	16%
Planning District #4	8%	11%
Planning District #5	2%	5%

SOURCE: Gladstone Survey, 1975

In May, 1974, Clackamas Senior Center Council obtained funds under the "Elderly and Handicapped Grant Program" for the purpose of purchasing two vans equipped with wheelchair lifts and radios. It will be the County's responsibility to operate and maintain these vans. Dispatching of the vans will be channeled through the Clackamas County Community Action Agency, located in Gladstone. This program is directed towards serving the needs of the elderly and transportation disadvantaged within Clackamas County.

The "Rural Highway Public Transportation Demonstration Project" is another Federal Grant that will fund a program establishing, on a city volunteer basis, a coordinated rural transportation system specifically, but not limited to, meeting the transportation needs of the elderly and handicapped. Some of the money to be received may also be used to install wheelchair lifts on existing senior citizen type vans within rural cities of Clackamas County.

Due to political constraints, most senior citizen type vans owned and operated by the cities cannot be utilized by residents outside the city limits. The TRAM (Transportation, Recreation, Activity and Medical) Bus, owned and operated by the City of Gladstone, however, is one such van that can provide transportation services to the elderly and transportation disadvantaged outside the city limits. Priority of use, however, is for residents within the city limits. The Gladstone TRAM Bus was funded in January, 1975, by the Coalition of Social Services Senior Citizen Council, State Golden Eagle Fund, and Title III of the Older American's Act, allocated by the Columbia Region Association of Governments (CRAG). The TRAM Bus began operation in April, 1975. Since its initiation, the TRAM ridership has been steadily increasing.

Although the TRAM service has been expanding, it is not yet being utilized to its capacity. The peak hour usage is from 11:00 A.M. to 1:00 P.M. during the Loaves and Fishes and Meals on Wheels runs.

Without adequate facilities for the handicapped (i.e. wheelchair lift) the breadth of those transportation disadvantaged being served is limited.

There are four convalescent care facilities located within Gladstone: Clackamas Terrace Care Center, Franklin Care Center, Gladstone Convalescent Care Facility, and Twin Pines Care Facility. There are a total of 329 patients residing in these four care facilities. Of the 329 patients, 176, or 53% of the patients,² are ambulatory and therefore could utilize a van equipped with a wheelchair lift.

The needs of those persons considered transportation disadvantaged due to personal or economic limitations have not been met in the Gladstone area unless they are senior citizens. A re-distribution of income for transportation services is beyond the capabilities of any city the size of Gladstone. This issue can only be addressed on a Regional, State or Federal level.

T A B L E V I I I

T.R.A.M. RIDERSHIP, 1975

MONTH	TOTAL # PEOPLE SERVED	# OF TRIPS	DIFFERENT # PEOPLE	NEW PARTICIPANTS
April	27	Not Recorded	Not Recorded	N/A
May	71	136	30	6
June	80	158	37	22
July	Not Recorded			
August	106	212	47	14
September	125	240	57	5
October	211	393	28	9
November	226	429	34	8
December	251	489	38	7
Mean (average)	137	294	39	10
Median (centerpoint)	215	240	36	8
Range	27 - 251	136 - 489	28 - 57	5 - 22

AREAS SERVED:

- Planning District #1 = Approximately 50%
- Planning District #2 = Approximately 25%
- Planning District #3 = Approximately 25%
- Planning District #4 = Minimal
- Planning District #5 = Minimal

Destinations or groups

- | | |
|-----------------------------|------------------------------|
| Loaves & Fishes | Opera for Seniors |
| Gold Star Club | Picnic for Mentally Retarded |
| Clackamas Community College | Post Office |
| Willamette Falls Hospital | Excursion Trip |
| Civic Auditorium | AARP - Marylhurst |
| Funeral Home | Recreation Trip |
| Shopping Center | R.S.V.P. |
| Bank | Franklin Care Center |
| Doctor | Gladstone Conv. Care Center |
| Oregon City Senior Citizens | Mentally Handicapped |

SOURCE: Gladstone Community School

PEDESTRIAN/BICYCLE W A Y S

Our need to maintain and enhance our urban environment calls for alternative methods of travel to that of the private automobile. If cycling or walking are to become viable alternatives, they must be given due consideration in the overall transportation system of the Gladstone area.

Gladstone is generally well suited for pedestrian/bicycle ways development. The city itself is located at the crossroads of four regional bikeways which include River Road, Oatfield Road, Webster Road and Clackamas Boulevard/82nd Drive bikeways. Gladstone borders the Clackamas and Willamette Rivers and has access to the waterfront via City and State owned lands. In addition, much of the topography of Gladstone, especially the activity areas of town is flat and therefore well suited for bicycling.

It is recognized that walking and bicycling are viable alternatives to the automobile for short hauls such as trips to work, school, shopping, etc. Walking and cycling also serve as recreational activities for all age groups. Although the extent of walking and bicycling within the city is minimal, there is a latent demand for these activities which would be satisfied through the development of various pedestrian/bicycle routes and facilities. The pedestrian/bicycle network is intended to supplement sidewalk facilities which provide a "systems" approach for path routing.

Generally, the pedestrian/bicycle system is designed to interconnect activity nodes to include schools, parks and historic sites, shopping areas, employment areas, churches, mass transit transfer stations, city hall, library and other community facilities. In addition, the pedestrian/bicycle system must minimize conflicts between motorists, bicyclists, and pedestrians, as well as lend support to the existing land uses.

Development of a pedestrian/bicycle system is influenced by such factors as existing and proposed pedestrian/bicycle routes, the width and ownership of the right-of-way (private or public), topography, automobile traffic, need for automobile parking, scenic quality and more. Therefore, each route has its own constraints and opportunities dictating a specific design scheme. The Oregon State Highway Division has established three classifications for bikeways - Class I, Class II and Class III.

CLASS I: A separated trail for joint use by bicyclists and pedestrians. It may be entirely independent of other transportation facilities.

CLASS II: A bikeway that is adjacent to the travel lane of motorized traffic but provides a physically separated through lane for bicycles and pedestrians.

CLASS III: A bikeway that separates the right-of-way with motor vehicles. Routes are designated by signing, striping or other visual markings only.

The Oatfield Road pedestrian/bicycle way is the only significant route in the Gladstone area. This is a Class III route which utilizes the existing roadway reserving a five foot pedestrian/bicycle way separated from the regular automobile traffic by dagmar bumps.



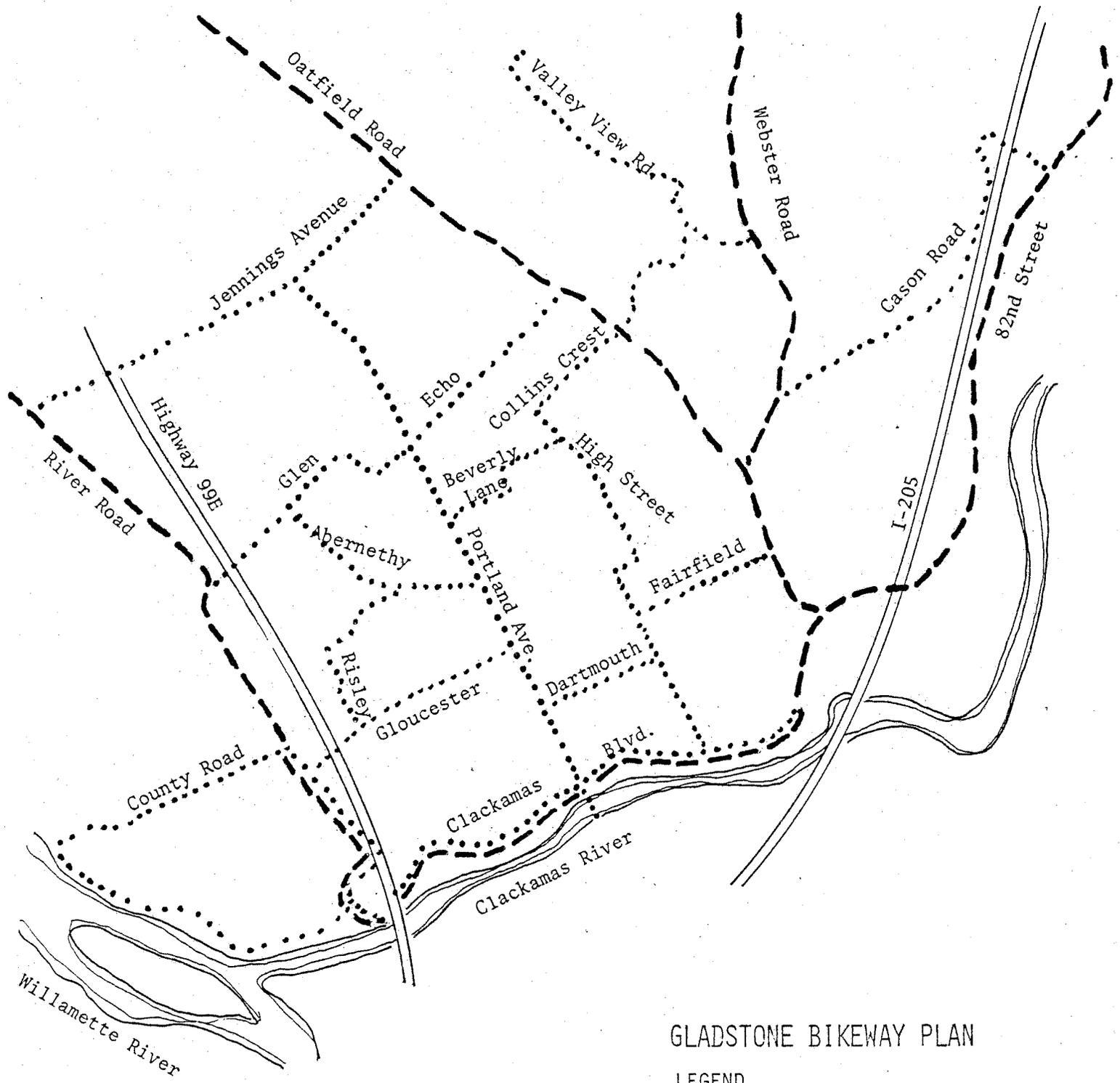
— STUDY STREETS

CONTINUOUS CROSS SECTIONS

- | | | |
|---|--|--|
| <p>BOTH SIDES</p> <p>—————</p> <p> </p> <p> </p> | <p>ONE SIDE ONLY</p> <p>—————</p> <p>.....</p> <p>.....</p> | <p>CURB AND SIDEWALK</p> <p>CURB ONLY</p> <p>SIDEWALK ONLY</p> |
|---|--|--|



MAP VII
CURBS AND SIDEWALKS



GLADSTONE BIKEWAY PLAN

LEGEND

- GLADSTONE BIKEWAY ROUTES
- REGIONAL BIKEWAY ROUTES

MAP VIII

RAIL TRAVEL

The only rail line running through the Gladstone area is the Southern Pacific Line located between 82nd Avenue and Edgewater Road paralleling the two streets. The chart below indicates that in the latter years less trains are being run. However, each train now contains more and larger cars. Therefore, the overall volume is up. Today there is a sixty-eight car average per train.

T A B L E I X

RAIL TRAFFIC IN GLADSTONE (EDGEWATER ROAD AREA)

YEAR	FREIGHT TRAINS PER DAY	PASSENGER TRAINS PER DAY
Today	22	2
Ten years ago	24 - 25	2 - 6
Twenty years ago	30	8

SOURCE: Oregon State Department of Transportation, 1975.

The commodities carried by the Southern Pacific Line include lumber and related products accounting for 60 - 70% of the total freight, and various commodities which include grain, piggy-back, cars, automobiles, propane and other chemical carrying tank cars accounting for 30 - 40% of the total freight. The Southern Pacific freight traffic is presently down 20% due to its heavy reliance on the lumber industry. On the whole, however, there has been a steady increase in traffic.

The only road crossing within the Gladstone area is located at Edgewater Road showing an average daily traffic count of 200 vehicles per day with no history of accidents. Since the area East of the Southern Pacific Line is relatively developed with single family homes, an increase in the average daily traffic count at this crossing is not anticipated.

These trains do not make any stops within the Gladstone city limits. Their impact, both economic and otherwise, is limited to encouraging industrial and commercial activity location along the rail line.

W A T E R T R A V E L

Water travel within the Gladstone area is limited to the Willamette and Clackamas Rivers. Generally there are two types of water traffic on these rivers, commercial and recreational.

COMMERCIAL

Commercial traffic along the Clackamas and Willamette Rivers consists mainly of barge traffic from sand and gravel operations, and barge and log traffic serving mainly the forest industry. The Willamette Sand & Gravel Company reports that approximately three to four gravel barges a day enter the Clackamas in route to Willamette's docking facilities located northeast of the Oregon City Shopping

Center. During periods of high demand for gravel, an average of four gravel barges a day enter the Clackamas/Willamette docking facilities. Prior to a mishap on the Columbia River resulting in the sinking of a Willamette Sand & Gravel dredge, an additional two gravel barges a week for a period of ten weeks a year entered the Clackamas/Willamette docking facilities from the Columbia River operation. No future plans have been made to reinstate the Columbia River dredging operation.

The intensity of traffic through the Willamette Falls Locks is dependent on the forest industry and the economy in general. At the end of the period from 1940 to 1957, the locks operated on a three shift basis. From 1957 to the present, the locks have been operating on a two shift basis. The irregular Willamette Falls Locks traffic, as shown below, is indicative of the locks dependence on the forest industry. Due to the energy-efficiency of water travel, this mode for transporting freight becomes a competitive and viable alternative to other less energy efficient modes of transportation.

T A B L E X

MARINE TRAFFIC THROUGH & INTO WILLAMETTE FALLS LOCKS	
YEAR	TOTAL TRAFFIC BY TONNAGE
1970	177,793
1971	886,083
1972	1,047,142
1973	912,149
1974	1,132,788
1975	753,388

SOURCE: Annual Report of Commerce and "Waterbourne Commerce of the United States, Part IV", published by U. S. Army Engineers for Years 1930-1975.

RECREATIONAL

The intensity of use of the Willamette and Clackamas Rivers for recreational use has been steadily increasing each year. Fishing is one of the major forms of recreation in the Gladstone area. The number of hunting and fishing state licenses issued tripled from 1915 to 1948. By 1969, over one million licenses were being issued each year.³

Conflicts between recreational and commercial use of the Willamette and Clackamas Rivers exist. However, within the last year a river deputy has been assigned to the area and has substantially minimized these conflicts. It is believed that the recreational use of the Willamette River, specifically fishing during the fishing season, is close to saturation.

3. Halprin, Lawrence Associates, The Willamette Valley Choices for the Future.

FINDINGS

The preceding analysis has identified a number of transportation problems, deficiencies and potentials to be addressed by the Gladstone policy plan. These are summarized below.

1. Low density linear commercial development now requires heavy reliance on private automobiles in the Gladstone area.
2. The dominance of the automobile makes pedestrian and bicycle movement potentially hazardous - a situation that is further aggravated by a lack of adequate facilities for these lighter modes of travel.
3. Due to scarcity of land available for urbanization and the projected doubling of the Region's population by the year 2000, Gladstone may be required to accept higher densities.
4. Due to rising costs of municipal services and the need to conserve energy and natural resources, support and need for mass transit will increase.
5. Tri-Met's bus system serves only a small minority of Gladstone's residents. It does not provide an adequate inter-city transit network which is, no doubt, one reason why the automobile continues to be the dominant mode of travel. Convenience and travel time are most important factors to commuters. Cost has not as yet proven to be a crucial consideration.
6. The following are essentially street-related problems.
 - a. The present circulation system directs relatively high volumes of traffic along pedestrian-generating centers.
 - b. Local streets are being utilized for through traffic, a use for which they were neither intended nor designed.
 - c. There are inherent conflicts between traffic flow and abutting land use activity.
 - d. The existing arterial system maps and physical delineators do not coincide.
 - e. Arterial streets are not optimally spaced.
 - f. Trucks are presently utilizing several city streets.
 - g. Providing left turn lanes on and ready access onto Highway 99E at non-signalized intersections presents potential hazards, slows traffic flow and encourages through traffic on local streets.

- h. There is a need for parking facilities in the Portland Avenue Commercial District and at Cross Park/Hi Rocks area.
 - i. The city lacks visual boundary definitions at its ingress and egress points.
 - j. The ambient noise level along Highway 99E and I-205 are excessive for residential use.
7. Transportation problems transcend municipal boundaries, therefore Gladstone's Transportation Plan must be developed in concert with Regional transportation plans.

S T A T E A N D R E G I O N A L G O A L S

The Gladstone policy plan must also address the transportation goal of the Oregon Land Conservation and Development Commission (LCDC), as well as the state transportation goal and objectives of the Columbia Region Association of Governments (CRAG).

LCDC GOAL

"To provide and encourage a safe, convenient and economic transportation system.

"A transportation plan shall (1) consider all modes of transportation including mass transit, air, water, pipeline, rail, highway, bicycle and pedestrian; (2) be based upon an inventory of local, regional and state transportation needs; (3) consider the differences in social consequences that would result from utilizing differing combinations of transportation modes; (4) avoid principal reliance upon any one mode of transportation; (5) minimize adverse social, economic and environmental impacts and costs; (6) conserve energy; (7) meet the needs of the transportation disadvantaged by improving transportation services; (8) facilitate the flow of goods and services so as to strengthen the local and regional economy; and (9) conform with local and regional comprehensive land use plans."

CRAG GOALS AND OBJECTIVES

CRAG's transportation goal of fostering "a safe, convenient, efficient and economic transportation system" is essentially the same as LCDC's.

Substantive Objectives

- a. "Support of Development. Transportation facilities and services, including a consideration of all transportation types, shall support and be appropriate in magnitude and scale to the development patterns associated with Urban, Natural Resource and Rural land use classifications, within the limitations of efficient utilization of limited transportation resources and regional priorities.

- c. "Reduce Land Use Conflicts. Effective procedures shall be utilized to identify, analyze and select transportation plans and improvements which serve to avoid or minimize disruption of existing neighborhoods, communities, designated Natural Resource Areas and economic centers.
- d. "Reduce Pollution and Noise. Design alternatives shall be utilized to reduce the degradation of air, water and land resources and the generation of noise.
- e. "Support Planned Development. Procedures shall be utilized which encourage provisions of transportation facilities and services in a timely, orderly and efficient manner to support planned development in Urban, Natural Resource and Rural Areas.
- f. "Classifications. All roadway uses and types to be used in transportation planning shall be classified."

G O A L O P T I O N S

Three goal options have been considered and weighed in relation to their advantages and disadvantages as alternative courses of action.

1. To allow present demand to dictate system design and take curative action where need arises to preserve "main stream" values.
2. To promote and facilitate a safe, efficient and convenient transportation system emphasizing the private automobile.
3. To promote and facilitate a safe, efficient and convenient multi-modal transportation system that emphasizes mass transit and a street circulation pattern designed to serve people first.

E C O N O M Y

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I N V E N T O R Y A N D A N A L Y S I S

The preceding introduction to the history of Gladstone is a mere glance at how this city developed into the residential community that it is today. This predominant characteristic continues to influence Gladstone's development and growth, its population and economy.

P O P U L A T I O N , E M P L O Y M E N T A N D I N C O M E

The population of Gladstone increased from 3853 in 1960 to 6237 in 1970, a 62% increase, which represents an annual increase of about 6%. By 1975, the population was determined, by the Center for Population Research and Census at Portland State University, to be 8075; close to 30% growth since 1970 or about a 6% annual growth rate. The latest survey, completed by the city in early 1977, puts the population at 8,875. At such a rate of growth, the population will exceed 10,000 by 1980.

But this rate of growth is not expected to continue because the City of Gladstone is running out of vacant buildable land.

The typical Gladstone resident is white, married and has a high school education. The majority of Gladstonians are in their high-earning years; they earn an average of about \$11,000 to \$12,000 per year. They work in Portland, Oregon City or Milwaukie, in manufacturing, retail/wholesale, education, construction or health services; spend about 27% of their income on house payments, and about 17% on cars, which they own and drive.

According to the 1970 U. S. Census, females outnumbered males in Gladstone by 1.15 to 1 (see Table I).

T A B L E I
P O P U L A T I O N B Y S E X

S E X	N U M B E R	% O F T O T A L
Male	2,897	46.45
Female	3,340	53.55
Total	6,237	100.00%

SOURCE: U. S. Census, 1970.

Gladstone's population is also predominately white, with non-whites comprising a miniscule 1.2% (see Table II).

T A B L E I I
POPULATION BY RACE

RACE	NUMBER	% OF TOTAL
White	6,161	98.78
Black	6	0.10
Indian	27	0.43
Japanese	14	0.22
Chinese	5	0.08
Filipino	3	0.05
All Other	21	0.34
Total	6,237	99.91%

SOURCE: U. S. Census, 1970.

Most adults in Gladstone are skilled and have a fairly adequate formal education. According to the 1970 U. S. Census, more than 56% of adult persons have had high school education, and about 20% had college education or better. The median years of schools completed by adults is no better or worse for Gladstone than for Oregon City, but is slightly lower than that for Clackamas County and West Linn (see Table III below).

T A B L E I I I
YEARS OF SCHOOL COMPLETED
(Persons 25 Years Old and Over)

	NUMBER	% OF TOTAL
No School Years Completed	52	1.38
Elementary: 1-8 Years	850	22.64
High School: 1-4 Years	2,122	56.51
College: 1-4 Years or more	731	19.47
TOTAL	3,755	100.00%
Median School Years Completed		
Gladstone	12.2	
Oregon City	12.2	
West Linn	12.6	
Clackamas County	12.4	

SOURCE: U. S. Census, 1970.

With regard to age, the largest age group in Gladstone is the 45 - 64 years, followed by the 25 - 44 and 6 - 17 age groups. The 25 - 44 and 45 - 64 age groups alone represent almost half (47%) the population of Gladstone. These are the productive age groups with the latter group earning the higher income. The smallest is the 18 - 24 age group which makes up the bulk of college-age students (see Table IV).

T A B L E I V
POPULATION BY AGE GROUP

1975		
AGE GROUP	NUMBER	% OF TOTAL
5 or less	800	10
6 - 17	1801	22
18 - 24	493	6
25 - 44	1769	22
45 - 64	2002	25
65 and Over	1210	15
Total	8075	100%

SOURCE: Figures were extrapolated from 1970 figures (Source: Human Resources Data 1970, League of Oregon Cities, October 1972) to 1975 population with adjustments made for increases and decreases per age categories as derived from Clackamas County population figures (Source: State of Oregon Population Projections for Oregon and its Counties 1975 - 2000, Center for Population Research and Census, Portland State University February 1976.)

Table IV also shows that Gladstone has a high percentage (15%) of retired and elderly individuals. School-age children are those 6 to 17 years of age plus 1/4 the 5 year olds and 3/4 the 18 year olds. Thus the 22% figure does not represent all school-age children in Gladstone. According to the latest (early 1977) city survey, school-age children in Gladstone make up 24% of the population, which is higher than the State average of 22.56%. But Gladstone is primarily a residential community and thus is likely to have a high percentage of school-age children.

A high employment rate has been fairly consistent in Gladstone according to the 1970 U. S. Census. However, most of Gladstone's work force is employed outside the city. Table V below shows that only 11% of Gladstone's work force actually work in Gladstone. The rest work in Portland, Oregon City, Milwaukie and other cities and communities in the area. However, Portland is the largest employer with 37% of Gladstone's work force.

T A B L E V
PLACE OF WORK
(Work Force: 40.5%)

PLACE	% OF TOTAL
Gladstone	11
Oregon City	16
West Linn	3
Lake Oswego	2
Milwaukie	13
Portland	37
Other	18
Total	100%

SOURCE: City-Wide Survey, 1975.

The majority of the city's work force is employed in the wholesale and retail trade, in manufacturing, professional and related services. Educational and health services make up the bulk of the last group of workers. Wholesale and retail is the largest employer with 642 people, followed by manufacturing with 521 (see Table VI below).

T A B L E V I
 TYPE OF EMPLOYMENT
 (Employed, 16 Years Old and Over)

TYPE	NUMBER	% OF TOTAL
Construction	124	5.20
Manufacturing	521	21.84
Transportation	85	3.56
Communications, Utilities and Sanitary Services	38	1.59
Wholesale and Retail	642	26.92
Finance, Insurance, Business & Repair Services	179	7.51
Professional and Related Services	458	19.20
Public Administration	125	5.24
Other	213	8.93
Total	2,385	99.99%

SOURCE: U. S. Census, 1970.

The fact that the great majority of Gladstone's work force finds employment outside the city makes Gladstone's economy so much more closely tied to the economies of its neighbors and the region.

Family income is an important indicator of the economic health of a city's population. Table VII below shows that 35% of all families in Gladstone earned between \$10,000 and \$14,999 per year, according to the 1970 U. S. Census, and close to 14% of the families earned annual incomes in excess of \$15,000.

Employment opportunities in Gladstone are mostly in services. School District 115 is the major employer with 155 employees. The Clackamas Terrace Convalescent Center, Gladstone Convalescent Care Facility and Franklin Care Center employ 82, 63 and 58 people respectively. The six major car dealerships employ about 186 people altogether. Other major employers include Danielson's Thriftway with 45 employees, Safeway Store with 48 employees, Tebos Restaurant with 45 employees, the Homestead Restaurant with 20 employees, H. C. Mason & Associates with 43 employees, Clackamas Grange Supply with 36 employees, Carolina Biological Supply Co. with 30 employees and the City of Gladstone with 40 employees.

T A B L E V I I

FAMILY INCOME

INCOME RANGE	NUMBER	% OF TOTAL
Less than \$2,000	60	3.54
\$2,000-2,999	57	3.36
\$3,000-3,999	96	5.66
\$4,000-6,999	264	15.58
\$7,000-9,999	401	23.66
\$10,000-14,999	585	34.51
\$15,000-24,999	183	10.80
\$25,000 and over	49	2.89
Total	1,695	100.00%

SOURCE: U. S. Census, 1970.

The above figures also show that close to 7% of Gladstone's families earned less than \$3,000 annually. However, when compared with Oregon City, Gladstone's families are better off. The median family income of \$9,811 for Gladstone is higher than that of Oregon City, but lower than median family income for both West Linn and Clackamas County. Gladstone also has fewer families below the poverty level than both Oregon City and Clackamas County, but more than does West Linn (see Table VIII below).

T A B L E V I I I

COMPARATIVE FAMILY INCOME

CITY OR COUNTY	MEDIAN INCOME	INCOME LESS THAN POVERTY LEVEL	FAMILIES RECEIVING SOCIAL SECURITY	MEAN INCOME OF FAMILIES RECEIVING SOCIAL SECURITY
Gladstone	\$9,811	6.1%	21.71%	\$1,904
Oregon City	\$9,513	10.7%	22.02%	\$1,712
West Linn	\$11,367	4.0%	14.00%	\$2,186
Clack. County	\$10,680	9.2%	17.93%	\$1,722

SOURCE: U. S. Census, 1970.

Summary

The population of the City of Gladstone is growing at the rate of 6% per year. At this rate of growth, saturation levels will be reached between 1990 and 1995, at which time the population will be approximately 11,500.

The majority of adult Gladstonians have had a minimum of high school education or better; they work outside the city in Portland or Clackamas County and earn

not less than \$875 per month; they are in their high earning years and are employed in the wholesale or retail trade, in manufacturing, professional or related services.

The median income of Gladstone families is higher than that of Oregon City, but lower than West Linn and Clackamas County. Families with incomes below the poverty level constitute 6% of the population of Gladstone; this is significantly lower than both Oregon City and Clackamas County, but higher than West Linn.

COMMERCIAL AND INDUSTRIAL ACTIVITY

Gladstone, throughout its history, has been characterized as a residential community. The desire to maintain this character has been strong. City policies and energies have thus been directed toward the support of residential development at the expense of further commercial and industrial development. Some commercial enterprises, because of their advantageous locations, have managed to thrive without substantial support from the city. By and large, however, the total commercial and industrial development within the City of Gladstone has been out-paced by residential development.

GROWTH AND DEVELOPMENT TRENDS

Commercial and industrial development in Gladstone has been limited to Highway 99E, Portland Avenue and 82nd/I-205. Commercial development has increased substantially since 1960, mainly along Highway 99E. As shown on Table IX below, commercially developed land jumped from 21.2 acres in 1960 to 76.35 acres in 1975, for a 260% increase.

T A B L E I X

PERCENT DISTRIBUTION OF
RESIDENTIAL, COMMERCIAL AND INDUSTRIAL DEVELOPED LAND
IN GLADSTONE 1960 - 75

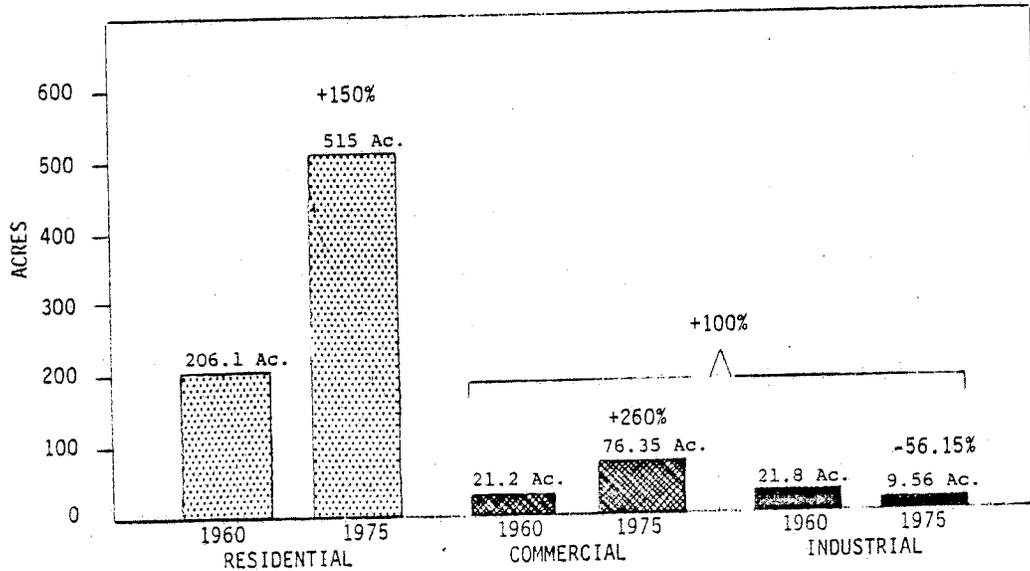
	1960		1975	
	ACRES	PERCENT	ACRES	PERCENT
Residential	206.1	82.74%	515.14	85.7%
Commercial	21.2	8.51%	76.35	12.7%
Industrial	21.8	8.75%	9.56	1.6%
Total	249.10	100%	601.05	100%

SOURCE: Land Use in 33 Oregon Cities, Bureau of Municipal Research and Service, University of Oregon, 1961, and City-Wide Land Use Inventory, 1975.

During this same period, residential development increased from 206.1 acres to 515.14 acres for a 150% increase.

The picture, however, is not complete. Although commercial development out-paced residential development, the combined commercial and industrial development has not. (See Graph I.) Due to a 56.15% reduction in industrially developed land, the combined commercially and industrially developed acreage increased by only 100% between 1960 and 1975.

GRAPH I
DEVELOPMENT TRENDS



If commercial and industrial development had kept pace with residential development between 1960 and 1975, the city would have had an additional 22 acres of developed commercial/industrial land by 1975.

In an effort to define what is the "typical" allocation between residential, commercial and industrial land development, a comparison with other cities of similar size was made (see Table X below). Such a comparison reveals Gladstone's strength in commercial development but also its obvious lack of industrial development.

TABLE X

COMPARISON OF SIX CITIES BY PERCENT DISTRIBUTION
OF RESIDENTIAL, COMMERCIAL AND INDUSTRIAL LAND USE

CITY	POPULATION	TOTAL AC (RES.COM.IND.)	RES. AC.	COMM AC.	IND. AC.	COMBINED COMM/IND. AC.
Gladstone*	8,075	573.65	85%	13%	2%	15%
Roseburg**	10,700	685.5	79%	8%	13%	21%
Astoria	10,500	663.9	61%	8%	31%	39%
Grants Pass	9,986	906.7	71%	7%	22%	29%
North Bend	7,200	454.9	66%	5%	29%	34%
Coos Bay	6,850	445.9	64%	11%	25%	36%
"Typical"				7.8%	24%	31.8%

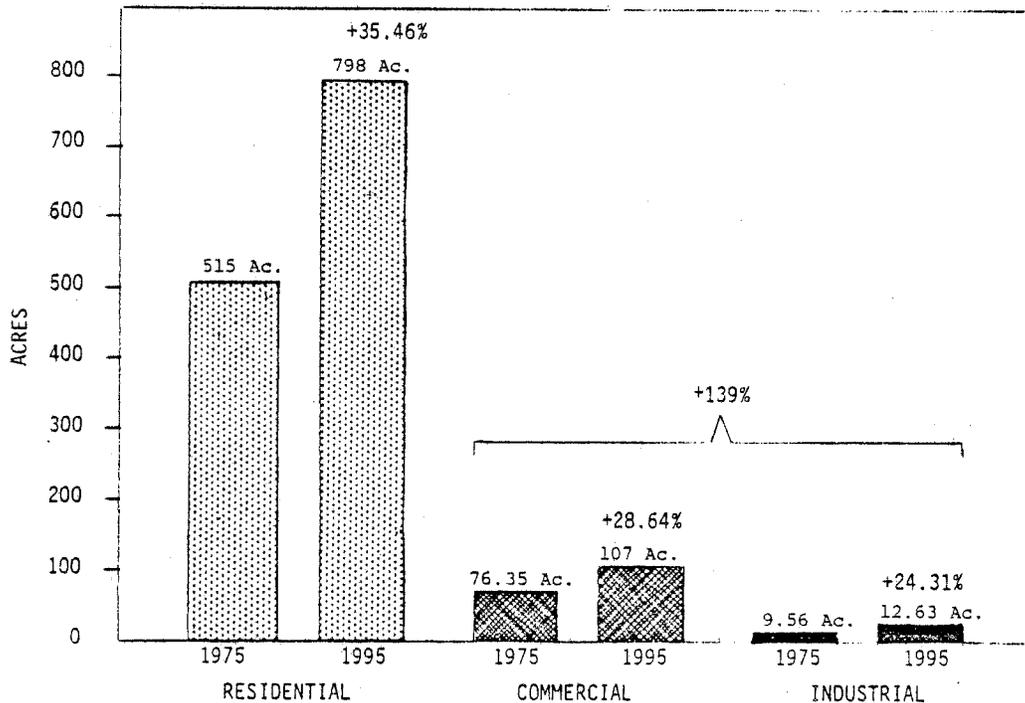
SOURCE: *Gladstone Survey, 1975

**All Other City Surveys, 1958 to 59, Land Use in 33 Oregon Cities, Bureau of Government Research and Service, University of Oregon, 1961.

Gladstone's 13% in commercial land use compares quite favorably with the other five cities where 8% is typical. The city's 1.6% industrially developed land, however, falls significantly short of the typical 24%. The combined commercial/industrial land uses in Gladstone is approximately 15%, whereas 32% is typical. If Gladstone were to attempt achieving the latter level of commercial/industrial development, 100 more acres of developed commercial/industrial land would be needed.

As one looks toward the future when Gladstone is likely to be completely developed, given the city's present zoning and land use, residential land use will continue to out-pace the combined commercial and industrial development.

GRAPH II
DEVELOPMENT TRENDS



As indicated on Graph II above, residential development will increase from 515.14 acres to approximately 798 acres between 1975 and 1995 totaling 87% of the combined residential, commercial and industrial development. Commercial development will increase from 76.35 acres to approximately 107 acres during the same period for a 12% total of the three land uses. Industrial development will total only 1% of the three land uses showing an increase from 9.56 acres in 1975 to 12.63 acres in 1995.

By comparing the development trends between 1960 and 1995, residential development is anticipated to increase by 287% compared to a 179% increase for the combined commercial and industrial development. Rather than the anticipated 120 acres developed as commercial/industrial by 1995, a proportional trend would have anticipated 167 acres developed for commercial/industrial purposes.

Land annexed into the City of Gladstone since 1960 has had a significant impact on the city's commercial and industrial land use posture. Between 1960 and 1975, 5.92 acres of industrially developed land was annexed into the city, accounting for 62% of the city's growth in industrial development during this period. Annexation of approximately 45 acres of commercially developed land contributed about 60% of 1960-75 growth in commercial development.

Land annexed into the city for residential purposes between 1960 and 1975 totaled approximately 600 acres. Although this area has not been completely developed, it does account for nearly 100% of residential development during this period.

Due to Gladstone's natural South, West and East borders, namely the Willamette and Clackamas Rivers, annexation activity in the foreseeable future will likely take place along the Northern borders. Upon examination of existing land use outside the Northern city limits, one finds most of the area developed with some vacant land. The proportion of residential, commercial and industrial land use to the North of Gladstone appears to align itself with Gladstone's present allocation with a slight shift toward more residential and industrial development versus commercial development.

COMMERCIAL DISTRICTS

Gladstone's commercial development is concentrated in three districts: Highway 99E, Portland Avenue and 82nd/I-205. Each district, to an extent, serves a different market and has its own distinct character. It is because of these differences that the districts have been analyzed separately. Each district presents its own constraints/problems and opportunities, and contribution to the city.

Highway 99E

The Highway 99E commercial district is a strip development...businesses capitalizing on the large volume of traffic. The portion of the strip located within the City of Gladstone encompasses approximately 43 acres. The majority of the area is zoned CG (General Commercial) which allows for the most intense commercial land use. Approximately 10 acres on the West side of the highway are zoned IL (Light Industry) with just under 6 acres developed for industrial purposes (Powell Laboratories), 3 acres for commercial land with the balance vacant. Of the entire district, only 2.78 acres, or 6% of the land, is vacant, suggesting a need to expand the commercial zone to provide for future business expansion.

As shown on Table XI below, the predominant business in this area is auto-related, accounting for 26 of 55 businesses for a total of 47% of the total business establishments on Highway 99E. The second major business activity is general commercial which includes retail activities such as department stores, appliance and typewriter shops, etc. A positive aspect of the district is that there exists a degree of variety and diversity of commercial activities. The majority of activities, however, are infrequently patronized establishments and thus must serve a regional market.

T A B L E X I
HIGHWAY 99E (McLOUGHLIN BLVD.) COMMERCIAL DISTRICT
LAND USE, 1976

ACTIVITIES	NUMBER OF OCCURRENCES	AREA (ACRES)	ASSESSED VALUE	ASSESSED VALUE PER UNIT	ASSESSED VALUE PER ACRE
-- Office-Professional	8	1.46	334,915	41,864	229,394
-- General Commercial	9	4.42	522,230	58,026	118,151
-- Grocery	4	.75	145,935	36,484	194,580
-- Auto Related (Sales, Service, and Repair)	26	23.71	3,246,040	124,848	136,906
-- Entertainment (Theater, Bowling Alley)	2	.38	44,480	22,240	117,053
-- Restaurants, Cafes, Drive-Ins	5	3.28	763,470	152,694	232,765
-- Manufacturing	1	4.52	363,360	363,360	80,389
-- Bars	--	--	--	--	--
-- Motels	1	.67	224,390	224,390	231,330
-- Storage	--	--	--	--	--
-- Vacant Land	12	2.78	--	--	--
-- Vacant Buildings	--	--	--	--	--
-- Residences	14	1.52	--	--	--
-- Public, Semi-Public	1	--	--	--	--

TOTAL DISTRICT AREA - 43.49 Ac.

TOTAL COMMERCIAL LAND USE - 39.19 Ac.

TOTAL NUMBER OF COMMERCIAL ESTABLISHMENTS - 55

TOTAL ASSESSED VALUE OF COMMERCIAL LAND USE AREA - \$5,644,820

SOURCE: Land Use Inventory and Assessor Records, City of Gladstone, 1976.

As indicated on Table XI, restaurants, motels and office-professional establishments represent the most favorable assessed value/acre ratio of all Highway 99E businesses. The predominant business, auto-related activities, accounts for only \$136,906 assessed value/acre. Full service automobile dealerships, however, do have a considerable amount of property improvements as reflected in the assessed

value/acre. Thus, full service dealerships compare quite favorably with the automobile sales business having just a car sales lot and small sales office.

T A B L E X I I

COMPARISON OF ASSESSED VALUE/ACRE
OF AUTOMOBILE SALES BUSINESS, 1976

BUSINESS	ASSESSED VALUE 1976	TOTAL ACRES	VALUE/ACRE RATIO
Immer & Oswald Volvo*	198,880	.83	239,614
Armstrong Buick*	153,400	1.18	130,000
Chalet Trucks	99,820	.74	134,892
Gladstone Lincoln-Mercury*	412,760	2.24	184,268
Webster-Wolfard Ford	178,040	5.50	32,371

*Full-Service Automobile Dealership

SOURCE: Assessors Records, 1976

The success of the Highway 99E Commercial District and its contribution to the city's tax base is amplified when compared to other districts within the city.

T A B L E X I I I

COMPARISON OF ASSESSED VALUE PER UNIT AND PER ACRE
OF COMMERCIAL LAND USE BY COMMERCIAL DISTRICT

DISTRICT	ASSESSED VALUE	ASSESSED VALUE PER UNIT	ASSESSED VALUE PER ACRE
Highway 99E	\$5,644,820	\$102,633	\$144,037
Portland Ave.	1,325,260	34,875	205,149
82nd/I-205	949,141	79,895	134,249

SOURCE: Assessors Records, 1976 and Land Use Inventory, 1976.

As indicated in Table XIII above, the Highway 99E commercial district accounts for a higher total assessed value than the other two districts combined.

The Highway 99E commercial district appears to be structurally sound. Many of the older buildings have been replaced or modernized. This constant upgrading assists in establishing an environment conducive to new investment and higher intensity of land use.

Although the buildings of the district are structurally sound, there is an absence of visual solidarity among the business community to achieve a desirable business environment. One of the most prominent features of the Highway 99E landscape, both in scale and lack of uniformity, is signs. The number of signs adds to the visual overload and thus negate their purpose. The lack of a reasonably consistent scale, number, siting and type contribute to a lack of solidarity and identity as a district which is distinct from other business districts along the Highway 99E/McLoughlin Blvd. strip.

Identity becomes an important element since many businesses along Highway 99E emphasize their place of business versus the product they are selling, therefore a well known landmark or identifiable city limits or district becomes essential. As one travels to the Gladstone area, though, the city limits and/or Gladstone's commercial district are not apparent. Gladstone Imports and Gladstone Auto Parts are not even in Gladstone while Oregon City Honda and Oregon City Realty are. The Highway 99E commercial development offers no central focus, store concentration or unified theme that would establish the identity for the area.

Not only is the Highway 99E commercial district's identity important for business but it is important for the city. For most people of the metropolitan area, their image of Gladstone is that which is projected along 99E. Thus, local concern for the aesthetic appeal of the Highway 99E commercial district is well founded, not only in terms of good business, but also in terms of Gladstone's image and identity as a community.

Gladstone's success in improving its commercial district's environment lies heavily upon the district's property/business owners. An inventory of property/business owners along Highway 99E was conducted in 1976. Property owners were divided into four groups, those that live in Gladstone, those that live in Clackamas County, those that live in the Portland SMSA (Standard Metropolitan Statistical Area) and those that live outside the SMSA.

It is commonly believed that out of town property owners generally have little interest in improving or maintaining their property. This condition is believed to make any program of revitalization or improvement more difficult because of lack of interest or commitment.

The general findings of this inventory indicate that a majority of entrepreneurs live either within the City of Gladstone or within Clackamas County. Those that live within the County are in close proximity to their establishment. This condition makes rehabilitation and/or improvement by cooperation due to interest in the community feasible only if the assumption made about ownership patterns is correct. Empirical evidence, however, proves otherwise.

In October, 1975, the city attempted to organize the business and property owners along Highway 99E in an effort to collectively address the problems identified above. The response was less than positive, suggesting the need for another alternative. Establishment of design standards and/or ordinances regarding site layouts, circulation, signs and landscaping may be a more appropriate strategy for addressing the problems and needs of the city in this area.

Portland Avenue Commercial District

The Portland Avenue Commercial District, for most Gladstonians, is "downtown" Gladstone. It is in this light that this area plays not only a commercial role, but a social and cultural role as well. The downtown area should reflect the real personality of the city. It is here that the real charm and character of the city is permitted to unfold.

Most of the buildings within this district were built around the 1920's. Although the trolley car is gone and replaced by a substantial number of automobiles, the area looks quite similar. A concentration of small shops exists between Clarendon and Arlington Streets with the commercial district extending to the Gladstone High School on the North and Clackamas Boulevard on the South. The entire district encompasses approximately 20 acres.

There are four different land use zones within the district which include: 1.58 acres zoned CG (General Commercial), two separate areas totaling 11.53 acres zoned CL (Limited Commercial), 5.52 acres zoned RC (Residential-Commercial), and 1.84 acres zoned RH (High-Density Residential). The majority of the district is surrounded by RH zone.

T A B L E X I V

PERMITTED OUTRIGHT USES BY ZONE

RH (High-Density Residential)

1. Single family dwelling (Minimum lot area 6,000 sq. ft.)
2. Two family dwelling (Minimum lot area 6,000 sq. ft.)
3. Multi-family dwelling (Conditional Use Permit Required - 3,000 sq. ft.)

RC (Residential Commercial)

1. Community Center
2. Hotel or motel
3. Office - business, professional or governmental
4. Retail shop as accessory use to the above

CL (Limited Commercial)

1. Retail trade establishment
2. Business, governmental or professional office
3. Financial institution
4. Personal and business service establishment
5. Community service facility
6. Restaurant

CG (General Commercial)

1. Permitting most commercial establishments to include all uses permitted in RC and CL zones.
2. Small parts wholesaling or retailing
3. Small appliance repairs, including radio, television and electronics repair
4. Automobile sales and service (Conditional Use Permit required)

SOURCE: Gladstone Zoning Ordinance of 1975.

As shown on Table XIV above, the entire gamit of commercial development is permitted along Portland Avenue. This lack of specificity may be appropriate for Highway 99E but not necessarily for the downtown area. To date, zoning has not been an effective tool in bringing about commercial development in the downtown area.

T A B L E X V
 PORTLAND AVENUE COMMERCIAL DISTRICT
 LAND USE, 1976

ACTIVITIES	NUMBER OF OCCURRANCES	AREA (ACRES)	ASSESSED VALUE	ASSESSED VALUE PER UNIT	ASSESSED VALUE PER ACRE
-- Office-Professional	12	.84	324,900	27,075	386,786
-- General Commercial	15	.94	221,680	14,779	235,830
-- Grocery	4	3.48	530,030	132,508	152,307
-- Auto Related (Sales, Service, and Repair)	3	.32	67,590	22,530	211,219
-- Entertainment (Theater, Bowling Alley)	--	--	--		
-- Restaurants, Cafes, Drive-Ins	2	.19	52,890	26,445	278,368
-- Manufacturing	--	--	--		
-- Bars	2	.23	52,280	26,140	227,304
-- Motels	--	--	--		
-- Storage	1	.46	75,890	75,890	164,978
-- Vacant Land	15	3.56			
-- Residences	64	8.03			
-- Public - Semi-Public	5	1.38			

TOTAL DISTRICT AREA - 19.43 Ac.

TOTAL COMMERCIAL LAND USE AREA - 6.46 Ac.

TOTAL NUMBER OF COMMERCIAL ESTABLISHMENTS - 38

TOTAL ASSESSED VALUE OF COMMERCIAL LAND USE AREA - \$1,325,260

SOURCE: Land Use Inventory and Assessor Records, City of Gladstone, 1976

Although the predominate land use of the district is residential, there does exist a quantity of commercial establishments. There are a number of small scale retail shops accounting for 15 of 38 commercial establishment occurrences (See Table XV). The market they serve is generally local since they cannot effectively compete with similar retail stores in outlying areas. Although there is a degree of variety of goods and services, the scale of activity is not comprehensive enough to generate a multiplier effect. New businesses coming into the area have been generally professional office establishments.

In addition to the retail function, the downtown area serves as the areas civic center. Located along Portland Avenue are City Hall, Library, Post Office, Clackamas County Community Action Agency, and Clackamas County Mental Health Clinic. Also, Gladstone High School, which serves as a Community School as well, abutts the district to the North and Gladstone Elementary School, City Park and Cross Park are within close proximity.

Given present conditions, the likelihood of new commercial development coming into the downtown area is limited. Some of the major land use constraints to new development include: 1) general low assessment of area, 2) limited vacant land, 3) small parcels of land, and 4) relatively good condition of existing residential structures in the district.

When compared to Highway 99E, Portland Avenue has a relatively low assessed value/unit ratio (see Table XIII). The low assessment can be attributed to the age and lack of modernization of the structures. The area has less than 18% of the land vacant and is plagued by the typical 50' x 100' parcels of land - an uneconomical size for new investments. Adding to these constraints, the single family residential structures are in fair condition and thus any new business activity would probably result in the conversion of residential structures versus demolition and new construction.

Lack of adequate parking along Portland Avenue is the most often cited reason for lack of business by proprietors of the area. In a study conducted in December, 1976, 190 curb-side parking spaces and 89 off-street parking spaces were identified within the study area (Portland Avenue and 200' of each side street bordered by Fairfield on the North and Clackamas Blvd. on the South). Findings indicate that 67% of curb-side parking and 50% of off-street parking are being utilized between 9:00 AM and 5:00 PM. Of the curb-side spaces being utilized, 27% of the spaces are utilized by the same vehicle with a 20% turn-over every 3-4 hours during the 9-5 time period. Generally, the district lacks adequate parking facilities and for certain areas, the problem is critical. Any future expansion or development will necessitate a solution to the parking problem. Note should be made that the majority of the study area is zoned CL which exempts businesses from off-street parking requirements.

As mentioned earlier, downtown Gladstone plays an important social and cultural role for the city. The quality of public open space becomes an essential aspect of an environment that fosters social and cultural pursuits. Likewise, the quality of the area's environment reflects the interests and aspirations of the community. Elements of public open space such as pleasant sitting areas, kiosks, attractive trash containers, trees or flower pots, special sidewalk textures, all could add to a pleasant human oriented environment. Even street lights along Portland Avenue, which are presently serving a purely functional role, could be decorative and thus add to the character of the area and help define it. These elements, together with a modernization of store fronts, would go a long way toward meeting the district's social and cultural role, as well as strengthen business activity.

If improvements are to take place, a healthy partnership between the public and private sectors must be established. The Portland Avenue commercial area has the good fortune of having most of the proprietors living within the city or nearby within Clackamas County. The result of this fact, together with the

condition of business in the area, has produced the most interested, concerned group of businessmen of the entire City of Gladstone. The most deteriorated section of the buildings in this area is owned by an absentee landlord. This condition suggests that absentee landlords have little concern for the area.

In summary, the Portland Avenue commercial district, because of a lack of modernization of the stores and lack of public investment, is maintaining an atmosphere of disinvestment. If the area is to survive and/or expand substantially, an overall environment, both economic, physical and psychological, must be developed which would be conducive to sound business activity. The problems and constraints of the area must be addressed along with economic opportunities.

82nd/I-205 Commercial District

The 82nd/I-205 commercial district has, to date, been mainly developed for residential purposes. The extent of commercial activity of yesteryear included the 3-Way Inn, a small restaurant, grocery store, Scottie's Service Station, and Dunmire Motors near the old 82nd Avenue Bridge. The completion of the Cascade Highway (now I-205) in the early 1970's provided improved access to the area but had a limited impact on expanding commercial development. As shown on Table XVI, the district encompasses approximately 39 acres with the predominate commercial activity being auto-related. Approximately 47% of the district is vacant with approximately one-half of the developed land in residential use. Most of the area is zoned CL (Limited Commercial).

Since the 1976 commercial area survey, two significant projects have materialized. Safeway Stores have completed a 33,000 square foot facility as the first leg of the "Gladstone Center." The Center, when completed, is proposed to have two restaurants, several retail shops, professional offices, a bank and more. The second major undertaking in this district is the development of sewerage service along 82nd Avenue on the East side of I-205. Once sewerred, this area will be well suited for commercial and/or industrial development.

The 82nd/I-205 commercial district stands to benefit from the anticipated increase in traffic volumes along I-205 from 30,000 vehicles per day (VPD) in 1976 to over 70,000 VPD in 1990.* Another benefit or opportunity to the area is the natural setting of the Clackamas River. Development, however, must be in harmony with the setting, adding and not detracting from its value.

The 82nd/I-205 commercial district has relatively large parcels of land under single ownership. Most of the property owners live either on the subject parcel or within the city. Of the three commercial districts, the 82nd/I-205 district has the highest potential for expansion.

*State Highway Division, Salem, Oregon, 1977.

T A B L E X V I

82ND/I-205 COMMERCIAL DISTRICT
LAND USE, 1976

ACTIVITIES	NUMBER OF OCCURRANCES	AREA (ACRES)	ASSESSED VALUE	ASSESSED VALUE PER UNIT	ASSESSED VALUE PER ACRE
-- Office-Professional	2	1.69	377,250	188,625	223,225
-- General Commercial	2	.92	100,420	50,210	109,152
-- Grocery	--	--	--		
-- Auto Related (Sales, Service, and Repair)	4	2.29	383,091	95,773	169,289
-- Entertainment (Theater, Bowling Alley)	--	--	--		
-- Restaurants, Cafes, Drive-Ins	--	--	--		
-- Manufacturing	--	--	--		
-- Bars	--	--	--		
-- Motels	--	--	--		
-- Storage	4	2.17	88,380	22,095	40,728
-- Vacant Land	22	18.12			
-- Vacant Buildings	--	--	--		
-- Residences	40	13.49			
-- Public - Semi-Public	--	--	--		

TOTAL DISTRICT AREA - 38.68

TOTAL COMMERCIAL LAND USE - 7.07 Ac.

TOTAL NUMBER OF COMMERCIAL ESTABLISHMENTS - 12

TOTAL ASSESSED VALUE OF COMMERCIAL LAND USE AREA - \$949,141

SOURCE: Land Use Inventory and Assessor Records, City of Gladstone, 1976.

Miscellaneous

Significant commercial and/or industrial activities which are not located within the three districts but are within the City of Gladstone are identified on Table XVII below.

T A B L E X V I I

BUSINESSES LOCATED OUTSIDE THE THREE COMMERCIAL DISTRICTS
LAND USE, 1976

ACTIVITIES	NUMBER OF OCCURRANCES	AREA (ACRES)	ASSESSED VALUE	ASSESSED VALUE PER UNIT	ASSESSED VALUE PER ACRE
-- Office-Professional	--	--	--		
-- General Commercial	2	.23	8,000	4,000	34,783
-- Grocery	--	--	--		
-- Auto Related (Sales, Service, and Repair)	4	5.83	217,950	54,488	37,384
-- Entertainment (Theater, Bowling Alley)	1	27.06	224,180	224,180	8,285
-- Restaurants, Cafes, Drive-Ins	--	--	--		
-- Manufacturing	3	5.34	141,330	47,110	26,467
-- Bars	--	--	--		
-- Motels	--	--	--		
-- Storage	2	2.63	14,390	7,195	5,471
-- Vacant Land	N/A				
-- Vacant Buildings	N/A				
-- Residences	N/A				
-- Public, Semi-Public	4	5.95	1,583,440	395,870	226,124

TOTAL AREA - 41.06 Ac.

TOTAL NUMBER OF COMMERCIAL ESTABLISHMENTS - 16

TOTAL ASSESSED VALUE OF COMMERCIAL LAND USE AREA - \$2,189,290

SOURCE: Land Use Inventory and Assessor Records, City of Gladstone, 1976

As indicated, there are approximately 41 acres of commercial/industrial activity outside the three districts. The main activity, convalescent care centers (Semi-Public) have a favorable assessed value/acre ratio. The care centers are permitted as a conditional use in all residential zones and the limited commercial zones of the city.

LAND USE COSTS AND REVENUES

City costs for FY 1975-76 amounted to \$1,106,247.75. Expenditures on public works alone constituted 41.2% of total expenditures for that year, police 26.6% and administrative services 22%. Fire protection and library services costs were 4.5% and 5.8% of the total expenditures respectively. If public works departments were considered separately, however, the police department would reflect the highest expenditures (see Table XVIII below).

T A B L E X V I I I

CITY EXPENDITURES		
1975-76		
DEPARTMENTS	EXPENDITURES	PERCENT OF TOTAL
Administration	\$243,061.18	22.0%
Police	293,977.70	26.6%
Library	64,058.65	5.8%
Fire	49,642.55	4.5%
Public Works		41.2%
Parks	53,186.12	4.8%
Sewer	129,013.00	11.6%
Street	144,937.53	13.0%
Water	128,371.02	11.6%
Total	\$1,106,247.75	100.1%

SOURCE: City Records, 1975-76

Revenues received by the city (including beginning balance) during FY 1975-76 amounted to \$1,351,218.49. Out of this amount about 37% was in the form of property taxes. The other 63% came from other sources such as service charges, fees, State and Federal entitlement payments, and franchises, among others. Schools, on the other hand, rely more heavily on property taxes than does the city. Approximately half the school revenues are derived from property taxes. The other half comes from State and Federal sources, local and intermediate sources, grants, etc.

Property taxes are levied on the following types of land uses in Gladstone:
 1) land and improvements used or designated primarily for single family dwellings, known hereafter as single family homes; 2) land and improvements used or designated primarily for multi-family dwellings (duplexes, triplexes, four-plexes, apartment complexes, etc.), known hereafter as multi-family homes; 3) land and improvements used or designated primarily as mobile home parks, hereafter known as mobile homes; and 4) land and improvements used or designated primarily for commercial or industrial uses, hereafter known as commercial/industrial (see Table XIX below).

T A B L E X I X
 SELECTED LAND USE DATA
 1975-76

LAND USE TYPE	NUMBER OF UNITS PER ACRE	MEAN ASSESSED VALUE PER UNIT	MEAN ASSESSED VALUE PER ACRE	MEAN NUMBER OF SCHOOL-AGE CHILDREN PER UNIT
Single Family Homes	5.10	25,508.79	130,094.83	.83
Multi-Family Homes	16.22	10,188.64	165,259.74	.31
Mobile Homes	12.24	3,730.28	45,658.63	0
Comm./Ind.	1.29	75,187.27	96,991.58	0

SOURCE: City and County Records, 1975-76 and Housing Survey, 1977.

A major property tax burden has been the schools. Approximately two-thirds (2/3) of the taxes collected from Gladstone by the County went to the schools, while less than one-fifth (1/5) of these taxes went to the city. All of the four types of land uses identified above help pay for school costs through property taxes despite the fact that school-age children are generated only by single family and multi-family homes with single family homes generating over 90% of the school system's students (see Table XIX above).

Table XX below shows that none of the four land use types pays its full share of city costs in property taxes. Non-property tax revenues pay for the balance. It is significant to note, however, that commercial/industrial land uses have the highest negative balance, while multi-family homes have the lowest. Negative balances for single family homes are four and one-half times those for multi-family homes per unit and about one and one-half times per acre.

T A B L E X X
 CITY COSTS AND PROPERTY TAX REVENUES
 1975-76

LAND USE TYPE	PER UNIT			PER ACRE		
	COSTS	REVENUES	BALANCE	COSTS	REVENUES	BALANCE
Single Family Homes	382.65	160.96	-221.96	1,951.52	820.90	-1,130.62
Multi-Family Homes	112.60	64.29	-48.31	1,826.37	1,042.78	-783.59
Mobile Homes	147.98	23.54	-124.44	1,811.28	288.13	-1,523.15
Comm./Ind.	1,408.23	474.43	-933.80	1,816.62	612.02	-1,204.60

SOURCE: City Records, 1975-76

However, when all revenue sources are taken into consideration, residential land uses show a revenue surplus in all three categories. This surplus helps offset the deficits created by commercial/industrial land uses. Among the three residential land use categories, multi-family homes have the highest surplus per unit and more than four times as much as single family homes per acre (see Table XXI). Thus, as far as the city is concerned, residential development, especially multi-family homes, is a viable option. On the other hand, commercial/industrial development is not a viable option from a city administration point of view.

T A B L E X X I
CITY OPERATING COSTS AND REVENUES
1975-76

LAND USE TYPE	PER UNIT			PER ACRE		
	COSTS	REVENUES	BALANCE	COSTS	REVENUES	BALANCE
Single Family Homes	382.65	455.12	+72.47	1,951.52	2,321.11	+369.59
Multi-Family Homes	112.60	204.41	+91.81	1,826.37	3,315.53	+1,489.16
Mobile Homes	147.98	163.03	+15.05	1,811.28	1,995.49	+184.21
Commercial/Ind.	1,408.23	1,252.28	-155.95	1,816.62	1,615.44	-201.18

SOURCE: City Records, 1975-76

The fact remains, however, that single and multi-family homes produce children who need to go to school. Thus, an analysis of city costs and revenues cannot ignore school costs and revenues. The following analysis will, therefore, combine the two to provide a more comprehensive view of the cost/revenue picture.

With regard to school costs, the picture is quite different. Since mobile homes and commercial/industrial land uses do not generate students, they cost the schools nothing. The property taxes the schools derive from them are all reflected in a positive balance. On the other hand, single family and multi-family homes are a financial liability. The additional costs per acre for multi-family homes are a little higher than for single family homes, but per unit additional costs for single family homes are almost three times those for multi-family homes (see Table XXII).

T A B L E X X I I
SCHOOL DISTRICT COSTS AND PROPERTY TAX REVENUES
1975-76

LAND USE TYPE	PER UNIT			PER ACRE		
	COSTS	REVENUES	BALANCE	COSTS	REVENUES	BALANCE
Single Family Homes	1,080.51	548.18	-532.33	5,510.60	2,795.72	-2,714.88
Multi-Family Homes	403.56	218.95	-184.61	6,545.74	3,551.37	-2,994.37
Mobile Homes	0	80.16	+80.16	0	981.16	+981.16
Comm./Ind.	0	1,615.77	+1,615.77	0	2,084.35	+2,084.35

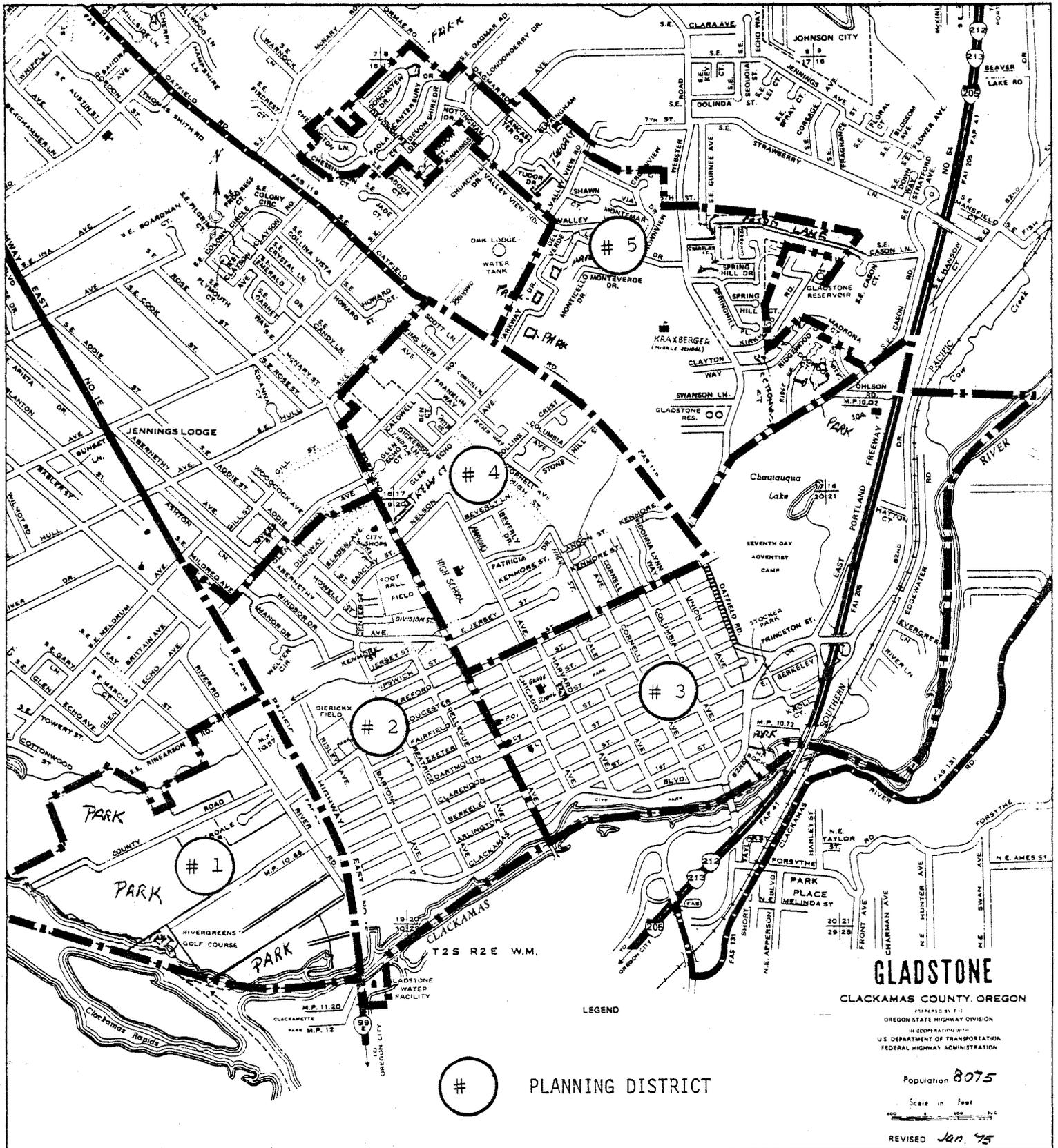
SOURCE: Gladstone School District and County Records, 1975-76.

Table XXIII below combines and compares city and school district costs and property tax revenues in order to uncover a larger part of the total cost/revenue picture. This table leaves no doubt that the cost/revenue picture for commercial/industrial land uses is an immensely favorable one. Not only do commercial/industrial land uses pay their way; they net positive balances amounting to \$681.97 per unit or \$879.75 per acre. Among the three other land use types, mobile homes reflect the lowest negative balance, while single family homes pile up additional costs in excess of two and one-half times those of multi-family homes per unit, but only a little higher per acre.

T A B L E X X I I I
COMBINED CITY AND SCHOOL DISTRICT COSTS AND PROPERTY TAX REVENUES
1975-76

LAND USE TYPE	PER UNIT			PER ACRE		
	COSTS	REVENUES	BALANCE	COSTS	REVENUES	BALANCE
Single Family Homes	1,463.16	709.14	-754.02	7,462.12	3,616.62	-3,845.50
Multi-Family Homes	516.16	283.24	-232.92	8,372.11	4,594.15	-3,777.96
Mobile Homes	147.98	103.70	-44.28	1,811.28	1,269.29	-541.99
Comm./Ind.	1,408.23	2,090.20	+681.97	1,816.62	2,696.37	+879.75

SOURCE: City, School and County Records, 1975-76



MAP I I
GLADSTONE PLANNING DISTRICTS

The preceding analysis dealt with average costs and revenues from land uses throughout the city. This approach, based on city-wide averages, can be misleading with regard to the specific characteristics of certain districts of the city, especially when sharp differences between districts exist. It can be argued, for example, that the relatively higher assessed value of homes in Planning District #5 should result in a better revenue picture and thus perhaps pay their school and city costs. Such an argument finds its answer in Table XXIV. below.

T A B L E X X I V
 PLANNING DISTRICT #5
 COMBINED CITY AND SCHOOL DISTRICT COSTS AND PROPERTY TAX REVENUE
 1975-76

LAND USE TYPE	PER UNIT			PER ACRE		
	COSTS	REVENUES	BALANCE	COSTS	REVENUES	BALANCE
Single Family Homes	2,218.22	1,105.88	-1,112.34	11,312.93	5,639.99	-5,672.94
Multi-Family Homes	607.29	314.38	-292.91	9,850.24	5,099.24	-4,751.00

SOURCE: City, School and County Records, 1975-76.

Due to the fact that the relatively new single family homes in District #5 generate almost twice as many school-age children (single family, 1.41 school-age children; multi-family, .38) as does the average single family home in Gladstone, the cost/revenue picture remains almost unchanged. And although single family and multi-family homes in District #5 (like those in the rest of the city) both run even higher additional costs (or deficits) to be paid for from non-property tax revenues, negative balances for multi-family homes are much lower per acre and more than three and one-half times lower per unit than those for single family homes (see Table XXIV above).

When all operating city and school costs and revenues (both property tax and non-property tax revenues) are combined and compared, all land uses appear to more than pay their way, with commercial/industrial land uses paying more than twice their cost requirements (see Table XXV below).

T A B L E X X V
 COMBINED CITY AND SCHOOL OPERATING COSTS AND REVENUES
 1975-76

LAND USE TYPE	PER UNIT			PER ACRE		
	COSTS	REVENUES	BALANCE	COSTS	REVENUES	BALANCE
Single Family Homes	1,463.16	1,514.13	+50.97	7,462.12	7,722.06	+259.94
Multi-Family Homes	516.16	614.15	+97.99	8,372.12	9,961.51	+1,589.39
Mobile Homes	147.98	243.19	+95.21	1,811.28	2,976.65	+1,165.37
Comm./Ind.	1,408.23	2,868.05	+1,459.82	1,816.62	3,699.78	+1,883.16

SOURCE: City, School and County Records, 1975-76.

However, since the city and the schools keep about 11.66% "cash-on-hand" (which includes both beginning balances and surplus new revenues) between then, actual revenues in Table XXVI have been reduced by 11.66%. The exclusion of "cash-on-hand" (which was more than 18% of total city revenue and more than 8% of total school revenue during FY 1975-76) from the revenue column in Table XXVI results in a deficit only in the case of single family homes. The other three land uses continue to show positive balances. Commercial/industrial land uses continue to show a very impressive economic advantage per unit that is about 17 times better than their nearest competitor, mobile homes, and more than 42.5 times better than multi-family homes. Multi-family homes continue to demonstrate that they are more economically advantageous than single family homes, almost five times more per unit. Per acre, however, mobile homes seem to be the most advantageous financially.

T A B L E X X V I

COMBINED CITY AND SCHOOL OPERATING COSTS AND REVENUES
(REVENUES LESS 11.66% CASH-ON-HAND)
1975-76

LAND USE TYPE	PER UNIT			PER --REVENUES--ACRE		
	COSTS	REVENUES	BALANCE	COSTS	LESS 11.66%	BALANCE
Single Family Homes	1,463.16	1,337.58	-125.58	7,462.12	6,821.66	-640.46
Multi-Family Homes	516.16	542.54	+26.38	8,372.11	8,800.00	+427.89
Mobile Homes	147.98	214.83	+66.85	1,811.28	6,629.52	+4,818.24
Comm/Ind.	1,408.23	2,533.64	+1,125.41	1,816.62	3,268.40	+3,268.40

SOURCE: City, School and County Records, 1975-76.

SUMMARY AND COMMENT

The conclusions to be drawn from the preceding discussion are in substantial agreement with the results obtained through similar attempts at analyzing public costs and revenues in both Oregon and throughout the Nation. What has been demonstrated here is that single family homes do not pay their way. In fact, they are being subsidized by the other land uses, especially commercial/industrial land uses.

The analysis above dealt only with operating costs and revenues during just one fiscal year. Capital expenditures during FY 1975-76 were minimal. Moreover, a study of capital costs, to be meaningful, should cover several years and should examine past performance as well as future capital needs and obligations.

POTENTIALS FOR ECONOMIC DEVELOPMENT

During the months of October, 1976, through January, 1977, the Planning Dept. featured three lecturers: Dr. John Hansen, Professor of Economics and Urban Studies, P.S.U. (Portland State University), Dr. Leonard Cain, Professor of Sociology and Urban Studies, P.S.U., and David Fisher and Howard Long of Fisher, Wallin, Long Architects. Each spoke on the problems/constraints and opportunities for commercial and industrial development in Gladstone from their individual perspectives. In addition, the Planning Dept. met with Mort Michaelson and Ann Cathcart from the Port of Portland to discuss opportunities for economic development in Gladstone. The comments made at these sessions have been summarized below.

Problems/Constraints

1. The City of Gladstone lacked early industrial zoning as did Southeast Portland.
2. The present high tax rate places Gladstone in a relatively poor position in the competition for commercial and industrial land use.
3. Gladstone does not have many five acre tracts of vacant land...a business does not want to invest in equipment only to outgrow its space and have to leave in two years.
4. Portland Avenue Commercial District lacks adequate parking facilities.
5. None of the three commercial districts provide any facilities for pedestrians (i.e. restrooms, quiet sitting area, safe crosswalks, etc.).
6. Gladstone cannot effectively compete with comparative shopping facilities such as the Oregon City Shopping Center or the Clackamas Town Center.
7. The Portland Avenue Commercial District has an image of non-investment which negates new development and improvements.
8. Gladstone needs some plan, whether good or bad, which will establish an environment of certainty and one of interest and cooperation.
9. Gladstone's commercial districts lack physical definition.

Opportunities

1. The Clackamas River is one of Gladstone's greatest assets. A visual link of natural vegetation between the river and the commercial districts, coupled with pedestrian facilities would begin to take advantage of this asset. In addition, all the Cross Park and Clackamas River users are potential business patrons.
2. Gladstone's History and the History of the area is a selling point. Possibilities of developing a historical theme with the relocation of some historical building may prove advantageous.

3. Should light rail transit become a reality and/or some old railroad cars and locomotives be located along Portland Avenue, together with the Portland Traction Company Railroad Bridge, development of a railroad motif with "end of the line" restaurants and shops may be created.
4. Development of professional-office buildings is warranted in the area.
5. Any type of entertainment to include stage/theater and/or very unique restaurants have possibilities.

FINANCIAL SOURCES AND TECHNIQUES

If development plans are to be implemented, financial possibilities must be examined. Listed below are a few of the major financial sources and techniques which may be applicable to the Gladstone area.

Tax Increment

As stated under Oregon State Law (ORS 457) municipal urban renewal agencies are authorized to use tax increment financing to pay for urban renewal project activities. Under this program, taxes are frozen for a specified period such as five years. Taxes derived from any increase in assessed value due to new private development and rehabilitation above the base year of the project are set aside to be used to carry out urban renewal project activities and retire the project indebtedness.

CD Block Grants

Federal Community Development Block Grants may be applied for by the city under the "Discretionary Applicants." Eligible activities range from acquisition of real property (must be blighted, deteriorated, undeveloped or inappropriately developed) rehabilitation of existing structures, preservation of historic structures, development of public facilities and more. Highest priority, however, is given to projects which directly assist low-income residents and thus unlikely to fund downtown development projects.

Revenue Sharing

City General Revenue Sharing funds may be used to purchase land, construction, repairs and restoration or to meet the operating and maintenance costs of some services and programs. The funds may also be used as a match for other grants.

Special Assessment

Special assessments may be an appropriate financing technique for public improvement such as parking facilities and pedestrian ways. Under this program the city may assess individual property owners for specific city improvements which provide greater benefits to them than to the community at large.

Small Business Administration 502 Program

Small Business Admin. 502 Program allows downtown development corporations to receive low-interest loans and low guarantee for the purpose of creating or improving facilities for small businessmen.

F I N D I N G S

1. Gladstone's population has been increasing at an annual growth rate of 6% with saturation levels expected by 1990-95 at which time the population will be approximately 11,500.
2. The majority of adult Gladstonians have a high school education or better; they work outside the city in Portland or Clackamas County and earn not less than \$870 per month; they are in their high earning years and are employed in the wholesale or retail trade, in manufacturing, professional or related services.
3. The median income of Gladstone families is higher than that of Oregon City, but lower than West Linn and Clackamas County. 6% of the Gladstone population is below the poverty level, which is significantly lower than both Oregon City and Clackamas County but higher than West Linn.
4. The major Gladstone employers are the Gladstone School District #115, three convalescent care centers and six major automobile dealerships.
5. The largest age group is from 45-64, accounting for 25% of the total population. There is also a high percentage of elderly (15%) within the city.
6. Since 1960, residential development has outpaced commercial/industrial development in Gladstone.
7. When compared to similar size cities, Gladstone has a substantial amount of commercial development, negligible industrial development with a combined commercial/industrial allocation 50% below the average.
8. Annexations have accounted for 60% of the commercial and 62% of the industrial growth between 1960-75.
9. The following findings essentially relate to the Highway 99E (McLoughlin Blvd.) Commercial District:
 - a. Highway 99E serves mainly a regional market
 - b. There is a lack of vacant buildable land
 - c. Highway 99E accounts for a higher total assessed value than all the other commercial development combined
 - d. For most people of the metropolitan area, the image of Gladstone is that which is projected along Highway 99E
 - e. Highway 99E Commercial District lacks identity and district definition
 - f. The number and scale of signs along Highway 99E negate their purpose
10. The following findings essentially relate to the Portland Avenue Commercial District:
 - a. The Portland Avenue Commercial District for most Gladstonians is "downtown" and therefore has not only a commercial but a social and cultural role as well
 - b. The area lacks adequate parking facilities
 - c. Commercial development is hampered by small lots (50' x 100') with sound single family homes

- d. The area lacks adequate vacant land for commercial development
 - e. The area is characterized by commercial buildings with low assessed value
 - f. The area lacks adequate public investment
11. The following findings essentially relate to the 82nd/I-205 Commercial District:
- a. Immediate plans for sewerage service to the areas East of I-205 make the area suitable for development
 - b. The area has relatively large parcels of vacant land
 - c. The "Gladstone Center" is planned for the 82nd/Arlington Street area
12. Single family homes do not pay their way but rather are subsidized by other land uses, especially commercial/industrial land uses.
13. Gladstone does have opportunities for commercial development.

STATE AND REGIONAL GOALS

The Gladstone policy plan must also address the economic goal of the Oregon Land Conservation and Development Commission (LCDC), as well as the stated economic goal and objectives of the Columbia Region Association of Governments (CRAG).

LCDC GOAL

"To diversify and improve the economy of the state.

"Both state and federal economic plans and policies shall be coordinated by the state with local and regional needs. Plans and policies shall contribute to a stable and healthy economy in all regions of the state. Plans shall be based on inventories of areas suitable for increased economic growth and activity after taking into consideration the health of the current economic base; materials and energy availability; labor market factors; transportation; current market forces; availability of renewable and non-renewable resources; availability of land; and pollution control requirements.

"Economic growth and activity in accordance with such plans shall be encouraged in areas that have underutilized human and natural resource capabilities and want increased growth and activity. Alternative sites suitable for economic growth and expansion shall be designated in such plans."

CRAG GOAL AND OBJECTIVES

The CRAG goal directs that the plan shall foster "diversity and improvement of the economy of the region, especially in geographic areas that have long-term unemployment."

Substantive Objectives

- a. "Support of Land Use Classifications. Regional economic development planning shall support types and levels of commercial and industrial facilities appropriate for, but limited to, uses permitted in Urban, Natural Resource and Rural land use classifications.
- b. "Employment. Economic growth and development which will provide diverse employment opportunities, including a consideration of infant industries, shall be encouraged and facilitated. Economic development planning efforts shall attempt to maximize the use of the region's indigenous labor pools. New labor supply should be considered where the region's present resources are insufficient to serve the labor demands of commerce and industry.
- c. "Commercial and Industrial Types. A product and service-diverse economic base, with emphasis on the retention and promotion of existing industries and encouragement of new industries shall be maintained. Land planning shall support achievement of a mix of labor- and capital-intensive industries in the region.

- d. "Location. Industry and commerce shall be located in areas planned for such uses, with emphasis on areas with existing or planned public facilities and services and public transit. Land planning for future industrial expansion shall include consideration of uniquely situated properties such as those with access to existing or planned public transit, deep water, pipelines, air traffic and freight or passenger rail facilities. The compatibility with surrounding planned land uses shall be considered in future commercial and industrial expansion.
- e. "Environmental Quality. Industry and commerce encouraged for the region shall be of types which will be consistent with regional, federal or state, air, water, land pollution and noise level standards.
- f. "Economic Resources. Economic resources shall be considered in the formulation of public policy with attention to:
 - (1) "public financial resources available and anticipated to support plans;
 - (2) "economic impact of plans considering public service costs; and
 - (3) "stability of land use policy which assures long-term economic continuity and minimizes public economic resource investment risks."

Procedural Objectives

- a. "Economic Growth Areas. Effective procedures for identifying and inventorying areas that are suitable for economic growth and development shall be utilized.
- b. "Economic Condition. The economic condition of the region, taking into consideration or inventorying such factors as the current economic base, material and energy availability, labor market factors and trends, transportation, current market forces, availability of renewable and non-renewable resources, availability of land, and pollution control requirements, shall be identified and analyzed.
- c. "Economic Assessment. Economic development plans and policies shall consider:
 - (1) "economic trends and potentials of the planning areas as a basis for estimating the need for employment opportunities and the need for variety, type, scale and location of business, industry and commercial activity; and
 - (2) "economic capability to sustain land use patterns considering public financial resources and service costs and inter-dependence of land use patterns and the economic base.
- d. "Manpower Resources. Economic development shall include and utilize effective procedures for encouraging economic growth and activity in areas within the region which have long-term employment.
- e. "Permit Procedures. The Regional Plan shall provide guidance and instruction to local governmental agencies on procedures designed to facilitate and simplify the administrative processing of development proposals."

GOAL OPTIONS

1. To maintain the present commercial/industrial base, allowing for its expansion only as allowed through existing zoning and land use regulations.
2. To have a strong commercial/industrial base through the expansion of existing and the development of new commercial/industrial activity at appropriate locations within the city.
3. To preserve the small town, residential character of Gladstone by discouraging commercial and/or industrial development in the city.

NATURAL RESOURCES

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NATURAL RESOURCES ELEMENT

INTRODUCTION

The natural resources element considers the natural setting of the Gladstone area. Air, water and land, fish and wildlife resources are among the resources considered. The quality, amount, and distribution of these resources has had and will continue to have considerable impact on the growth, livability, and land use arrangements in this area. One resource --- open space --- is important not only for the enjoyment it provides, but also for protecting the air, water and land resources, and for providing shelter for wildlife. Man's survival in a compatible environment depends on how carefully he preserves and manages nature's resources. Gladstone is in a unique position to contribute to the natural resources management and preservation effort in this region by virtue of its location.

INVENTORY AND ANALYSIS

AIR

Air quality in Gladstone is determined mainly by the overall quality of air within the region. The extent to which air pollution exists depends on a number of factors including land use, geographic characteristics and meteorological conditions. The most significant factor, land use, includes the type and location of the area's transportation system, industrial operations, municipal and private disposal processes, fuel consumption and agricultural practices.

The geographic make-up of the Willamette Valley consists of mountain ranges bordering three sides of the valley. This configuration tends to confine the movement of air. The winds, which average 9 to 11 miles per hour during the winter and 7 to 9 miles per hour during the balance of the year, are not sufficient to foster horizontal ventilation. The lack of strong winds allows the contaminants to remain suspended in the atmosphere which often interact under the sun to produce harmful compounds. Thermal inversions which are normally experienced in the spring and summer months may prove to be very hazardous by preventing vertical ventilation.

The most common types of air contaminants of the Metropolitan Area are identified on Table I as well as major sources and accompanying health hazards. For Gladstone and the Metropolitan Area, carbon monoxide is the most common contaminant. 86% of carbon monoxide contaminants are produced by the incomplete combustion from motor vehicles (see Tables II and III). Other pollutants being emitted by motor vehicles include hydrocarbons, nitrogen oxides, aldehydes, sulphur compounds, organic acids, ammonia, lead and other metallic oxides.

Preliminary estimates, based on traffic volumes and speed limits, indicate Highway 99E to be violating the State and Federal eight-hour carbon monoxide standard. I-205, the other major traffic corridor, presently meets these standards but is projected to violate these standards by 1990.

Ambient air data from the Milwaukie monitoring site indicates that the Gladstone area is presently violating the one-hour photo-chemical oxidant standard several times a year. Being within the Portland air quality maintenance area, Gladstone is likely determined to be a non-attainment area for total suspended particulate photo-chemical oxidants and carbon monoxide as discussed earlier.

T A B L E I

AIR QUALITY ASSESSMENT FOR GLADSTONE

ROADWAY	YEAR	AVERAGE DAILY TRAFFIC	AVERAGE ¹ PEAK HOUR TRAFFIC (8 hr. per week day)	SPEED LIMIT	MAXIMUM ² VOLUME OF CARS ALLOWED (& meet standard)	EMISSION ² REDUCTION REQUIREMENTS
Hwy. 99E	1975	26,000	13,000	40MPH	11,600	8%
I-205	1975	30,000	15,000	55MPH	29,500 ³	Meets Requirement
Hwy. 99E	1990 ⁴	35,000	17,500	40MPH	14,500	10%
I-205	1990	70,000	35,000	55MPH	36,875	Less than 5%

1. Assumes 50% of traffic occurs during peak 8 hour period.
2. Oregon Department of Environmental Quality, Banfield Transitways Study.
3. Personal estimate.
4. Assumes a 25% reduction in auto carbon monoxide emissions by 1990.

SOURCE: Gladstone Comprehensive Plan Elements: Students pursuing MUS in Planning at Portland State University pg. 92, 1977.

Please note that the simplified analysis as depicted in Table III does not consider emissions from diesel trucks which emit nitrogen contaminants.

Another major source of pollutants in Gladstone is the use of fossil fuels for space heating. A CRAG energy study estimates that the City of Gladstone relies on fuel oil for 79% of its residential energy requirements.* Pollutants released from the combustion of fuel oil include aldehydes, oxides of nitrogen, sulphur oxides, organic materials and some fly ash. Smoke may also be produced by deficient or inappropriately maintained oil burners. Newer housing starts within Gladstone and the Metropolitan Area have shown a preference for gas and electricity over fuel oil for space heating purposes. Gas combustion, however, emits such pollutants as aldehydes, organics and oxides of nitrogen in addition to invisible smoke. National forecasts indicate a greater reliance on electricity for space heating - essentially a non-polluting system at the use level. Sources of other air contaminants within Gladstone area originate within the region but normally outside the city itself.

In an effort to deal with air pollution on a national level, the Federal Environmental Protection Agency (EPA) has required states to identify those areas which may exceed national air quality standards within the next ten year period following June of 1975. The Oregon Department of Environmental Quality (DEQ) has responded by establishing State Ambient Air Standards monitoring existing air quality and forecasting future air quality. From this research and analysis effort, an air quality plan will be developed specifying air pollution control policies and strategies for the state.

Regional and sub-regional planning is presently underway by DEQ and CRAG, the results of which will likely have impact on Gladstone.

*CRAG Region Energy Analysis, Energy-Housing Information Base, work in progress, Report 2, June 1977, p. 17.

T A B L E I I

MAJOR TYPES OF AIR CONTAMINANTS

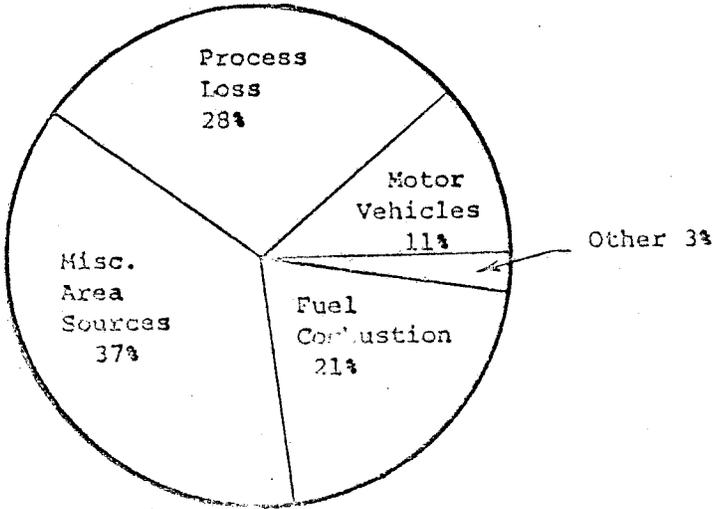
<u>Pollutant</u>	<u>Major Sources</u>	<u>Principal Effects</u>
Carbon monoxide	Gasoline-powered vehicles, fuel combustion, industrial processes	Reduction in the oxygen-carrying capacity of blood
Suspended particulate matter	Combustion and industrial and natural processes	Visibility reduction, soiling
Oxidants	Atmospheric photochemical reactions involving nitrogen oxides, organic gases, vapors and solar radiation	Sensory and respiratory irritation, plant damage. Provides indirectly, an index of visibility reduction due to photochemical aerosols.
Sulphur dioxide	Fuel combustion (coal, oil, cellulosic material) industrial processes	Sensory and respiratory irritation, plant damage, corrosion
Total gaseous hydrocarbons	Fuel combustion, industrial processes	Visibility reduction, plant damage, and sensory irritation are produced in photochemical reactions involving nitrogen oxides; these gases may also cause adverse health effects, and nitrogen dioxide can cause decreased visibility.
Total aliphatic aldehydes, formaldehydes and acrolein	Fuel combustion, incineration of wastes, atmospheric photochemical reactions	Sensory irritation, plant damage, visibility reduction, and possible adverse effects on health
Carbon dioxide	Combustion processes	Used as an index of pollution from combustion operations

SOURCE: Air Pollution Control Policy in the Willamette Basin, Abed, George T., Oregon Department of Commerce, Page 11.

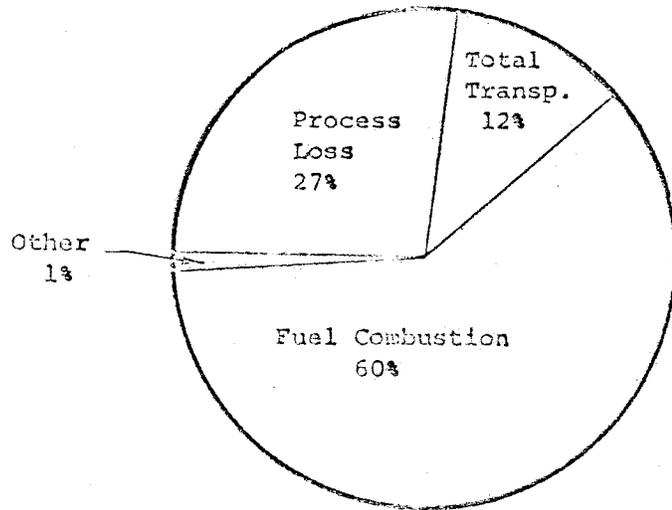
TABLE III

PERCENTAGE OF EMISSIONS FROM MAJOR SOURCES
 PORTLAND INTERSTATE AIR QUALITY CONTROL REGION
 1975

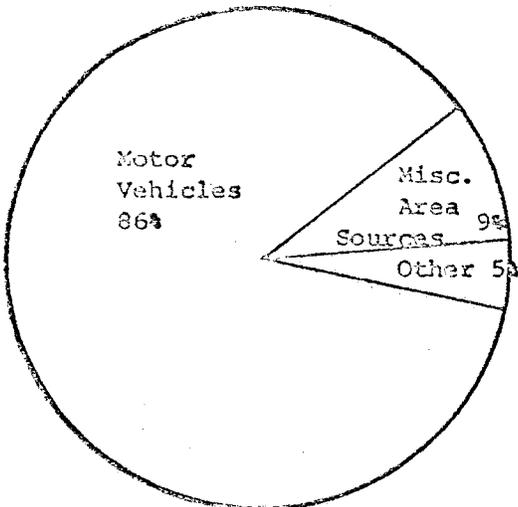
TOTAL SUSPENDED PARTICULATE



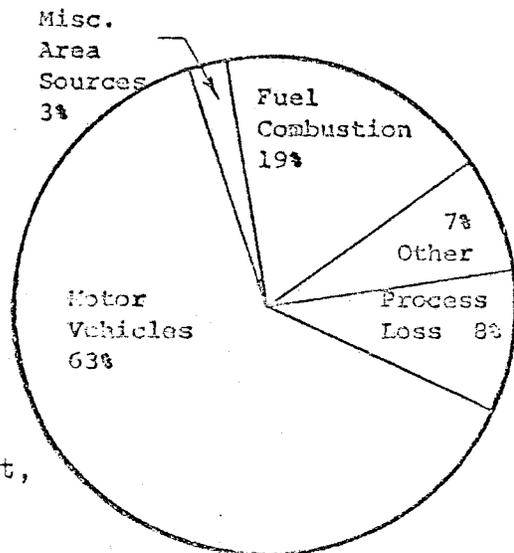
OXIDES OF SULFUR



CARBON MONOXIDE



OXIDES OF NITROGEN



Source; Oregon Department of Environmental Quality, Air Quality Annual Report, 1975.

The options available for Gladstone to deal with air pollution are somewhat limited. Concern for air quality should be reflected in policies related to land use, population density, and transportation. Naturally, such planning should be conducted in concert with regional air quality planning. Although Gladstone is not a significant source of pollution, it is part of the Regional Air Shed and thus has a role to play in establishing air quality policies. At present air pollution of the area could be termed a nuisance and unless controlled will likely worsen in the future.

NOISE

The effects of noise on health are widespread. Excessive noise levels have the capability of producing hearing loss. It can also interfere with speed communications, sleep and relaxation, one's ability to perform complicated tasks, and can be a source of annoyance and generally detract from the quality of life. Noise can also affect property values, especially noise sensitive land uses such as homes and schools.

Vehicle and train traffic are the two main noise generators within the Gladstone area. The acceptable noise levels for residential areas usually range between 50 to 60 decibels (dBA). The Federal Highway Administration has set their acceptable noise levels for residential areas at 70 dBA, the Department of Housing and Urban Development at 65 dBA, and the City of Portland at 55 dBA. Table IV below is an excerpt from the City of Portland's noise ordinance which provides the reader with relative noise level standards for residential, commercial and industrial land uses. For purposes of analysis, Gladstone has used 60 dBA as the acceptable noise level for residential areas. Acceptable noise levels for commercial and industrial land uses, for purposes of analysis, have not been determined.

T A B L E I V

SOUND LEVELS, IN dBA, FOR LAND USE ZONES, AS MEASURED AT ANY POINT ON THE LOT LINE SEPARATING THE SOURCE FROM THE RECEIVER

(1) Existing Uses. For purposes of this title, existing uses shall be considered as used in operation, or for which installation or construction was commenced on or before January 1, 1977.

Zone of Source	Zone of Receiver		
	Residential	Commercial	Industrial
Residential	55	60	65
Commercial	60	70	70
Industrial	65	70	75

(2) New Uses. For purposes of this title, new uses shall be considered as uses for which installation or construction was commenced after January 1, 1977.

Residential	55	60	60
Commercial	55	65	65
Industrial	60	65	70

(b) Adjustments to Table IV.

(1) During night hours, the sound levels of Table IV shall be reduced 5 dBA.

SOURCE: City of Portland "Noise" Ordinance.

With assistance from the Department of Environmental Quality in Seattle and from the City of Portland, the City of Gladstone conducted a noise level study along Highway 99E and I-205. Results from this study indicate that land within 350 feet from the centerline of the near lane of Highway 99E could experience a noise level exceeding 60 dBA. This level is based on a 1976 traffic count of 26,000 average daily traffic (ADT). For 1990, with an expected traffic volume of 35,000 ADT, this distance could increase to approximately 600 feet.

For I-205, land within 500 feet of the centerline of the near lane could experience a noise level exceeding 60 dBA, based on the present traffic volume of 20,000 ADT. By the year 1990, traffic volumes should increase to 70,000 ADT, thus increasing the noise impact area to 800 feet from the centerline of the near lane. Map I illustrates these noise impact areas on the two transportation corridors.

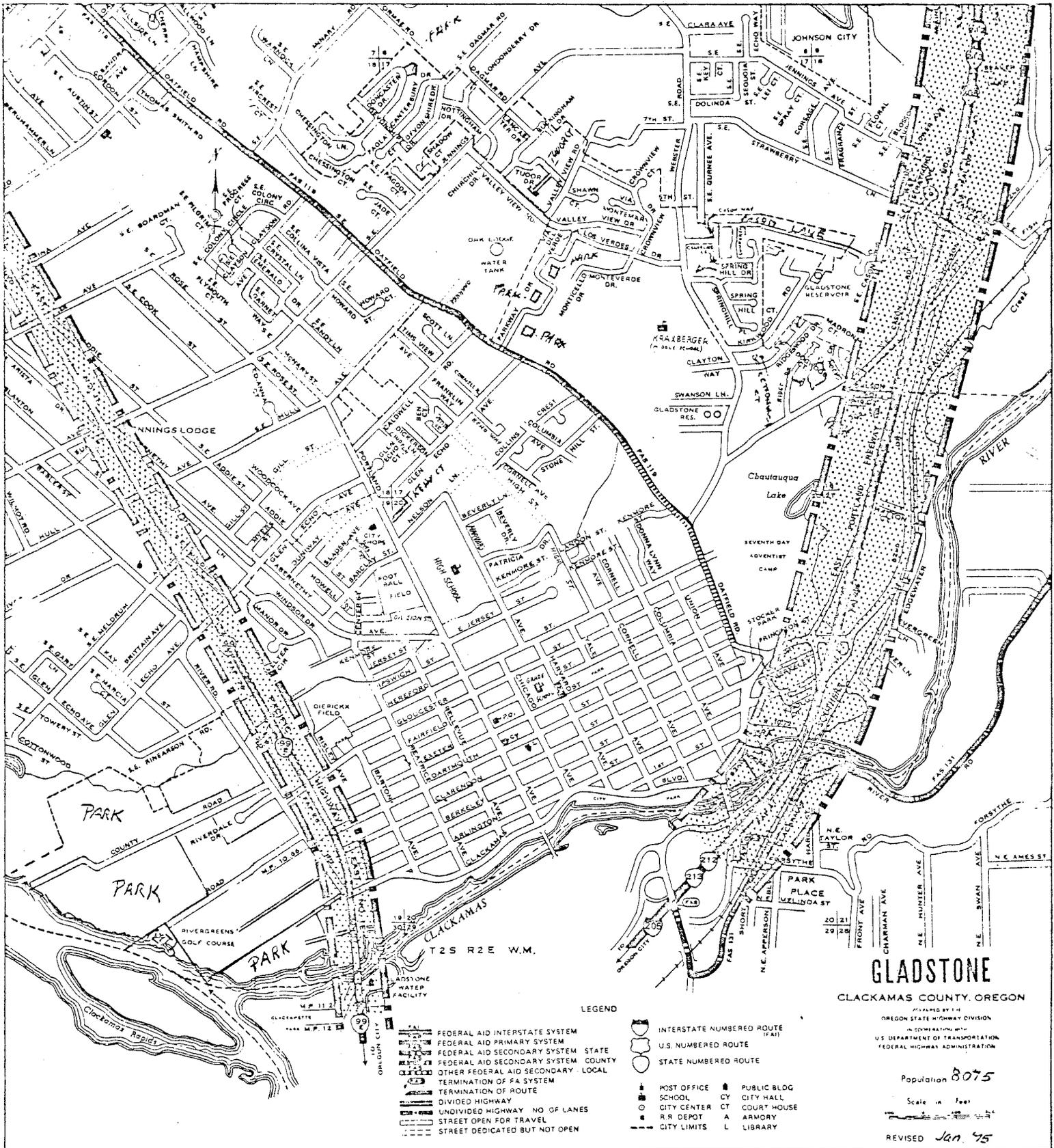
Several methods can be utilized to reduce noise levels within the noise impact area. These include:

1. Accoustical site planning such as locating noise sensitive activities away from the noise source and locating noise compatible activities between the noise source and the sensitive activity, or using buildings as barriers.
2. Accoustical architectural design such as building height limitations and window placement.
3. Accoustical construction such as the use of dense materials and double pane windows.
4. Noise barriers such as berms, walls and fences.

To a limited extent, the commercial buildings located along Highway 99E act as an adequate noise buffer between highway traffic noise and abutting residential developments. A two or three story structure such as an apartment house, however, would not benefit from a one-story commercial building between the highway and the apartment building.

Train noise along 82nd Drive and Edgewater Road reaches maximum levels of 94 dBA. It is because of the I-205 traffic noise and the Southern Pacific train noise that this area between I-205 and 82nd is incompatible with residential development. Due to the sloping topography East of Edgewater Road, this area is probably suitable for single family development.

Unacceptable noise levels are perhaps reached along most arterials and collectors during peak hours in the Gladstone area. Section 29, sub-section 3, of the Gladstone Subdivision Ordinance, allows the Planning Commission to require a ten foot planting screen along the line of building sites abutting such traffic arterials. To date, however, this provision has not been utilized.



MAP I
NOISE IMPACTED AREA

WATER

WATER RESOURCES

Gladstone is fortunate to be located at the confluence of the Clackamas and Willamette Rivers. The two rivers provide opportunities for fishing, boating, and other recreational activities. Substantial undeveloped land remains along the river banks for recreational use by the residents of Gladstone and the surrounding region.

Gladstone is also fortunate to have some centrally located wetlands. These marshy areas are of ecological and aesthetic importance to the community. In addition to providing unique natural settings for quiet rest and relaxation and limited recreation in the middle of an urban area, they influence both the quality and quantity of water in Gladstone. By holding water during wet periods and retaining it during dry periods, they keep the water table high and fairly stable. They provide habitats for water fowl, furbearers, and non-game wildlife. Moreover, they provide nutrients for plant and aquatic life in nearby water systems and protect the downstream from siltation and pollution.

Ground water in Gladstone is also an important resource as a potential water source. Though of medium capacity (with the capability of supplying up to several hundred gallons per well), it can still be relied upon to supplement existing water supplies should the need arise. The main concerns are the protection of groundwater recharge areas and guarding them from possible sources of pollution.

The Clackamas and Willamette Rivers, however, are Gladstone's most important resource. The quality of water in these two streams is of utmost importance to Gladstone, but the city obviously cannot deal with it on a local basis. The quality of water below Willamette Falls, for example, is largely determined by the water-related activities of communities located upstream from the Falls. The Willamette River system drains some 11,200 square miles. The river flows north for 187 miles before entering the Columbia River near Portland, making it the largest tributary to that river below the dams. The Willamette River Basin provides living, work and play space for about 1.5 million people. The sewage and industrial wastes produced in this Basin are equivalent in terms of biochemical oxygen demand (BOD*) to the raw wastes from approximately 5 million people. The nature and magnitude of this problem, therefore, is a basin-wide concern. Water quality maintenance in this basin is the responsibility of all concerned.

SOURCES AND EFFECTS OF WATER POLLUTION

Water pollution problems have primarily been seasonal slime growths, bottom sludge deposits, and high coliform bacteria levels associated with municipal treatment plant and industrial discharges, as well as storm and land runoff. These conditions result in seasonally low dissolved oxygen (D.O.**), in high river temperatures during low flow periods, and in bacterial contamination.

*The amount of oxygen demanded by wastes for oxidation, etc.

**Certain levels of dissolved oxygen are needed for aquatic life.

Domestic and industrial wastes are the most severe water pollution problem and leave the most potential adverse impact on water resources. In addition to being potentially the most damaging, they are the most obvious and aesthetically displeasing. According to CRAG, these wastes could increase discharges to municipal systems from 60 to 80 percent between 1975 and the year 2000.

Sewage sludge disposal areas are filling up quickly and sewer overflows in the Tri-City area (Gladstone, Oregon City, West Linn) and in Portland contribute significantly to water quality degradation in the lower Willamette Zone. Low dissolved oxygen levels in the Willamette downstream from Willamette Falls are suspected to be attributed to oxygen demand exerted by bottom sludge deposits.

The discharge of bacterially contaminated sanitary waste has an immediate adverse impact of public health significance on potential downstream uses as well as an adverse aesthetic and economic effect. Effluents containing oxidizable materials tend to deplete dissolved oxygen content of the water, and they deprive fishes of it. Low dissolved oxygen concentrations have an adverse impact on fish survival and prevent or delay the entry of fall chinook salmon and other anadromous fish species into the river system. Such obstacles and delays in spawning migration can reduce the reproductive capacity of the fish to the extent that they do not live long enough to spawn.

Persistent low dissolved oxygen concentrations encourage predatory fish to compete more successfully with salmon. High water temperatures cause a gradual shift from the more desirable aquatic life forms to the less desirable types. Thus, salmonoids are at a disadvantage in waters with low dissolved oxygen concentrations and high temperatures. Aquatic life species which can tolerate such water conditions compete more successfully with desirable species. The undesirable species, such as predatory fish, can also be hazardous to downstream migrating juvenile salmon and steelhead.

Toxic materials discharged into the river are of public health significance and can convert a healthy aquatic environment to an unhealthy one. They impair fish production and cause mortalities. Chemical wastes can taint salmon flesh and make it unpalatable.

Channel deepening, bank revetment and gravel mining cause increased turbidity, bottom siltation, and loss of valuable spawning gravel. Logging and related activities can also have adverse effects, if not carefully done. Denuding watersheds can result in loss of cooling shade along streambanks and increased runoff. The resulting debris can choke watercourses and cause siltation of streambeds. Log removal and storage in or near water courses can generate large volumes of bark and debris in the water, much of which eventually sinks to the bottom to form extensive deposits which undergo decomposition and strip dissolved oxygen from overlying waters in the process.

Food processing industries generate large volumes of waste of relatively high organic strength. Peak waste loads from these industries usually coincide with low stream flows. The most efficacious way of disposing of them is on land away from streams.

Nuclear power plants, in the process of converting heat energy into usable electric energy, dissipate approximately twice as much heat energy into the environment as they produce. Such vast quantities of heat discharge can adversely affect desirable fish species while causing predatory fish species to thrive. This is why nuclear power plants in Oregon are required to install off-stream cooling facilities.

Gladstone's principal impact on water quality is associated with overflows during peak rainfall periods. In areas of the city where storm and sanitary sewers are combined, the problem is not limited to storm run-off. The problem is further aggravated by infiltration through old clay sewer pipes. In 1975, the U. S. Geological Survey began a five-year study of urban storm run-off to determine its effects. Until this study is completed, knowledge about the impact of such run-off will continue to be limited. What is known, however, is that because of impervious surfaces, urban areas provide greater peak flows and that the quality of the storm run-off water may be very poor due to dirt, debris and chemicals built up on streets and parking lots.

THE ROLE OF DEQ

Before the creation of the Oregon Department of Environmental Quality in 1969, Oregon had a series of legislative acts dealing with water quality control. The first of these was approved in 1938 establishing basic water quality laws. These laws were subsequently modified by the State Legislature in 1961. In 1967, Oregon's water quality control laws were completely rewritten and greatly strengthened. The emphasis was placed on pollution prevention rather than pollution abatement. A waste discharge permit procedure was established and a sewage works program was instituted along with the provision of tax credits to industries installing pollution control facilities. After its creation, DEQ has taken over most of the responsibilities for air and water quality. In 1971, responsibility for noise pollution control was added and, in 1973, responsibility for motor vehicle inspection was also vested in DEQ. In the same year, the state water quality laws were modified in order for DEQ to carry out the provisions of the Federal Water Pollution Control Act amendments of 1972.

The Department of Environmental Quality has assigned waste loads based on the predicted assimilative capacity of the Willamette River at a minimum flow of 6,000 cubic feet per second (cfs). The natural river flows often do not exceed 3,500 cfs during dry periods. Low flow augmentation from federal water storage projects helps meet river flow requirements.* Without these auxiliary flows, waste treatment by municipalities and industries would not be sufficient to bring Willamette River waters to standard conditions.

The limitations on the amount of waste discharged into the Willamette River are the backbone of the DEQ program aimed at keeping a healthy balance between waste loads and minimum flows. Industries and municipalities have been assigned fixed limits of biological oxygen demand (BOD) discharges, and advised that additional new waste loads would require increased waste treatment efficiency. DEQ requires and issues waste discharge permits containing definite limits on quantities and strengths of waste that can be discharged, such as numerical limits on suspended solids, pH** and bacteria, temperature, color

*A minimum flow of 6,000 cfs.

**pH is an expression of hydrogen ion concentration; a measure of alkalinity or acidity. It varies from pH 1-14; pH 6 indicates water is slightly acidic; pH 8 is an indication of slight alkalinity in water; pH 7 is neutral.

and toxicity, etc., when applicable, in addition to limits on BOD. Continued growth and development require that treatment efficiencies be upgraded periodically in order to maintain a high level of water quality.

To meet fishery needs primarily, DEQ has established dissolved oxygen standards for the Willamette River (see Table V below). These specify that a minimum 5 parts per million (ppm*) dissolved oxygen concentrations be maintained downstream from Willamette Falls to insure the passage of anadromous fish and the survival of resident fishes. Between Willamette Falls and Newberg, 6 ppm dissolved oxygen concentrations are required for anadromous fish passage and salmonoid rearing. For salmonoid fish rearing and spawning between Newberg and Salem, 7 ppm DO are required. Upstream from Salem, 80% DO saturation is required for salmonoid spawning.

T A B L E V

WILLAMETTE RIVER PRESENT DO STANDARDS	
RIVER ZONE	MINIMUM DO
Willamette Falls to Columbia River	5 ppm
Willamette Falls to Newberg	6 ppm
Newberg to Salem	7 ppm
Upstream from Salem	90% Saturation (10 ppm)

SOURCE: DEQ

WATER QUALITY IN CLACKAMAS AND WILLAMETTE RIVERS

According to DEQ, the Clackamas River has no serious water quality problems, except perhaps during periods of heavy rainfall and resulting sewer run-off. Table VI below summarizes water quality data for the Clackamas during both winter and summer of 1973 and 1974. Although water quality in the Clackamas is generally good, there is appreciable variation between winter and summer. This variation is the result of seasonal fluctuations in the levels of water flows and the different types of pollutants entering the stream.

T A B L E V I

CLACKAMAS RIVER PARK PLACE BRIDGE 1973-74		
PARAMETER	WINTER	SUMMER
Temperature (C°)	5.5 - 7.5	12-16
Dissolved Oxygen (% Sat.)	97-101	94-99
pH	6.5 - 7.2	7.1 - 7.3
Total Coliform (mpn)	45K-2400	60-620
Fecal Coliform (mpn)	45K-230	45K-230
Flow (cfs)	5150-45,800	980-6210

SOURCE: DEQ

K = Less than

*The number of weight or volume units of a minor constituent present with each one million units of the major constituent of a solution or mixture. This expression was recently replaced by the ratio milligrams per liter (MGL or mg/l).

Dissolved oxygen is a major indicator of water quality. A 90-95% oxygen saturation is necessary for salmonoid fish propagation in tributary streams such as the Clackamas. High temperatures, which occur mainly as a result of solar heating of low flow summer flows, often pose serious problems for fishery stocks. Coliform bacteria* show seasonal variation due, primarily, to increased run-off during winter storm periods. pH levels remain fairly constant throughout the year. The dredging operation in the Clackamas River does not, according to DEQ, present major problems as actual dredging occurs in a lagoon with a controlled overflow gate. Perhaps the major adverse impact on water is the result of overflows to the Clackamas River during peak rainfall periods. It should be noted, however, that during periods of peak run-off there is also greater water flow and thus greater dissipation of pollutants.

Water quality in the Willamette River is of greater concern to more people than that in the Clackamas. This is obviously so because it involves more people and activities and thus has more water pollution problems. The river serves as a route for the upstream migration of anadromous fish and furnishes spawning and rearing habitats for them. The principal determinants of water quality levels for the Willamette River are dissolved oxygen requirements of anadromous salmonoid fishes and the recreational and aesthetic requirements of people. Since 1970, the river has generally met the dissolved oxygen standards set by DEQ (see Table VII).

T A B L E V I I

DISSOLVED OXYGEN LEVELS - PORTLAND HARBOR
LOW FLOW MONTHS - JUNE TO OCTOBER
(D. O. STANDARD FOR THIS ZONE IS 5.0 ppm)

YEAR	June		July		August		September		October	
	Average	Low	Average	Low	Average	Low	Average	Low	Average	Low
1957	3.5	3.0	2.4	1.0	1.7	0.8	3.0	1.3	4.2	1.8
1962	6.1	5.1	4.5	3.6	3.7	2.4	3.6	2.3	5.3	3.8
1967	4.9	3.8	4.3	2.3	2.6	2.4	4.8	2.3	7.2	5.2
1968	5.7	4.9	5.1	4.5	5.1	3.9	7.0	5.9	8.9	8.0
1969	7.8	5.6	6.9	5.1	6.8	4.9	6.9	6.3	7.7	6.3
1970	7.2	5.7	6.1	5.0	6.3	6.0	7.2	6.4	8.3	8.0
1971	9.4	7.6	7.7	6.2	6.9	6.0	8.2	7.6	9.2	8.7
1972	9.0	8.0	7.7	6.7	7.2	6.5	8.5	7.3	9.0	8.4
1973	7.5	6.7	7.0	6.1	6.6	5.9	7.3	6.8	8.6	7.6
1974	10.6	9.8	8.9	7.3	7.1	6.4	7.8	6.6	9.3	8.9

SOURCE: DEQ

The Oregon DEQ maintains a number of monitoring stations on the Willamette River, the closest of which to Gladstone are the stations at the Oregon City Marina, the Canby Ferry and the SP and SRR Bridge. Table VIII summarizes

*A group of bacteria predominantly inhabiting the intestines of man or animal but occasionally found elsewhere. They are of sanitary significance.

water quality data compiled by the stations at the Canby Ferry and SP and SRR Bridge during 1972-73 and 1974-75 (see also Figures 1 and 2).

T A B L E V I I I
THE WILLAMETTE RIVER
WATER QUALITY DATA

Parameter	1972-1973				1974-1975			
	Canby Ferry		SP & SRR Bridge		Canby Ferry		SP & SRR Bridge	
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Temperature (C°)	4-14	14-24.5	3-19	12.5-22.5	6-14	13-21.5	5-14	13-20.5
Dissolved Oxygen (mg/l)	9-11.5	6.9-8.8	9.8-13.5	6.4-8.9	9.6-10.9	7.5-8.9	9.8-12	7.1-9.3
Dissolved Oxygen (% Sat.)	83-102	80-91	87-107	75-97	83-102	80-90	86-103	74-106
pH	6.9-7.1	6.7-7.1	6.9-7.1	6.9-7	6.8-7.0	6.7-7.1	6.8-7	6.7-7.1
Total Coliform (mpn)*	620- 7000L	230- 7000	620- 7000L	60- 2400	2400- 7000	45K- 2400	2400- 7000	230- 2400
Fecal Coliform (mpn)	60-620	45K-60	60- 1300	45K-230	23- 7000	45K-60	45K- 2400	45K-230
Flow (cfs)	12000- 81000	5620- 10200	---	---	12900- 59000	6800- 12400	---	---

SOURCE: DEQ

K = Less than

L = Greater than

Although dissolved oxygen levels in the Willamette River presently meet fishery needs, there are other problems. One of these is a noticeable downward trend in dissolved oxygen levels during low flow periods. Another is the high level of coliform bacteria in the river despite the high degree of sewage treatment throughout the basin. A third is the temperature increases during low flows as a result of solar heating. Table IX provides the latest data on water quality in the Willamette at the Oregon City Marina during the summer period of June 7 to September 14, 1977.

T A B L E I X
OREGON CITY MARINA
JUNE 7 - SEPT. 14, 1977

PARAMETER	OCM - SUMMER 1977
Temperature (C°)	20.28
Dissolved Oxygen (mg/l)	7.83
Dissolved Oxygen (% Sat.)	85.53
pH	7.01
Total Coliform (mpn)	390.35
Fecal Coliform (mpn)	51.25
Flow (cfs)	9.560

SOURCE: DEQ Labs

*Most probable number in milliliters

Figure 1
 Willamette River - Main Stem
 Minimum Dissolved Oxygen Levels

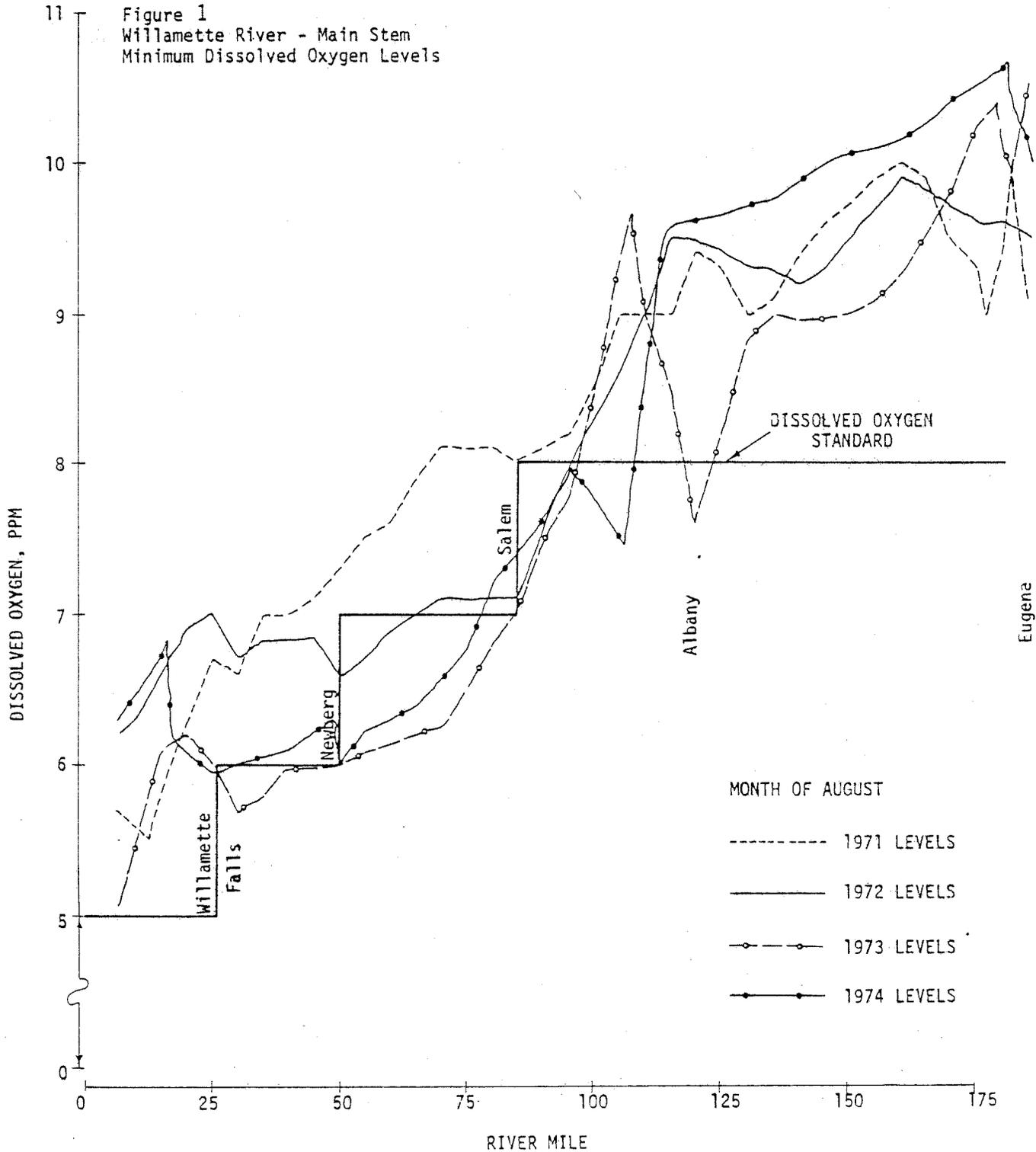
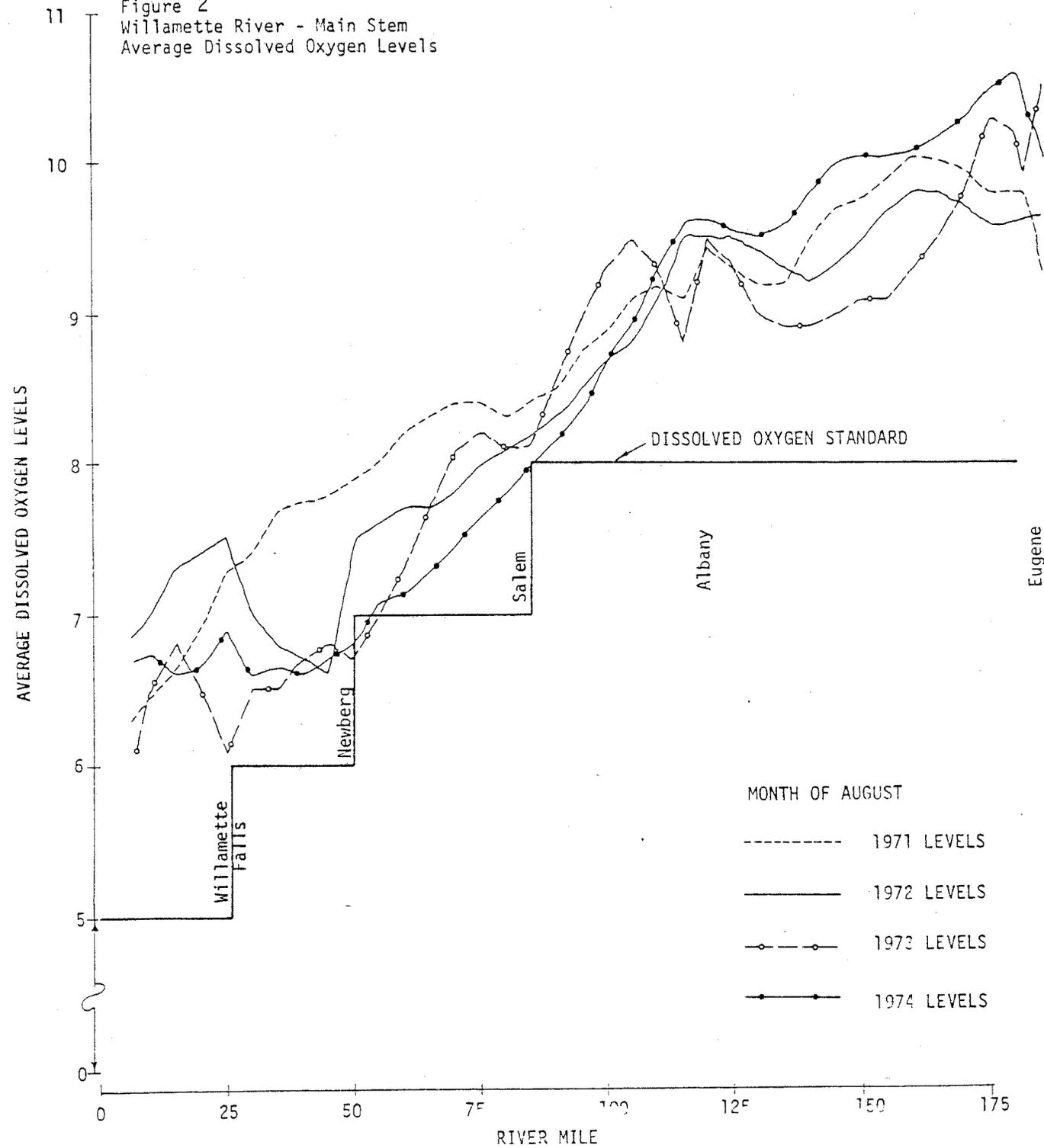


Figure 2
 Willamette River - Main Stem
 Average Dissolved Oxygen Levels



The middle river section has practically failed to meet minimum dissolved oxygen levels. In 1974, the U. S. Geological Survey discovered that ammonia nitrogen discharges from the Boise Cascade Salem Pulp Mill and the Wah Chang Metals Plant near Albany were the causes for substantial oxygen demand in the middle Willamette Zone. Until these problems are solved, ammonia nitrogen concentrations are going to continue to hinder attempts at maintaining water quality standards in the middle Willamette River.

WATER HAZARDS

Flooding is the most serious water hazard in Gladstone. River bank erosion is a problem, but is not considered to be a serious one. It has been attributed to the natural tendency of a river to meander. Flooding in Gladstone is mainly caused by the Clackamas and Willamette Rivers. The Clackamas River runs along the city's easterly and southerly borders; the Willamette River runs along its westerly border. Floods on the two rivers usually occur together, although the Clackamas River crests 1 to 2 days prior to the Willamette River. Flooding is also, to a lesser extent, caused by ponding resulting from local storm runoff.

The annual flood season extends from October through April, the period of greatest storm activity. However, the majority of major floods have occurred during December and January. Throughout the winter, cyclonic storms move inland from the Pacific Ocean bringing periods of intense rainfall over the Pacific Northwest. Floods are a threat whenever rainfall is abnormally heavy or prolonged. Major floods occur when ground and hydrologic conditions are favorable for runoff. When the ground is frozen or saturated, runoff is even greater and more rapid. The direction of the storm path also influences the rate of runoff; higher flows are generated when the storm front moves in a downstream direction producing a buildup of floodwaters.

Many large floods have occurred on the Willamette and Clackamas Rivers. The greatest flood known to have occurred in the Willamette River Basin was the December, 1861 flood. Other major floods in this area occurred in January, 1881 and February, 1890. In most of the Willamette River Basin, the 1890 flood was lower in stage than the 1861 flood. However, at Oregon City, the stage of the 1890 flood was higher than that of the 1861 flood. This was caused by river channel restrictions due to manmade developments in the Willamette Falls area after 1861. The flood of December, 1964, had it not been regulated, would have been approximately equal to the 1861 flood.

Heavy and continuous precipitation, augmented by snowmelt, caused the 1861 flood. This flood crested at Oregon City on December 4. Peak flow is estimated to have been approximately 590,000 c.f.s. (cubic feet per second), greater than any other known flood. The Falls at Oregon City were completely submerged by high water, with the water level even downstream from the Falls about 8 feet higher than their crest. At the height of the flood, water flowed through the main streets of Oregon City to a depth of 4 feet.

Like the 1861 flood, the 1890 flood resulted from exceptionally heavy rains and rapid melting of an extensive snow cover. On February 5, 1890, Oregon City experienced the highest flood crest in its history, when waters reached a stage of 2.1 feet above that of the 1861 flood. The flow of the Willamette River at Oregon City of 510,000 c.f.s. was substantially lower than the 1861 flood flow of 590,000 c.f.s. The higher stage was attributed to buildings and other improvements constructed around the Falls after 1861.

The 1964 flood resulted from unusually heavy precipitation on frozen topsoil, augmented by snowmelt both in the Valley and in the Cascade and Coast Ranges. Peak flow near Oregon City was reduced substantially as a result of upstream storage regulation. Had there been no regulation, the flood of December, 1964 would have been approximately equal to the 1861 flood throughout the Willamette Valley. Record or near-record flood stages were observed on streams without storage regulation. Many streams had peak flows in December, 1964 exceeding previously observed peaks by as much as 50 percent. Yet peak Willamette River flow at Oregon City was only 385,000 c.f.s. The Clackamas River peaked at 120,000 c.f.s.

The area most susceptible to riverine floods in Gladstone stretches from the Willamette River easterly and northeasterly into the city (see Map II). Other areas such as E. Jersey, Risley Street and Franklin Way, have flooded during heavy rain or snow melt. Except for a few residences and farms along the Clackamas River, Gladstone's 100 year flood* plain is relatively undeveloped. Extensive development exists, however, in the 500-year flood** plain. Such a flood would inundate many residences, including apartments and mobile homes, many businesses and a golf course. But since development in the 100-year flood plain has been limited, recent riverine flooding caused only moderate damage in Gladstone.

The Federal Flood Insurance Program divides a 100-year flood plain into a floodway and a floodway fringe. The floodway is the channel of a stream and any adjacent flood plain areas considered essential for the unobstructed flow of a 100-year flood. The floodway fringe is that area of the flood plain that could be completely obstructed without increasing the water surface elevation of a 100-year flood more than one foot at any point. The 500-year flood zone indicates additional areas of potential flood risks in the community.

Flood stages at Gladstone are reduced significantly by eleven Corps of Engineers dams and reservoirs on the Willamette River upstream. Three more reservoirs are planned for the Willamette. The Clackamas River has five hydroelectric dams not designed for flood control. Heavy rains and snowmelt in nearby mountains can cause very high water runoff in the Clackamas River. If this occurs when the Willamette is at flood stage, serious flooding can be expected.

Gladstone has adopted regulatory measures to guide new development in the flood plain. City Ordinance No. 871 embodies these measures and provides for their enforcement. The ordinance was accepted by the Federal Insurance

*A flood that is reasonably expected to occur once in 100 years. Therefore, there is 1% chance it might occur in any year. A 100-year flood is more a statistical term, however, than a prediction of frequency; in fact, a 100-year flood may occur two or three times within any 100 year period.

**A flood that is reasonably expected to occur once in 500 years.



MAP I I
FLOOD HAZARD BOUNDARY

Administration on March 15, 1977, and the Gladstone flood insurance rate maps became effective as of the same date. These maps show expected water surface elevation of the 100-year flood and delineate flood insurance zones for the application of actuarial insurance rates.

Forecasting flood levels in the Willamette and Clackamas Rivers is the responsibility of Portland River Forecast Center, National Weather Service of the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce. These forecasts are disseminated through Clackamas County Emergency Services, television, radio and other news media.

SUMMARY AND CONCLUSIONS

Gladstone has uninterrupted access to the Clackamas and Willamette Rivers. Water quality in the two rivers has been of particular concern to both public and private groups and individuals. The Clackamas River has little, if any, serious water pollution problems. The pollution problems in the Willamette River have mainly been seasonal slime growth, bottom sludge deposits, and high coliform bacteria levels associated with municipal and industrial discharges and with storm and land runoff. However, through the efforts of the Department of Environmental Quality and its predecessors, water quality in the Willamette River has improved significantly in recent years, despite the fact that sewer overflows from Oregon City, West Linn and Gladstone continue to be part of its remaining water pollution problems.

Industrial wastes are fairly well controlled through the National Pollutant Discharge Elimination System administered by DEQ. Some recently discovered industrial waste problems are presently being dealt with. Municipal wastes are also controlled with the exception of overflows from treatment plants operating with over-capacities. Nonpoint sources of waste may contribute somewhat to present pollution problems and are potentially serious, but the extent of their pollution effects has not been documented. The Tri-City sewerage treatment problem has been thoroughly studied and a recommendation has been made to build a regional treatment plant in Oregon City. The economic advantages of large regional treatment plants should increase as treatment requirements become more stringent and when well planned and operated, they may offer economies in construction and operation. Besides, studies to determine the feasibility of regional sewerage systems and demonstrate the cost effectiveness of proposed sewerage plans and projects are prerequisites now to obtaining either federal or state sewage works construction grants.

The main water hazard in Gladstone is flooding by the Clackamas and Willamette Rivers. The 100-year flood plain in Gladstone is relatively undeveloped except for a few residences and farms along the Clackamas River. Much more development exists in the 500-year flood plain, however, and such flood would cause extensive and serious damage. Gladstone has adopted regulatory measures to guide new development in the 100-year flood plain, which were approved by the Federal Insurance Administration.

FISH AND WILDLIFE

The Willamette River is a migration route for summer and winter steelhead, spring and fall Chinook salmon, Coho salmon and sturgeon. Cutthroat trout move from the Willamette River into the small tributaries each fall and winter and spawn. Planned habitat management and fish cultural activities should result in increased runs of salmon and steelhead and in improved wildlife habitat.

Anadromous fish have always been plentiful in the Clackamas and Willamette Rivers. For centuries, the Indians of the Willamette Valley traded dried salmon, trout, smelt and sturgeon to other tribes. Major fishing areas, such as Willamette Falls, supported permanent villages. Most of the population, however, lived a semi-nomadic existence and depended on occasional fishing, hunting and gathering. There was relatively little game in the densely forested area, but the valley abounded with it.

FISH

The fishery below Willamette Falls is still a major fishing area. The beaches at the mouth of the Clackamas River are extremely popular bank fishing areas for salmon and steelhead anglers. A popular sturgeon fishing area for both boat and bank anglers is near the West Linn Bridge. Topping the list in importance is spring Chinook salmon. A 23-year average for these fish show a run of 51,000 and a harvest of 12,400. In 1976, the spring Chinook salmon catch was estimated at 16,355 below Willamette Falls. A record catch of 20,000 fish was made in 1971 in the fishery below Willamette Falls. The total number of days fished by local anglers between Oregon City and St. Helens in 1976 is 134,735 man-days. About half of this activity can be attributed to the stretch of river which runs by Gladstone. According to the Fish and Wildlife Department biologists, trout have been sighted in Cow Creek and warm water fish are likely to inhabit several of this area's other small streams.

WILDLIFE

The meandering course of the Willamette River through the productive Willamette Valley provides excellent wildlife habitat. Gravel bars, back waters, islands, riparian vegetation, and especially sloughs are essential components of this ecosystem. Much of this important habitat has already been destroyed by man's attempt to channelize the river. Wherever these natural features remain, they should be preserved or wildlife will vanish.

A survey of the Gladstone area by the Department of Fish and Wildlife to identify lands of significant importance for wildlife was completed in January, 1978. Two principal sites with high wildlife potential were identified. One of these sites is Meldrum Bar, located along the Willamette River between river mile 25.4 and 25.0. This site has excellent potential for wintering water fowl during high water and has fair beaver habitat. The heavily vegetated area is a good site for bird watching and provides angler access to the Willamette River. It has some fair size cottonwood trees which provide some wood duck nesting habitat. One problem with this site is that it has too much cover and could be improved by removing some of the dense thickets of Himalaya blackberries which have crowded out most of the other vegetation. The other site is located west of Portland Avenue

between Glen Echo Avenue and Hull Avenue. This large marshy area supports a variety of wildlife species. This site, too, is good for bird watching and other passive recreational activities.

Some upland game (quail and pheasant), water fowl (ducks), furbearers (beaver and muskrat), and non-game wildlife (raccoon, brush rabbit, etc.) are likely to inhabit many parts of the Gladstone area. Riparian vegetation and wetlands provide habitats for upland game, water fowl, furbearers and non-game wildlife. Water fowl can be seen on and near Chautauqua Lake and a grey fox has been spotted recently near the lake.

PROTECTION

Long-range planning for the city should include provisions to protect wetlands and leave them in their natural state. The riparian vegetation along all the small waterways in the study area should be protected because of their value to wildlife. The Department of Fish and Wildlife stresses the importance of the protection and enhancement of the natural vegetation which serves as an attractive habitat for broad categories of wildlife. The goals of the department include retaining riparian vegetation and channel integrity, preserving fish and wildlife habitat, and providing for a variety of recreational and aesthetic values.

LAND

The geology, soils and topography of Gladstone is of concern due to their effect on general structural stability. Also of concern is the land's mineral and aggregate resources. Knowledge of these resources and hazards is essential if we are to maintain and improve our land resources and protect life and property.

GEOLOGY

An understanding of the geologic make-up enables scientists to locate faults and estimate displacement fairly accurately, thus identifying present environmental hazards including both faulting and landsliding.

Geologic history reveals that Columbia River Basalt entered Western Oregon in a trough through the Cascades. This trough extended from the present day Columbia River Gorge to the Clackamas River. Stratigraphic sections of this Basalt indicate the Gladstone area is composed of 19 of 21 maximum Basalt flows which enter the Portland Area. The composite thickness for the Gladstone Area is approximately 200 meters. The most recent volcanic activity was the Boring Lavas. These appeared as basaltic shield volcanoes and cinder cones erupting through the Columbia River Basalt. The lava vented through the basalt along zones of fractures or faulting. In some places, the magma failed to reach the surface and thus formed intrusions.

The Portland Hills Anticline Fault began before and continued long after the basalt flows (see Map III). Its magnitude of movement is estimated at a maximum 2 mm. per year since the Eocene Period. The Southwest block is pushing North and West past the Northeast block.

Other major faults within the Gladstone Area include the Oak Grove Fault resulting from the collapse of an anticline, the Northeast trending Gladstone Fault with a displacement of between 50 and 80 meters, and the fault trending Northeast and crossing the Gladstone Fault having about a 10 meter displacement. Exclusive of the Anticline Faults, most of the faults in the area are related to the collapse after extrusion of the Boring Lavas. Due to their short length, large earthquakes are unlikely with minor seismicity possible.

It is anticipated that the folding and uplifting of the Portland Hills Fault will continue and thus have strong implications to earthquake potential. This fault trend which extends from the coast North of Astoria through Portland and into Central Oregon has approximately 40 kilometers of right lateral offset and a potential fault length of 100 kilometers to 300 kilometers. The magnitude of an earthquake is proportional to the fault length. Fault lengths of 100 kilometers, 200 kilometers and 300 kilometers are relative to 5.6, 6.4 and 6.8 earthquake magnitude. Earthquakes of these magnitudes are expected to recur at nearly 1400 year intervals.

Possible geologic hazards caused by earthquakes include areas subject to strong ground shaking, areas of ground displacement and areas subject to landsliding. As shown on Map IV, the Eastern half of Gladstone is subject

to possible strong ground shaking and landsliding. Areas subject to possible ground displacement are located immediately East of the city.

SOILS

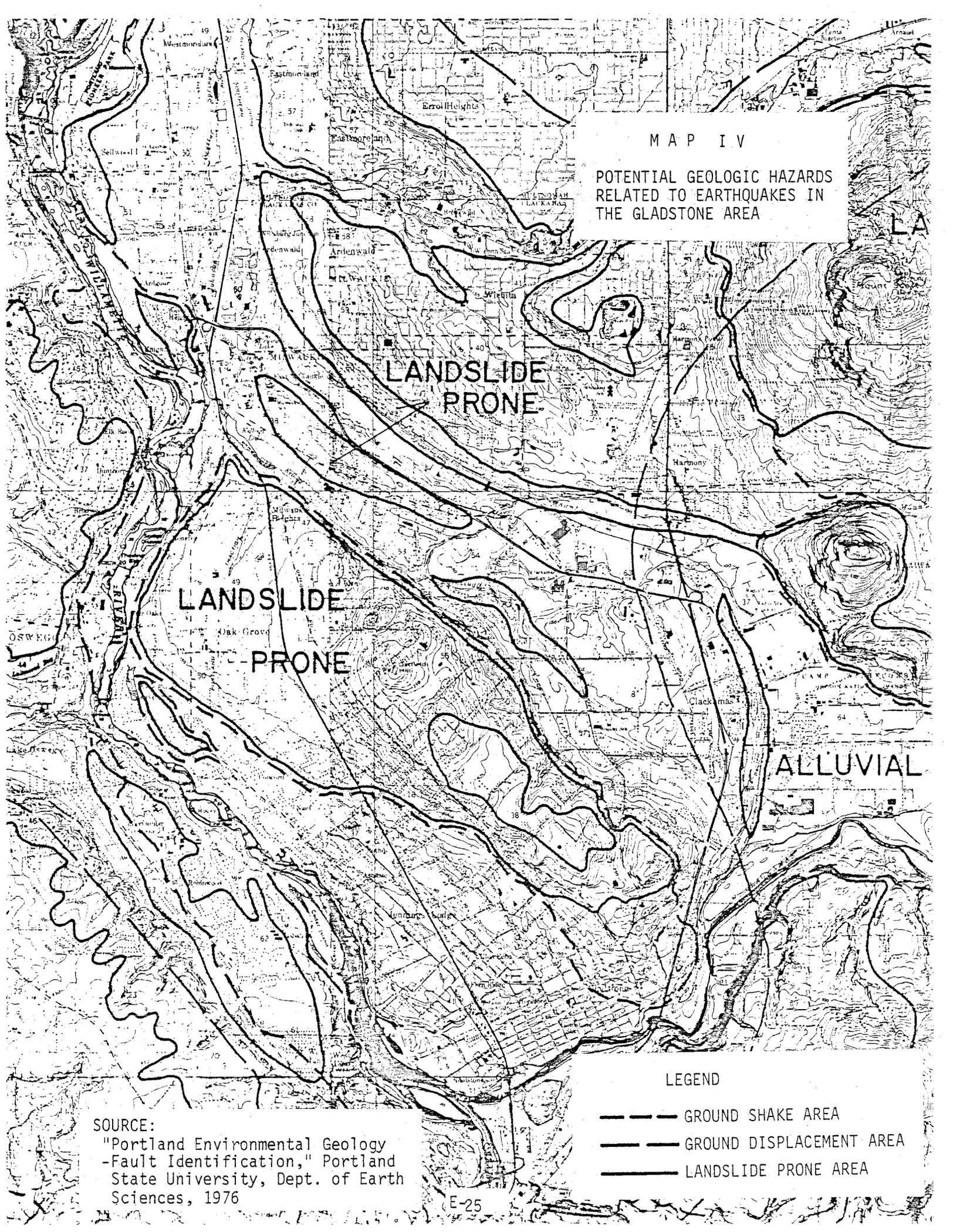
The U. S. Soil Conservation Service, Clackamas County Field Office, completed a detailed soils survey of the Gladstone area in 1976. The purpose of this survey was to identify the kind and location of soils in the area. The soil texture, color, depth, and length of slope, and other soil properties, as well as vegetation, geology and surface drainage were observed by soil scientists. Soils were then classified according to similar properties and profiles. Once classified and named (example: Woodburn Silt Loam), the boundaries of each soil series were drawn on an aerial photograph. In addition, a survey report was published which identified the strengths and weaknesses of each soils series, identifying some soils as very suitable for crop production, septic tank absorption fields, or sanitary landfills, while others were not. Suitability for sanitary facilities and community development were rated on a slight, moderate and severe scale. A summary of this soil survey of the Gladstone area is provided below.

The principal soils along the Clackamas and Willamette Rivers include Camas gravely sandy loam, Chehalis silty clay loam, Cloquoto silt loam, Newberg sandy and silt loam, and McBee silty clay loam, all formed in recent alluvium. Severe limitations to development exist in this area due to flooding.

The principal soils in the "old town" area of the city and the area West of Portland Avenue and North of Hull Avenue are Woodburn silt loam, Aloha silt loam and Powell silt loam formed in old alluvium deposits or valley terraces. Woodburn silt has moderate to severe limitations on development due to low strength. Aloha and Powell soils have severe limitations on development due to wetness.

MAP IV

POTENTIAL GEOLOGIC HAZARDS
RELATED TO EARTHQUAKES IN
THE GLADSTONE AREA



LANDSLIDE
PRONE

LANDSLIDE
PRONE

ALLUVIAL

LEGEND

- GROUND SHAKE AREA
- GROUND DISPLACEMENT AREA
- LANDSLIDE PRONE AREA

SOURCE:
"Portland Environmental Geology
-Fault Identification," Portland
State University, Dept. of Earth
Sciences, 1976

The Northeast corner of old town and the area East of Portland Avenue and North of Hereford is characterized principally by Xerochrepts-Basalt rock outcrop complexes and Witzel cobbly silt loam with Willamette silt loam to the North. Xerochrepts and Witzel have severe limitations in excavation for building sites due to shallow depth to bedrock. Willamette silt loam has moderate limitations on development due to low strength and slope (where applicable).

Development and/or redevelopment potential on land identified as having severe limitations will depend on specific site conditions and factors such as costs associated with building site preparation. One way to avoid large rock out-croppings or low strength soils and lower overall construction costs is through cluster development and mixed housing types. The city's Zoning Ordinance provides for such development under the "Planned Unit Development" (PUD) zoning regulations. Although to date the PUD has not been utilized, this may be the only feasible development method for land located in the Seventh Day Adventist Campground should this land be more intensely developed in the future.

SLOPE

From the standpoint of slope, most of the area in Gladstone is developable. The area near the banks of the Clackamas and the Willamette Rivers is characterized by relatively flat terrain with moderate slopes. The North, Central and Northeast portions of Gladstone typically have slopes approaching 12%. Slopes approaching 25% and even 50% do exist, but much of this area is already developed or set aside as open space. Development on extreme slopes is not necessarily prohibitive but typically results in higher construction costs. The West Hills in Portland serve as a good example. Road development is constrained, however, since the vertical distance required to support an adequate road bed is proportional to the increases in slope. In addition, roads constructed on steep slopes are more prone to slides or settling.

As shown on Map V, landslides have occurred in the recent past and are presently active along Oatfield Road in the area of Jennings Avenue and Caldwell Road. This area has low strength soils subject to wetness.

AGGREGATE RESOURCES

As depicted on Map VI, there are three rock resource sites exclusive of river gravel which are within the immediate Gladstone area. The Seventh Day Adventist Campground Site is estimated to have a future rock potential of approximately 645,000 cubic yards. To date, 100,000 to 200,000 cubic yards have been mined from the quarry site.

The Willamette Hi-Grade Site off the Clackamas River has been completely mined. An estimated 1,260,000 cubic yards of rock were removed from this site in the past. Presently the site is serving as a rock processing facility.

The rock quarry site at Park Place has a past production figure of 14,000 cubic yards with a future potential of an additional 28,000 cubic yards.

According to Jerry Gray, State Geologist, all of the sites mentioned above can be mined safely, even if they are within close proximity to residential and commercial development. Correct drilling patterns and use of delays, appropriate stemming, and small blasts will allow minimum ambient impact.

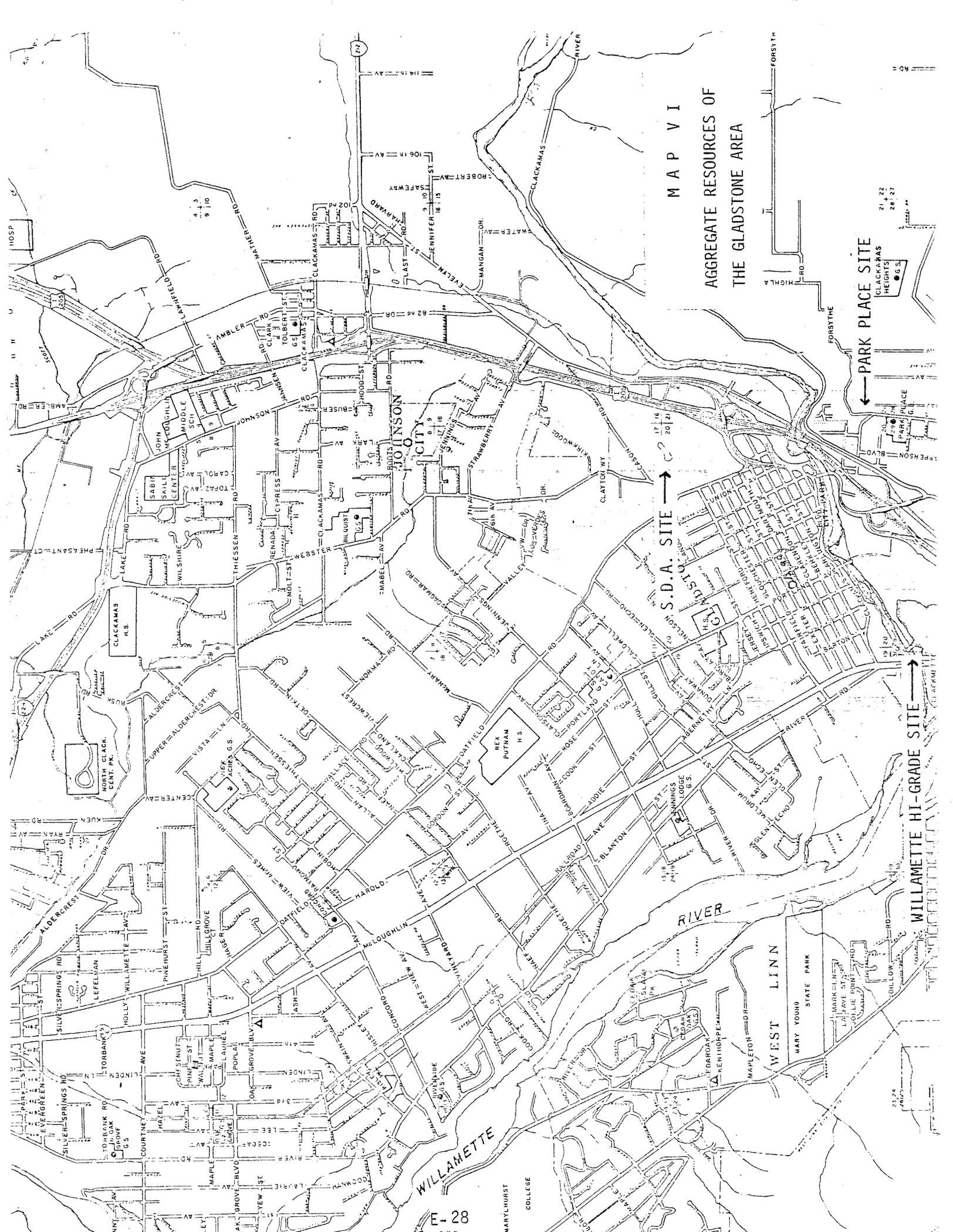
A detailed topographic map of the Gladstone area, Oregon. The map features contour lines indicating elevation, a grid system, and various geographical features such as roads, rivers, and buildings. A white rectangular box in the upper right corner contains the title. The map shows a complex terrain with numerous hills and valleys, and a dense network of roads and structures. The title 'MAP V SLOPE AND LANDSLIDES IN THE GLADSTONE AREA' is prominently displayed in the upper right.

MAP V
SLOPE AND LANDSLIDES IN
THE GLADSTONE AREA

SOURCE:
"Portland Environmental Geology
-Fault Identification," Portland
State University, Dept. of Earth
Sciences, 1975

M A P V I

AGGREGATE RESOURCES OF
THE GLADSTONE AREA



S.D.A. SITE →

← PARK PLACE SITE

← WILLAMETTE HI-GRADE SITE

The State Department of Geology is presently undertaking a study to inventory all aggregate resources within the State, define present and future demand for these resources, and address the need for reclamation of quarry sites. Aggregate resources within the Willamette and Clackamas Rivers have yet to be inventoried. There are no identified mineral resources within the Gladstone Area.

OPEN SPACE

An open space network can provide areas for recreation and forms for social interaction, protect water ways and wetlands and in turn preserve fish and wildlife habitats, and insure that lands with outstanding views and aesthetic quality will remain for all generations to enjoy. Open space may also serve as a bordering element to give identity to a community or district, act as a buffer between conflicting land uses and serve as a linear core element to interconnect activity nodes such as parks, schools and other community facilities.

A "Parks and Open Space" plan was developed for Gladstone in 1973 by Cornell, Howland, Hayes and Merryfield (CH2M). The plan briefly discussed the need for park facilities but did not directly address the need for open space. This latter need, however, underlies most of the plan objectives which include the following:

1. Preserve the Willamette and Clackamas Rivers in a condition which will allow this and future generations to enjoy them. Fishing, swimming, and boating are encouraged.
2. Preserve the wooded hillsides and river banks which frame residential areas, contribute to community identity, and generally enhance the city with green surroundings.
3. Preserve the river flood plains and islands. The floodway required to discharge large river flows should not be restricted. No development should occur in the flood plain which would result in risk to human life or property.
4. Preserve some high places which will provide outstanding or pleasant views of the community.
5. Preserve buildings and places of historical value or cultural interest.
6. Establish and maintain street trees which contribute the residential character of Gladstone.
7. Create a neighborhood park within walking distance of the residents of each neighborhood. It should be built near an adjoining school playground to make both active and passive recreation possible.
8. Establish small play lots or tot lots for young children in residential areas throughout the city. There they may safely play close to home and under the supervision of parents.
9. Create a large community park for groups of neighborhoods. It should be near an adjoining high school play field and athletic complex.
10. Establish special recreational facilities desired by the local population such as an indoor swimming pool, tennis courts, small lakes and a golf course.

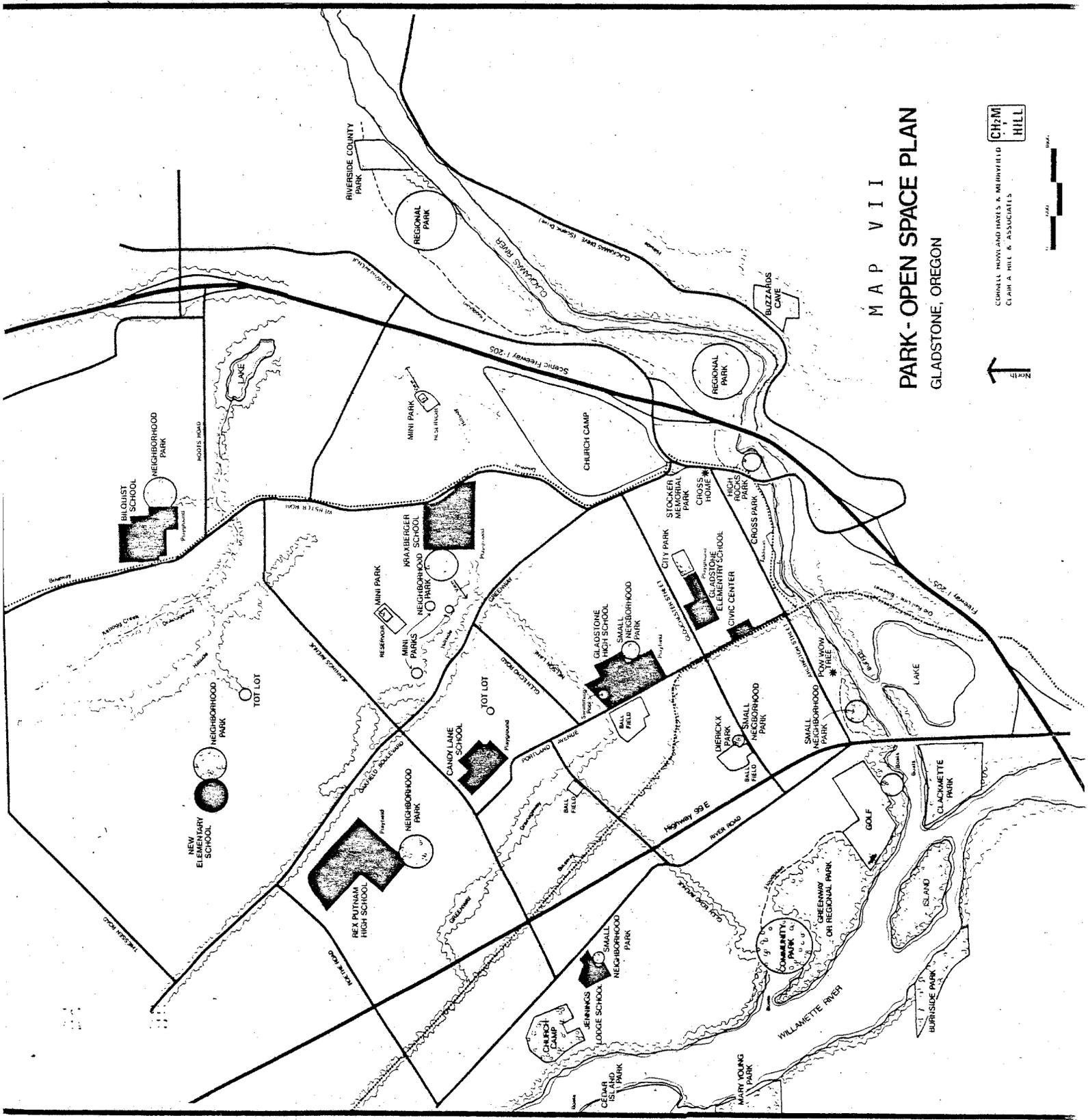
11. Encourage the creation of regional parks and open spaces within the community to serve a wider population where unique local resources or opportunities make this desirable.
12. Create scenic drives or boulevards enhanced by trees and landscaping to provide pleasant drives through the community.
13. Establish a system of greenways--a continuous ribbon of natural or landscaped terrain. These may define or separate residential areas, buffer conflicting land uses, protect and preserve a stream bank or drainage way, or preserve a hillside. Greenways may also include a linear development frequented by pedestrians or be part of a planned unit development specially designed to integrate buildings and open spaces.
14. Establish a system of trails and bikeways which thread the community and connect active recreation sites and other pedestrian destinations such as local shopping areas. These routes will preferably be included in the city's greenway system.*

Generally, the plan calls for the establishment of greenways along the Willamette and Clackamas Rivers and major roadways (not including Highway 99E), vegetation buffers between Willamette Hi-Grade Sand and Gravel Company and the Clackamas River, and protection of land subject to sliding or flooding. The CH2M Plan also proposed regional, community, neighborhood and mini-parks through the Gladstone area (See Map VII). The "Gladstone Bikeway Plan," adopted in 1975, complements some of the recommendations in the CH2M report by establishing a bikeway system throughout the city.

Techniques for preservation of open space have been identified within the "Parks and Open Space" plan. These include conservation easements, leasing, purchase and lease back, flood plain zoning, acquisition and more. The city has instituted several protection techniques for its river banks which include a land-lease agreement with the State for land along the Willamette River, flood plain zoning, inclusion of land abutting the city's two rivers within the Willamette River Greenway Program and the city ownership (Cross and Hi Rocks Park). Adequate conservation techniques have not been established East and North of Hi Rocks. The southern bank of the Clackamas River, although not included in the Gladstone city limits, has a direct influence on the overall natural, scenic and recreational qualities of the river. Adequate preservation controls have not been instituted along this southern bank. Areas with severe slopes have, to date, been developed or set aside as common open space (example - Ridgewood #2 Subdivision). Private development, however, has not assured a continuous open space network. Adequate protection controls are lacking for wetlands north of West Glen Echo Avenue.

In summary, the city has taken effective steps to conserve natural open space along the Willamette and portions of the Clackamas Rivers. Development has already taken place in some of the areas identified in the Parks and Open Space plan to be preserved as open space. The options for the retention of open space and natural areas are foreclosing and thus a continuing program of implementation of the parks and open space plan is essential.

*Park and Open Space, CH2M, Gladstone, Oregon, 1973.



MAP VII
PARK - OPEN SPACE PLAN
 GLADSTONE, OREGON



CUNNELL HOWLAND HAYES & McHUGHFIELD
 CLAIR A. HILL & ASSOCIATES



WILLAMETTE RIVER GREENWAY

The Willamette River Greenway is a program designed "to protect, conserve, enhance, and maintain the natural scenic, historical, agricultural, economic and recreational qualities of land along the Willamette River as the Willamette River Greenway" (Statewide Planning Goal #15). The Greenway encompasses that area immediately adjacent to the river within at least 150 feet from ordinary low water line, not to exceed an average of 320 acres per river mile.

The origin of the Willamette River Greenway dates back to the action of the 1967 and 1972 Legislatures. During this period a set of policies were established to guide the program's implementation and directed the Department of Transportation (DOT) in cooperation with units of local government, to develop a greenway plan. Once this plan was developed, the Legislature in 1973 directed LCDC to review and revise, if necessary, the DOT Plan. Upon review, LCDC determined further plan detail was required and thus established a two-step process to implement the plan. The process included: 1) Greenway preliminary order (interim), and 2) Willamette River Greenway land use planning goal (long term).

In order for Gladstone to comply with the LCDC interim order, Ordinance No. 866 amending the Gladstone Zoning Ordinance was adopted establishing a Greenway Conditional Use Zone. In addition, a more refined Greenway Boundary was adopted by the City Council and approved by LCDC. The adoption of the Comprehensive Plan will allow the city to meet the Greenway Goal. Within the Comprehensive Plan, the city must identify a finalized Greenway Boundary, permitted uses and acquisition areas within the Greenway.

The Greenway Boundary, since the program's inception, has gone through several changes. For Gladstone, the preliminary boundary as proposed by state consultants, encompassed most of "old town" Gladstone and that area West of River Road. Through a joint state and local effort, a more refined (interim) boundary was established based on the following state criteria:

Criteria to Consider for the Review of the Greenway Boundary

1. Areas of brush land, timber, vegetation bordering the rivers, channels, sloughs, backwaters and tributaries.
2. Upland areas having direct scenic influence in the river scene.
3. Areas of historical, archaeological, and cultural significance.
4. Significant natural areas to include fish and wildlife habitats.
5. Lands with the potential for public recreational use (as discussed in acquisition criteria).
6. Areas already in public ownership.
7. The boundaries of lands acquired or to be acquired as State Parks and recreational areas as described in Section 8a, Chapter 558, Oregon Laws, 1973.
8. Practical considerations related to land ownership, access, political boundaries, and existing physical or manmade features.

9. Those areas not satisfying any of the above criteria in which the minimum boundary of 150 feet from the ordinary low water would not extend far enough from the river to ensure adequate scenic protection: or those areas in which future development or change in land use might be detrimental to greenway values in the Greenway Goal.

Based on this criteria, a Greenway Boundary (as depicted on Map VII) was established. This boundary generally encompasses the State-owned land along the Willamette River, the major portion of the Rivergreens Golf Course (that area within the 100-year flood plain), all of the Jensen Property abutting the Willamette River, and generally that area South of Clackamas Boulevard extending to the Park Place Bridge. The City of Oregon City has adopted a Greenway Boundary which encompasses only that area within 150 feet of the ordinary low water line of the Willamette River.

Exclusive of the Willamette River Greenway Program, the City of Gladstone has not established policies to maintain and enhance the scenic values of its two rivers, the Clackamas and Willamette.

HISTORIC SITES

"Pow-Wow" Tree

This historic maple tree on Clackamas Blvd. is a living connection with the past. It is the site of Indian councils and marks the entrance to the First Oregon State Fair in 1861. Indian tribes, mainly Clackamas and Multnomahs, met at this site to make trading agreements, settle community affairs, and conduct wedding ceremonies.

Chautauqua Park

This site was part of the Fendal Cason's 640 acre land claim which they received in mid 19th Century. The first school serving Gladstone, Park Place and the Clackamas area was built on part of this site in 1871. In 1894, the park was leased from Harvey Cross, who had purchased the 640 acre land claim from the Casons in 1883, by the Willamette Valley Chautauqua Association for its annual summer assemblies. The Association built two auditoriums, one in 1895 and the other in 1917. The first seated 3,000, the second seated more than twice as many. Because of Chautauqua, Gladstone became a cultural and social center. Chautauqua drew people from Portland and other towns and communities for concerts, ball games, sermons and other activities. The First Clackamas County Fair was held at Chautauqua in 1907. The Gladstone Chautauqua Park was the third largest permanent Chautauqua Park in the United States. The park was closed in 1927. The Seventh-Day Adventists purchased it two years later upon the death of Judge Cross, and they still own it.

Park Place Bridge

This bridge at "Hi-Rocks" was built by the first white settlers. The first bridge was built in 1852, soon after the arrival of the Casons and Rinearsons, but it was washed out by the waters of the 1856 flood. The bridge was rebuilt in 1860 and purchased a year later by Ad Cason. Ad's gunshop at the north end of the bridge served as a coach stop for stages traveling between Portland and Oregon City.

Railroad Bridges

The first railroad bridge was built in 1869 by Ben Holliday. The old piers still stand. Holliday hired 600 Chinese workers to build the bridge over the Clackamas River at what is now "Hi-Rocks." The first electric line from Portland to Oregon City was completed in 1893. Judge Cross donated 10,800 ties of timber for the electric streetcar bridge and he and other residents made other contributions to assist in the construction of the line.

Cason-Cross House

This house situated at 82nd Drive and Arlington Street serves as a monument to two families. Adoniram Cason built the house and lived in it until his death in 1882, at which time it was purchased by Harvey Cross. With only a few minor changes to the interior, the house still stands as originally constructed and in a remarkable state of preservation.

Rinearson House

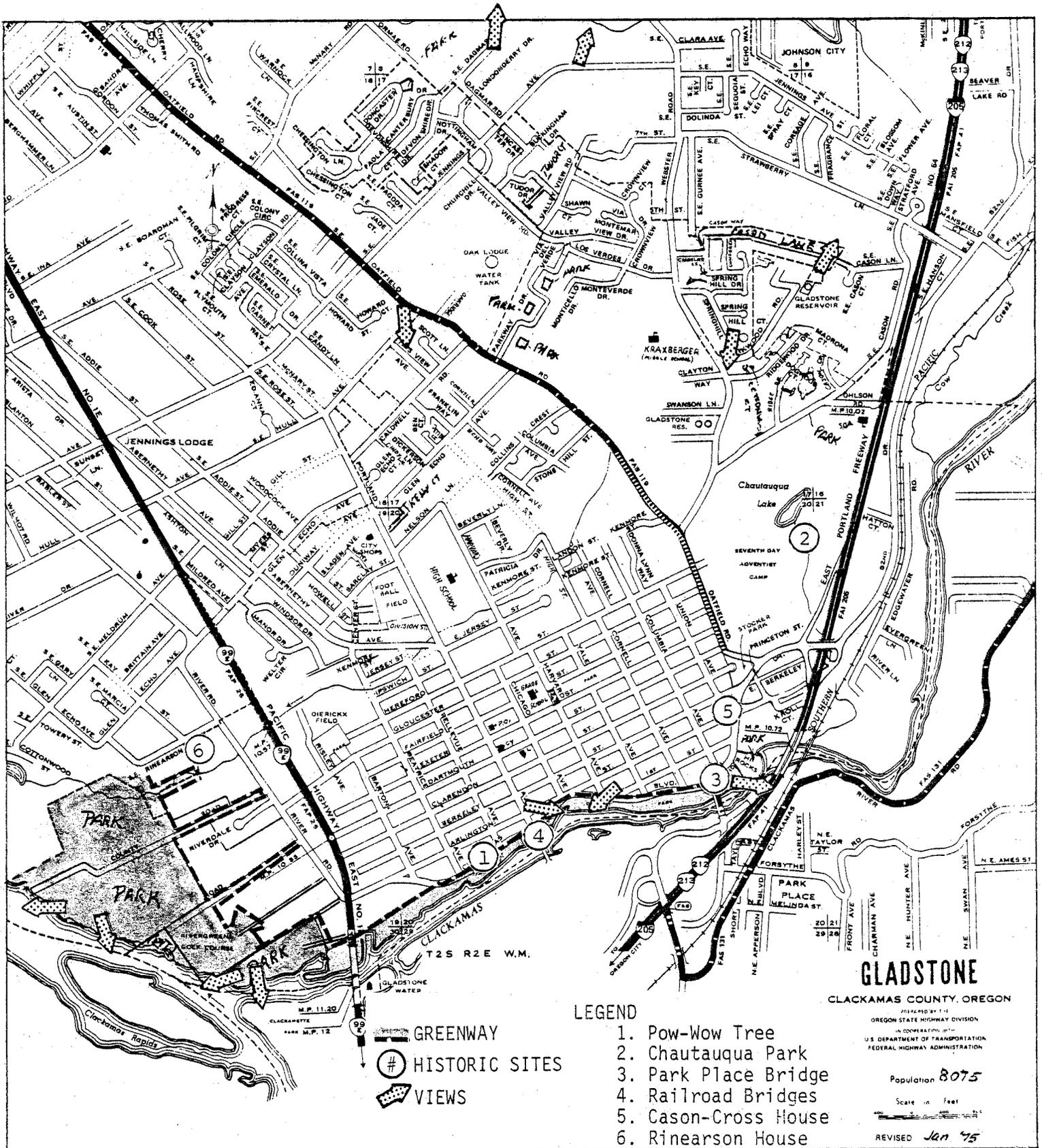
Built in 1856 by Peter M. Rinearson, this house had 21 rooms and was built for two families. But Jacob, Peter's brother, never married so Peter and his family lived there until their death. The interior of the Rinearson house has been modernized, but the exterior remains the same as in 1856.

SCENIC VIEWS AND SETTINGS

Gladstone's attractive position at the confluence of the Clackamas and Willamette Rivers affords it a unique scenic advantage. The two rivers and topographical variations in the landscape provide views and clearings at many points. The level and gently rolling terrain offers ready homesites, while the hills give the community an identity which lends variety and interest to the local scene.

Views and settings are important and worthy of preservation. Vantage points and landmarks such as rivers and hills provide a sense of scale, of form and order, in a world where change is constant. These visual aspects of the environment provide a heightened awareness and sense of place in nature. Visitors are usually struck by the visual characteristics of an area. Images of color, height and texture, contribute to the "character" of a city. Visual quality is influenced primarily by the "fit" and harmony of development with the natural landscape.

The City of Gladstone has many scenic areas and vantage points in addition to historic sites. An appreciation of the beauty of Gladstone's natural setting is as important as the appreciation of its historic past. Map VIII shows scenic as well as historic sites and the Willamette Greenway in Gladstone.



MAP VIII
 WILLAMETTE RIVER GREENWAY
 HISTORIC AND SCENIC SITES

F I N D I N G S

The preceding analysis has identified a number of problems, deficiencies and potentials to be addressed by the Gladstone policy plan. These are summarized below.

1. The most common air pollutant in the Gladstone area is carbon monoxide, 86% of which is produced by motor vehicles. Highway 99E presently violates the state and federal eight-hour carbon monoxide standards. I-205 and other major traffic corridors are projected to violate these standards by 1990.
2. Excessive sound levels for residential development are experienced along Highway 99E and I-205.
3. The Willamette River still has some water pollution problems, but there has been significant improvement in the quality of its water. The Clackamas River has no serious water pollution problems, but projected population increases are likely to increase demand on its waters.
4. Sewer overflows from Oregon City, West Linn and Gladstone continue to be part of the remaining water pollution problems in the Willamette. Sewer treatment plants in the tri-city area are operating with overcapacities.
5. As a comprehensive solution to the waste water treatment problem in the tri-city area, a regional treatment plant has been proposed to serve the three cities of Gladstone, Oregon City and West Linn.
6. Nonpoint sources of waste may contribute somewhat to present pollution problems and are potentially serious, but the extent of their pollution effects has not been documented.
7. The principal water hazard in Gladstone is flooding by the Clackamas and Willamette Rivers. The 100-year flood in Gladstone is relatively undeveloped except for a few residences and farms along the Clackamas River. Much more development exists in the 500-year flood plain, and such a flood would cause extensive and serious damage. Gladstone has adopted regulatory measures to guide new development in the 100-year flood plain, which were approved by the Federal Insurance Administration.
8. The Willamette River is a migration route for summer and winter steelhead, spring and fall chinook salmon, coho salmon and sturgeon. Cutthroat trout move from the Willamette River into the small tributaries each fall and winter to spawn. The beaches at the mouth of the Clackamas River are extremely popular bank fishing areas for salmon and steelhead anglers. This is a major fishing area.
9. Preservation of gravel bars, back waters, islands, riparian vegetation and sloughs is essential if wildlife is to thrive. Meldrum Bar has excellent potential for wintering fowl and wood duck nesting and has fair beaver habitat. However, it has too much cover, particularly blackberries which have crowded out other vegetation.

10. The marshy area west of Portland Avenue between Glen Echo and Hull Avenues supports a variety of wildlife species and provides passive recreational opportunities such as bird watching.
11. Possible geologic hazards caused by earthquakes in Gladstone include areas subject to strong ground shaking, areas of ground displacement and areas subject to landsliding.
12. The Seventh-Day Adventist Campground site has a future aggregate rock potential of 640,000 cubic yards.
13. Gladstone has taken effective steps to conserve open space along most of its riverbanks, but not within the city's interior.
14. As part of the State's Willamette River Greenway Program, the city must refine the existing Greenway Boundary and identify permitted uses and acquisition areas within the Greenway.
15. Gladstone has a number of valuable historic structures and sites as well as scenic views and settings.

STATE AND REGIONAL GOALS

The Gladstone policy plan must also address the goals of the Oregon Land Conservation and Development Commission (LCDC), and the Columbia Region Association of Governments (CRAG).

LCDC GOALS

Goal #5 Open Spaces, Scenic and Historic Areas, and Natural Resources

"To conserve open space and protect natural and scenic resources.

"Programs shall be provided that will: (1) insure open space, (2) protect scenic and historic areas and natural resources for future generations, and (3) promote healthy and visually attractive environments in harmony with the natural landscape character. The location, quality and quantity of the following resources shall be inventoried:

- a. Land needed or desirable for open space;
- b. Mineral and aggregate resources;
- c. Energy sources;
- d. Fish and wildlife areas and habitats;
- e. Ecologically and scientifically significant natural areas, including desert areas;
- f. Outstanding scenic views and sites;
- g. Water areas, wetlands, watersheds and groundwater resources;
- h. Wilderness areas;
- i. Historic areas, sites, structures and objects;
- j. Cultural areas;
- k. Potential and approved Oregon recreation trails;
- l. Potential and approved federal wild and scenic waterways and state scenic waterways.

Where no conflicting uses for such resources have been identified, such resources shall be managed so as to preserve their original character. Where conflicting uses have been identified the economic, social, environmental and energy consequences of the conflicting uses shall be determined and programs developed to achieve the goal.

"Open Space:

- a. Conserve and enhance natural or scenic resources;
- b. Protect air or streams or water supply;
- c. Promote conservation of soils, wetlands, beaches or tidal marshes;
- d. Conserve landscaped areas, such as public or private golf courses, that reduce air pollution and enhance the value of abutting or neighboring property;
- e. Enhance the value to the public of abutting or neighboring parks, forests, wildlife preserves, nature reservations or sanctuaries or other open space;
- f. Promote orderly urban development."

Goal #6 Air, Water and Land Resources Quality

"To maintain and improve the quality of the air, water and land resources of the state.

"All waste and process discharges from future development, when combined with such discharges from existing developments shall not threaten to violate, or violate applicable state or federal environmental quality statutes, rules and standards. With respect to the air, water and land resources of the applicable air sheds and river basins described or included in state environmental quality statutes, rules, standards and implementation plan, such discharges shall not (1) exceed the carrying capacity of such resources, considering long range needs; (2) degrade such resources; or (3) threaten the availability of such resources."

Goal #7 Areas Subject to Natural Disasters and Hazards

"To protect life and property from natural disasters and hazards.

"Developments subject to damage or that could result in loss of life shall not be planned nor located in known areas of natural disasters and hazards without appropriate safeguards. Plans shall be based on an inventory of known areas of natural disaster and hazard."

Goal #15 Willamette River Greenway

"To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette River Greenway.

- "1. The qualities of the Willamette River Greenway shall be protected, conserved, enhanced and maintained consistent with the lawful uses present on December 6, 1975. Intensification of uses, changes in use or developments may be permitted after this date only when they are consistent with

the Willamette Greenway Statute, this goal, the interim goals in ORD 215.515(1) and the statewide planning goals, as the case may be, and when such changes have been approved as provided in the Preliminary Greenway Plan or similar provisions in the completed plan as appropriate.

- "2. The Willamette Greenway Program shall be composed of cooperative local and state government plans for the protection, conservation, enhancement and maintenance of the Greenway, and of implementation measures including management through ordinances, rules, regulations, permits, grants as well as acquisition and development of property, etc. It shall also become a part of all other local and state plans and programs within and near the Greenway.
- "3. The Greenway Program shall include:
 - a. Boundaries within which special Greenway considerations shall be taken into account;
 - b. Management of uses on lands within and near the Greenway to maintain the qualities of the Greenway;
 - c. Acquisition of lands or interests in lands from a donor or willing seller or as otherwise provided by law in areas where the public's need can be met by public ownership."

CRAG GOALS AND OBJECTIVES

GOALS

To provide "sufficient land for the recreation needs of the region's residents and visitors."

To "preserve or conserve mineral and aggregate resources."

To "preserve or conserve open space, natural, fragile, historic and scenic areas."

To "maintain and improve the quality of air, water and land resources."

To "protect life and property from natural disasters and hazards."

OBJECTIVES

Objective III. Air, Water and Land Resources Quality

Substantive Objectives

- a. "Maintain Quality. The quality of air, water and land resources in the region shall be improved or maintained at applicable federal, state and regional standards to protect natural resource values and other beneficial uses.
- b. "Future Discharges. Direct or indirect air contaminate discharges, discharges from future emissions sources and all waste and process discharges from future development, when combined with such discharges from existing development, shall not threaten to violate or violate applicable regional, state or federal environmental quality statutes, rules or standards."

Procedural Objectives

"Plan Integration. Effective procedures and provisions shall be developed and utilized which will assure that (1) air, water and land resources quality planning will be an integral part of the land planning process, and (2) the components of air, water and land resources quality plans will be integrated."

Objective X. Recreation, Open Space and Historic Areas

Substantive Objectives

- a. "Support of Development. Planning shall promote the designation of regionally significant (1) lands for parks and recreation; (2) open spaces, scenic and natural areas; and (3) historic resources, considering public purpose and needs.
- b. "Land Use Classifications. Planning shall promote the provision of regional facilities for the variety of needs and resources that exist in Urban, Rural and Natural Resource land use classifications, with an emphasis on multiple land use facilities.
- c. "Unique Natural Features. The regional recreation and open space plan shall be based on the unique pattern of natural areas that exist throughout the region, especially rivers, shorelines and fragile areas.
- d. "Regional Facilities. A system of regional facilities shall be encouraged which accommodates participatory sports and activities, spectator events, the performing arts and cultural interests.
- e. "Cultural and Historic Areas. Preservation and restoration for public enjoyment and education of structures, objects, facilities and resources which are examples of the region's history, architecture, archaeology and natural science shall be promoted in Urban, Rural and Natural Resource Areas.
- f. "Linear Corridors. A system of linear corridors that provide safe, accessible and enjoyable recreation travel routes shall be encouraged."

Procedural Objectives

- a. "User Needs. Regional public recreation and open space needs and characteristics shall be identified and evaluated.
- b. "Inventory of Recreation, Open Space and Historic Areas. The regional agency shall actively pursue the cooperation of local planning agencies in identifying and inventorying:
 - . historic areas, sites and structures
 - . cultural areas
 - . potential and approved Oregon recreation trails
 - . potential and approved wild and scenic waterways and greenways
 - . lands needed or desirable for open space
 - . wilderness areas
 - . fish and wildlife areas and habitats
- c. "Rural Activities. Recreation activities generally incompatible with the densities of Urban Areas or the conservation or preservation requirements of Natural Resource Areas shall be identified.
- d. "Natural Resource Activities. Recreation activities compatible with the conservation or preservation requirements of Natural Resource Areas shall be identified.
- e. "Regional Parks and Facilities. Regional parks and facilities shall be identified and inventoried."

Disclaimer

There are no energy sources, ecologically and scientifically significant natural areas, wilderness areas, cultural areas, potential or approved Oregon recreation trails, potential or approved federal wild or scientific waterways or state scenic waterways in Gladstone other than those described in this report.

E N E R G Y

ACKNOWLEDGEMENTS

This report has relied heavily on the Portland Energy Conservation Project, an eleven volume study concluded in 1977 by the City of Portland. The Portland Energy Conservation Project, referred to in this report as such or as PECP, has proven to be extremely useful. It is perhaps the most comprehensive energy conservation study done anywhere. Its usefulness to a city like Gladstone has been enhanced by the fact that it did include the whole Portland Metropolitan Area in its scope.

Other energy conservation studies relied upon in this report are listed below along with the PECP in order of their usefulness to the development of an energy element for the City of Gladstone.

1. Skidmore, Owings and Merrill, Portland Energy Conservation Project, Vol. 3 and 3A-E (Portland Bureau of Planning, 1977).
2. Weinstein & Associates, Energy and Metro-Area Housing (prepared for the Lane Council of Governments, December, 1977).
3. Mackie, Marsha and Bill, Relationships of Energy and Land Use (McMinnville, Yamhill County Energy Office, 1977).
4. Oregon Office of Energy Research and Planning, Transition - A Report to the Oregon Energy Council (Salem, 1974).
5. Weinstein & Associates, Crag Region Energy Analysis, Reports 1-4 (Portland, CRAG, 1977).
6. California Innovation Group, Urban Energy Management Study (Anaheim, Calif., 1977).
7. Massachusetts Department of Community Affairs, Assistance in Local Government Energy Conservation in Massachusetts (Massachusetts, 1977).

Portland General Electric and Northwest Natural Gas Company have also provided valuable information on energy use in Gladstone. The assistance of Doug Boleyn and Dale Horton, both of PGE, is especially appreciated. Doug is Energy Management Consultant, Portland office, and Dale is Manager of the Division of Energy and Field Services, Oregon City office.

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I N T R O D U C T I O N

The United States relies on oil and natural gas for 75% of its energy use. Recent energy studies indicate that proven oil reserves in the world could be depleted by 1990 if lower consumption is not achieved. Moreover, if energy consumption continues at present rates, yearly average electricity use could increase by almost 200% by the year 2000. Sufficient generating capacity to meet this demand is, by all means, not certain. In the Northwest, the Bonneville Power Administration will not be able to guarantee the availability of sufficient power from its hydro system to meet all firm energy needs after 1983. Increased energy demand could exceed assured supply unless a strong local commitment to energy conservation and energy source diversification is made. At the same time, energy costs to the area's users could escalate very rapidly. Furthermore, if energy demand continues to rapidly increase, there is no guarantee that there will be sufficient capacity to meet that demand at any cost.

Until the early 1960's, fuel oil was the dominant energy source for the area's users. Since then, the use of natural gas has increased steadily until the early 1970's, when electricity became the dominant energy source. Over 93% of the homes built since 1973 use electricity for all household tasks. Fuel oil involves many distributors. Costs of fuel oil are expected to increase from 42¢ per gallon in 1976 to 58¢ per gallon by the end of the century. There are no proven reserves of natural gas in the Pacific Northwest. The distributor is Northwest Natural Gas Company, which purchases it from Northwest Pipeline Corporation, which obtains it from several sources in the U. S. and from B. C. and Alberta, Canada. The cost of natural gas is expected to rise to 40¢ per therm by the year 2005 from 29.2¢ per therm in 1976. The principal electricity wholesaler in the Pacific Northwest is the federal government. The Bonneville Power Administration markets the electricity produced by the hydro-electric projects built by the U. S. Corps of Engineers and the Bureau of Reclamation.

Electricity demand in the Pacific Northwest began to exceed economically and environmentally acceptable sources of hydro-power by the early 1960's. In response to this situation, the Joint Power Planning Council, which includes BPA and the region's utilities, formulated the Hydro-thermal Power Program. The electric energy delivery system, according to this program, would first evolve from predominant reliance on hydro to a combination of thermal and hydro-generating facilities. The second phase would involve increased reliance on thermal plants in assuming a larger portion of energy requirements. However, environmental opposition and the fragmented structure of publicly-owned utilities, as well as the lack of sufficient capital to build thermal plants, have stalled action on the provisions of the latter phase of

the Hydro-thermal Power Program.

The assumption was a decade ago that a nuclear plant could be completed in about six years after authorization. It now takes about ten to twelve years to complete. Moreover, plants now in operation have been found to operate at capacities below those anticipated. For a plant to provide 1100 megawatts of actual generating capacity, 1530 megawatts must be installed. Generating for peaking purposes has been accomplished through the use of fossil fuels. Oil prices, however, have risen over 400% and those of natural gas 300% since 1973. As a result, the cost of this peaking power is extremely high. This is in addition to the fact that a steady supply of these fuels is not certain.

The need for restructuring the power generation and supply system in this region became apparent as a result of the increasing disparity in electricity rates between publicly-owned and investor-owned utilities. When private utilities lost access to cheap hydropower in 1973, they had to fill the gap with thermally-generated electric power, which is much more costly. Private utilities have had to charge about 10-20% more than public utilities for the same amount of electricity.

In 1973, almost half of all energy used in Oregon was consumed by households. Of all energy used by households, 87% is for space heating and automobile operation, which is one third of all direct energy* used in Oregon (see Oregon Office of Energy Research and Planning, Transition, Salem, 1974, pp. 92-94). On the average, the consumption of one unit of direct energy involves the consumption of one unit of indirect energy. For example, it is assumed that, for every gallon of gasoline a car burns, an equivalent amount of energy was required to make the car in the first place. Indirect energy is represented in construction materials, in maintenance and support equipment, in foods and other goods and services.

The need to conserve energy has prompted a number of responses on the national, state and regional levels. The National Energy Plan includes an "immediate objective," a "medium-term objective" and a "long-term objective." These objectives are: 1) "to reduce dependence on foreign oil and vulnerability to supply interruptions," 2) "to keep U. S. imports sufficiently low to weather the period when world oil production approaches its capacity limitation," and 3) "to have renewable and essentially inexhaustible sources of energy for sustained economic growth."

The energy conservation goal of the Oregon Land Conservation and Development Commission (LCDC) requires local jurisdictions "To conserve energy-----Land and uses developed on land shall be managed and controlled so as to maximize the conservation of all forms of energy." The transportation goal of LCDC requires that a transportation plan shall "minimize adverse social, economic and environmental impacts and costs" and shall "conserve energy."

"The conservation of energy," according to the Columbia Region Association of Governments (CRAG) Goals and Objectives, "shall be maximized in the development and re-development of the land and uses on the land," and the "development of energy-consuming activities shall minimize the use of non-renewable sources and encourage the use of energy from renewable energy sources."

*Direct energy is a form of energy source that is directly used by the consumer such as fuel oil, gasoline or electricity. Indirect energy is contained in all goods and services used, which is the sum of the direct energies used to produce those goods and services.

The potential for energy conservation is tremendous. It has been estimated that Americans in 1975 wasted more energy than was used by 2/3 of the world's population. Conservation, therefore, could significantly reduce the rate of consumption of non-renewable sources of energy and save millions of dollars. "Conservation and fuel efficiency are the cornerstone" of the National Energy Plan. According to this plan, "Conservation is cheaper than production of new supplies, and is the most effective means for protection of the environment." Damage to the environment can result in very high energy costs in the form of costly correction measures. For example, in land development, excessive environmental manipulation can be avoided by working with the natural landscape.

The importance of energy conservation cannot be overemphasized. Conservation would reduce the possibility of shortages in energy supply and the rate of future energy price increases. It would strengthen the economy and prevent the loss of jobs. It would help protect the environment and individual choice. It would reduce government expenditures on energy and protect low-income groups from energy price increases. At the same time, it would require only minor lifestyle changes. Conservation buys time in which to develop new energy sources. Programs such as home weatherization would produce immediate local benefits due to reduced energy expenditures by the homeowner or renter and the creation of new jobs. It has been estimated that electric energy made available through conservation is six times cheaper than energy provided by new thermal power plants.

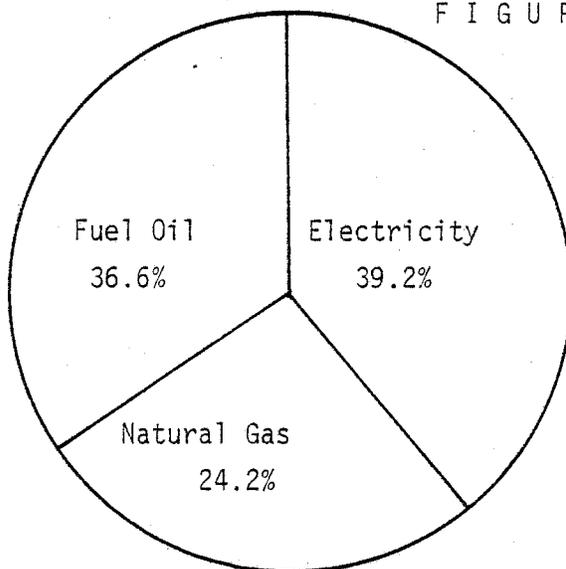
INVENTORY AND ANALYSIS

RESIDENTIAL SECTOR

RESIDENTIAL ENERGY USE

The residential sector in the Portland Metropolitan Area depends primarily on three sources of end-use energy: electricity, fuel oil and natural gas. The use of electricity by the residential sector has been increasing rapidly in recent years. In 1975, nearly 40% of the energy used by the residential sector in the Portland Metropolitan Area was electricity (see Figure I below).

FIGURE I



Sources of Residential End-Use Energy, Portland SMSA, 1975

SOURCE: Portland Energy Conservation Project, 1977.

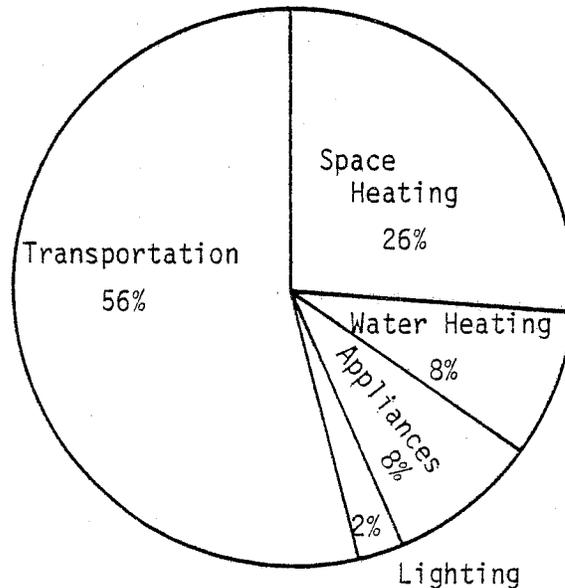
According to PGE, 24% of single family homes and 78% of multi-family residences in Gladstone use electricity for space heating. 832 (25.5%) housing units in Gladstone use natural gas for space heating, according to Northwest Natural Gas Company. The majority of the rest presumably use oil.

The great majority of dwelling units in Gladstone and the Portland Metropolitan Area are one-story single family homes. Some of these homes are a hundred years old or older; some are not so old and some are brand new. Because of the great range in age, design and quality of construction of these homes, their energy use efficiency varies greatly. While the more recent units can be very energy-efficient, the older units are extremely wasteful of energy. Multi-story dwelling units such as split-entry and daylight basement units, which are recent in age, are generally more energy efficient because of higher building standards and better insulation, and because part of the structure is below grade. "The key to energy efficiency," according to the Portland Energy Conservation Project, "lies in the ratio of outside exposed wall to floor area." Split-level residences are also fairly energy efficient because they are comparatively new (the oldest being 25 to 30 years) and because of high quality construction and good insulation. Multi-family units (two units or more) can possess a high degree of energy efficiency because of less wall exposure and less glass areas.

Figure II below shows energy use in a typical single family household in the Portland Metropolitan Area. The family's auto uses 56% of the energy used by a typical single family household; 26% is used for space heating; 16% is used for water heating and appliances; and only 2% is used for lighting.

FIGURE I I

ENERGY USE IN A TYPICAL SINGLE FAMILY HOUSEHOLD



SOURCE: Portland Energy Conservation Project, 1977.

Space Heating

The size of a house, how well it is insulated and the temperature setting of the thermostat are the primary determinants of the amount of energy used for space heating. Most dwellings constructed prior to 1950 have 2" (R-6) of ceiling insulation. Dwellings built between 1950 and 1974 have an average of 4" (R-11) of ceiling insulation. Increasing ceiling insulation should be a simple task since most dwellings have a rather roomy attic. The Revised Oregon Building Code requires R-19 in ceiling or attic insulation at the present, but R-30 after January 1, 1979.

Floor insulation in houses built prior to 1975 is between 0" and 2". The Revised State of Oregon Building Code requires R-9 at the present, but 6" of floor insulation or R-19 after January 1, 1979. An energy conservation study by the Bonneville Power Administration recommends 6" of floor insulation or R-19 for unheated basements and crawl spaces.

Wall insulation in dwellings built before 1950 is practically non-existent. The loose-fill insulation used in them has over the years settled to the bottom of the walls. Many homes built between 1950 and 1975 have 2" to 3" of fixed insulation which prevents the addition of further insulation. The Revised Oregon Building Code requires an R-11 wall.

Double glazed or storm windows are now required by the Revised Oregon Building Code in all areas of the state. The Building Code also requires sealing or weatherstripping all windows and exterior doors. Storm doors may not be a good investment because of their relatively high cost in relationship to the energy savings they

effect. Window shutters, drapes or roller shades, all add energy savings.

Heating ducts can be the cause of much heat loss when exposed. Most apartments are designed with all ducts within heated spaces. Where ducts are exposed to unheated spaces, such as in single family homes, R-6 insulation is needed.

Heating efficiency also requires annual cleaning of filters and adjustment of burners on fuel oil and natural gas furnaces. Additional savings are realized by resetting the thermostat at night. Automatic and semi-automatic devices that lower room temperatures at a specific hour and restore it at a later hour are available at reasonable costs.

In heating a typical existing or new house in the Portland Metropolitan Area, electricity and fuel oil require roughly the same BTU's; gas requires slightly fewer BTU's. Gas heaters have been found to be the most efficient space heaters. The end-use efficiency of electric heaters is high, but much energy is lost in burning fuel at the power plant and in the transmission of electric power to residences. Of the fuel oil used for space heating, 60% is wasted and only 40% is used as heat.

Water Heating

Approximately 8% of the energy used in a typical residence is for water heating. The amount of energy used for water heating is directly related to the size of the household and the hot water consumption habits of each householder. The average household uses about 50 gallons of hot water per day, 40% of which is for showers and baths and 29% for clothes washing. Dishwashing uses 12%* and the remaining 10% is used by the kitchen sink and wash basin/s. Table I below shows the average annual energy required for water heating in a typical single family home or apartment.

T A B L E I
AVERAGE ANNUAL ENERGY REQUIRED FOR WATER HEATING

Fuel Type	Typical Single Family 1300 sq. ft. home using 60 gallons per day		Typical Apartment 700 sq. ft. apt. using 40 gallons per day	
	Amount	Million BTU's	Amount	Million BTU's
Electricity	5,000 KWH	17.1	3,500 KWH	11.9
Natural	300 Therms	30.0	240 Therms	24.0
Oil	184 Gallons	35.6	129 Gallons	17.9

SOURCE: Portland Energy Conservation Project, 1977.

*Dishwashing by hand or by machine uses approximately the same amount of water. However, water temperatures used for dishwashers (150°) are much higher than temperatures used when hand washing dishes (110°).

The following table shows the type and percentage of energy used for water heating in single family homes and apartments in the Portland Metropolitan Area.

T A B L E I I

TYPE OF ENERGY USED FOR WATER HEATING
PORTLAND METROPOLITAN AREA

Energy Type	Single Family	Apartment	Total
Existing Structures (pre 1975)			
Electricity	72%	88%	75%
Natural Gas	19%	10%	17%
Oil and Other	9%	2%	8%
New Structures (after 1975)			
Electricity	91%	98%	94%
Natural Gas	9%	2%	6%

SOURCE: Portland Energy Conservation Project, 1977.

Most water heaters have 1" to 1½" of insulation around the tank. A heater of this type loses about 21% of the energy input to it through the tank wall and insulation. This "standby loss" can be greatly reduced by wrapping the tank with an insulation jacket and placing it in heated space. The Oregon Revised Building Code requires R-11 insulation of water heaters and placing them in heated space.

Since most hot water heaters are set at high temperatures ranging from 140° to 160° F., it has been estimated that these high temperature settings use about 20% more energy than is necessary. Lowering the temperature can be done easily by the homeowner or occupant at no cost. Pilot lights on natural gas water heaters waste a lot of energy. Installation of pilotless or electric ignitors on such heaters saves most of the energy wasted.

Showering and bathing use nearly half the energy required to heat water for a typical household. Considerable savings can be realized by restricting the flow of hot water through the shower head without affecting quality or comfort. Shower head and sink throttling devices are readily available and can be easily installed by the user. These devices can reduce total water flow from the normal 6-8 gallons per minute to 3 gallons per minute.

Appliances

Household appliances include such high-consumption items as refrigerators, ranges and clothes dryers, as well as very low-consumption items such as electric clocks, sewing machines and food blenders. The table below lists the types of appliances found in most of the area's homes and shows annual appliance energy use by a typical home or apartment. According to this table, appliance usage is less in apartments than in single family homes. The lower usage in apartments is due to a smaller household.

T A B L E I I I

ANNUAL ENERGY USED FOR TYPICAL APPLIANCES - SMSA AND PORTLAND

Appliance Type	Single Family		Apartment	
	kwh/yr.	Million Btu/yr.	kwh/yr.	Million Btu/yr.
Refrigerator (frost free)	1,600	5.46	1,400	4.78
Range (electric)	1,200	4.10	1,100	3.75
Dishwasher	300	1.02	—	(New apts. only)
Clothes Washer	100	0.34	—	—
Clothes Dryer	1,000	3.41	—	—
Color TV	500	1.71	450	1.54
Other Miscellaneous	700	2.39	500	1.71
Clock	(12)		(12)	
Coffee Maker	(144)		(110)	
Food Blender	(12)		(5)	
Hair Dryer	(24)		(20)	
Iron	(156)		(110)	
Radio	(84)		(60)	
Toaster	(20)		(15)	
Vacuum Cleaner	(72)		(45)	
Sewing Machine	(12)		(8)	
Other	(164)		(115)	
Total	5,400	18.43	3,450	11.78

SOURCE: Portland Energy Conservation Project, 1977.

With the exception of a few gas ranges and clothes dryers, almost all appliances in the Portland Metropolitan Area use electricity (see Table IV).

T A B L E I V

TYPE OF FUEL USED FOR HOUSEHOLD APPLIANCES - SMSA AND PORTLAND

Fuel Type	Ranges	Clothes Dryers	All Other Appliances
Electricity	85%	98%	100%
Natural Gas	15%	2%	0%
Total	100%	100%	100%

Taken from Portland Energy Conservation Project, 1977.

For cooking, a typical single family household uses approximately 4.1 million BTU's using an electric range. Using a gas-fired range, the same household would use approximately 11.4 million BTU's per year for cooking.* Approximately 6 million BTU's per year are consumed by the pilot light that burns continuously in gas stoves.

Lighting

On the average, single family homes use more energy for lighting than do apartments. It is estimated that a typical single family home uses about 3.07 million BTU's per year for lighting (900KWH). The typical apartment uses approximately 2.39 million BTU's because of fewer people per household and a smaller area to light. Total lighting accounts for only 2% of the typical household's energy use. (Source: Portland Energy Conservation Project, 1977.)

SELECTED CONSERVATION MEASURES

The energy conservation measures described below, which would effect energy savings in significant amounts, do not require major changes in comfort or health standards. The equipment and techniques recommended have been tested, are widely available, and their costs are within the personal economies of the city's householders.

Existing** Homes and Multi-Family Units

Residences built through 1975 have little or no insulation. Therefore, the bulk of energy savings would result from weatherization programs. Table V below gives the estimated costs of a number of selected conservation actions and potential energy savings. The Portland Energy Conservation Project evaluated these conserving actions by applying them to an average household living in a typical 1,300 square foot existing home. Cost estimates assume that all conserving actions would be done by a contractor; costs would be much less if the homeowner does the work.

T A B L E V

ESTIMATED COSTS AND SAVINGS OF SELECTED CONSERVATION MEASURES
TYPICAL 1,300 SQ. FT. EXISTING HOME
1977 COSTS

Conservation Measures	Estimated Costs Per Unit	Estimated Energy Savings (Million BTU's per Year)	Estimated Dollar Savings Per Year
Weatherizing doors and windows	\$ 100	7.23	\$ 29.79
Insulating ceilings from R-9 to R-38	500	12.05	49.65
Insulating floors from R-5 to R-19	200	19.28	79.43
Insulating walls to R-19	600	18.08	74.49
Installing glass storm windows	850	13.26	54.63
Insulating ducts in unheated spaces to R-11	35	2.53	10.42
Installing automatic thermostat setback	85	5.29	21.79
Insulating hot water heater to R-11	20	1.83	7.54
Installing shower head flow restrictor	5	3.05	12.57
Lowering water temperature	0	3.08	12.69
Totals	\$2395	85.68	\$353.00

SOURCE: Portland Energy Conservation Project, 1977.

*Source: Northwest Natural Gas Company estimates for typical dwellings. Cited in the Portland Energy Conservation Project.

**Built through 1975.

Existing multi-family housing units, like existing single family homes, do not have adequate insulation. However, by sharing common walls with other apartments, as well as other features, make them less wasteful of energy. Table VI below shows the possible savings which can be realized as a result of the conservation actions selected.

T A B L E V I

ESTIMATED COSTS AND SAVINGS OF SELECTED WEATHERIZATION MEASURES
TYPICAL 700 SQ. FT. EXISTING MULTI-FAMILY UNIT
1977 COSTS

Conservation Measures	Estimated Costs Per Unit	Estimated Energy Savings (Million BTU's per Year)	Estimated Dollar Savings Per Year
Weatherstripping doors and windows	\$ 75	2.58	\$ 15.33
Insulating ceilings from R-6 to R-38	240	3.23	19.19
Insulating floors from R-3 to R-19	155	5.17	30.71
Insulating walls to R-19*	360	8.08	48.00
Installing glass storm windows	325	3.55	21.09
Insulating ducts to R-11	35	0.74	4.40
Installing automatic thermostat setback	85	1.55	9.21
Insulating hot water heater to R-11	20	1.18	7.01
Installing shower head flow restrictor	5	1.98	11.76
Lowering water temperature	0	2.01	11.94
Totals	\$1300	30.07	\$ 178.64

SOURCE: Portland Energy Conservation Project, 1977.

New* Homes and Multi-Family Units

For homes built since 1975, the costs and savings of selected conserving actions are shown in Table VII below. Here the size of a typical home is 1,700 sq. ft. Again, cost estimates assume that the work would be done by a contractor.

*Recent research suggests that some homes built with heavy insulation over the last 15 years have experienced excessive moisture condensation in wall cavities, causing dry rot. Therefore, when R-19 wall insulation is installed in new homes, a continuous plastic vapor barrier should be used as a precaution. If research establishes that heavy wall insulation causes problems in existing homes, the problem can be resolved by painting the interior walls with a special paint that acts as a vapor barrier.

*Built since 1975.

T A B L E V I I

ESTIMATED COSTS AND SAVINGS OF WEATHERIZATION MEASURES
TYPICAL 1,700 SQ. FT. NEW HOME, 1977 COSTS

Conservation Measures	Estimated Costs Per Unit	Est. Energy Savings (Million BTU's/ Unit /Year)	Est. Dollar Savings/ Unit/Year
Weatherstripping doors and windows	\$ 50	4.47	\$ 26.55
Insulating ceilings from R-19 to R-38 ^a .	360	4.47	26.55
Insulating floors from R-9 to R-19	110	5.75	34.16
Insulating walls from R-11 to R-19 ^b .	140	4.47	26.55
Reducing double-glazed window area from 14% to 11%	0	3.20	19.01
Insulating ducts to R-11 ^c .	35	1.66	9.86
Installing automatic thermostat setback	85	3.47	20.61
Insulating hot water heater to R-11	20	1.65	9.80
Installing shower head flow restrictor ^d .	5	2.75	16.34
Lowering water temperature ^d .	0	2.78	16.51
Totals	\$1160	42.98	\$ 255.30

SOURCE: Portland Energy Conservation Project, 1977.

- a. Approved code requires R-30
- b. Approved code required R-11

- c. Approved code requires R-6
- d. Not required in approved code

The table below shows the costs and savings resulting from selected conservation measures as applied to multi-family units. The typical size of a new multi-family unit is assumed to be the same as an existing one.

T A B L E V I I I

ESTIMATED COSTS AND SAVINGS OF WEATHERIZATION MEASURES
TYPICAL 700 SQ. FT. NEW MULTI-FAMILY UNIT
1977 COSTS

Conservation Measures	Estimated Costs Per Unit	Estimated Energy Savings (Million BTU's per Year)	Estimated Dollar Savings Per Year
Weatherizing doors and windows	\$ 50	1.66	\$ 9.86
Insulating ceilings from R-19 to R-38	185	1.66	9.86
Insulating floors from R-9 to R-19	110	2.08	12.36
Insulating walls from R-11 to R-19	155	2.79	13.60
Installing double-glazed windows	180	2.70	16.04
Insulating ducts to R-11	25	0.63	3.74
Installing automatic thermostat setback	85	1.30	7.72
Insulating hot water heater to R-11	20	1.09	6.47
Installing shower head flow restrictor	5	1.82	10.81
Lowering water temperature	0	1.84	10.93
Totals	\$ 815	17.07	\$ 101.39

SOURCE: Portland Energy Conservation Project, 1977. F- 11

Savings in Gladstone

The following are estimates of energy and dollar savings which would be realized if all the conservation measures listed in the preceding four tables were instituted in all single and multi-family housing units existing in Gladstone prior to July 1, 1977. To expect that they will be, of course, quite unrealistic. Nevertheless, this exercise will help dramatize the potential savings if this were possible. Again, these estimates do not include mobile homes, of which Gladstone has about 250 units.

T A B L E I X

ESTIMATED SAVINGS IN GLADSTONE
SINGLE AND MULTI-FAMILY UNITS
1977 COSTS

Type of Housing Units	# Units	Million BTU's Per Unit Per Yr.	Million BTU's Per Year	Dollar Savings Per Year
Existing SF Units	2,237	85.68	191,666.16	\$789,664.58
Existing MF Units	572	30.07	17,200.04	102,168.24
New SF Units	194	42.98	8,338.12	49,528.43
New MF Units	16	17.07	273.12	1,622.33
Totals	3,019	(72.04 avg.)	217,477.44	\$942,983.58

SOURCE: City records and other sources cited earlier in this report.

OTHER CONSERVATION MEASURES

In addition to the conservation measures discussed above, there are a number of other actions which could effect further energy savings. These include (1) the maintenance of furnace efficiency, (2) the use of electrical ignitors in gas furnaces, (3) the use of foam night shutters, (4) heating houses selectively by zone, (5) building more two-story single family homes, (6) installing heat pumps, (7) using solar heating systems, (8) using wood stoves for space heating, (9) washing clothes in cold water, (10) washing only full loads in dish and clothes washers, (11) using electrical ignitors in gas water heaters, (12) using individual water heaters at spigots, (13) installing solar-assisted hot water heating systems, (14) using electrical ignitors in gas ranges, (15) reducing the use of household appliances, (16) Improving the energy efficiency of appliances, (17) substituting fluorescent lamps for incandescent bulbs, (18) replacing bulbs with lower wattages, and (19) turning off lights when not in use.

(1) The maintenance of furnace efficiency requires cleaning filters and adjusting burners in all forced air furnaces annually. Doing so regularly on an annual basis is estimated to effect energy savings of between 5 and 15% per year in space heating.

(2) The use of electrical ignitors rather than gas pilot lights in gas furnaces is estimated to save 7% in space heating. The pilot light alone uses about 9 million BTU's per year, 75% of which is wasted since a gas furnace is fired less than 25% of the time.

(3) The use of 2" foam night shutters on the insides of windows in existing homes saves approximately 15% in space heating. These shutters would, however, have to be opened and closed daily.

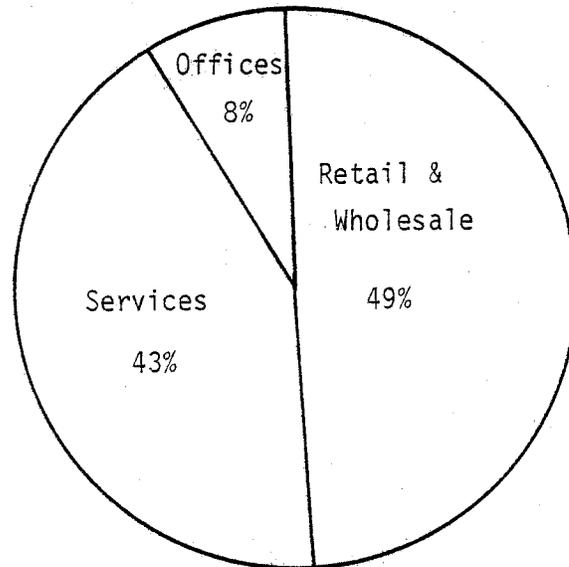
(4) Since bedrooms and utility areas account for approximately 35% of the heating load, heating a house selectively by zone can effect 10-20% reduction in space heating energy use. Reducing temperatures in bedrooms and utility areas is compatible by adjusting dampers, registers and baseboard heaters.

- (5) The savings resulting from reducing exposed floor and ceiling area by half are partially offset by increased square footage to accommodate stairways. Nonetheless, the savings realized amount to 15% in space heating.
- (6) Heat pumps have been found to reduce energy consumption for space heating by 50%. They are, therefore, the most important energy saving devices in use today for space heating. However, because ducts in existing buildings are undersized, installing heat pumps in these buildings involves high capital costs. The cost of installing a heat pump in existing homes is about \$3,500, \$2,500 in new homes. It is expected that the use of heat pumps in residences will increase as energy costs rise and as heat pump technology for small buildings improves.
- (7) Solar heating systems that are reasonably priced are not on the market yet. The option will become feasible when it becomes easy to buy a solar system as it is to buy a furnace today.
- (8) If air quality improves significantly in the Portland Metropolitan Area, the use of wood stoves could be encouraged. Their use would effect significant energy savings. At this time, however, their wide use would aggravate the air quality situation in the Portland Metropolitan Area.
- (9) Clothes washing uses approximately 29% of the energy used to heat water in a typical residence. Washing clothes in cold water would save at least 10% of the energy used for this purpose.
- (10) Washing only full loads in dish and clothes washers would further reduce the energy used for hot water. About 12% of the energy used to heat water is used for dishwashing and 29% for clothes washing.
- (11) The use of electrical ignitors instead of gas pilot lights in gas hot water heaters is estimated to result in saving 33% of the energy used to heat water.
- (12) Point of use water heaters are an alternative to insulating water tanks and lines. They are widely used in Europe and are estimated to save approximately 15% of energy used for heating water.
- (13) Estimates from St. Louis claim that a 30 sq. ft. collector and a 50 gallon storage tank provide about 46% of the hot water supply. The cost is about \$660. The frequent cloud cover in this area would, however, make a back-up water heater a must.
- (14) The use of electric ignitors in gas ranges is estimated to save 20% of energy used by household appliances. The typical annual use of a gas range results in 5 million BTU's used for the pilot light and 6.4 million BTU's for cooking.
- (15) Per capita use of electrical appliances has been increasing each year. Reduction in use depends to a great extent on personal habits and life styles. Estimates of savings in this area, therefore, are not easy to make.
- (16) The Association of Home Appliance Manufacturers has pledged to make a number of efficiency improvements in appliances. These improvements could effect an average of 20% saving in appliance energy use.
- (17) The potential savings through the use of fluorescent lights is estimated at 9%. In addition, lighting levels would be 75% higher.
- (18) The possible savings through the use of lower wattage bulbs is not estimated but is obvious.
- (19) To effect this change, a change in personal habits is required. But the potential savings are evident.

COMMERCIAL SECTOR

Most of the energy used by the commercial sector is in buildings. It is difficult, however, to determine the amount of energy used by different commercial operations due to the variation in the size and scope of these operations. Finance, real estate, insurance, communications, and utilities occupy offices. Retail and wholesale operations are mostly stores and warehouses. Service operations require a variety of buildings ranging from nursing homes and hospitals to amusement halls and insurance offices. Energy use within each building depends on building size and the activities taking place in it.

FIGURE III



SOURCE: Portland Energy Conservation Project, 1977.

1975 Energy Use in the Portland Metropolitan Area Commercial Sector

Estimates of energy use for heating, lighting, cooking and other functions vary widely. For the Pacific Northwest, it has recently been estimated that lighting uses 30% of energy used by the commercial sector, space heating 21% and air conditioning and ventilation 18%, refrigeration 16%, water heating 14% and other uses about 1%.

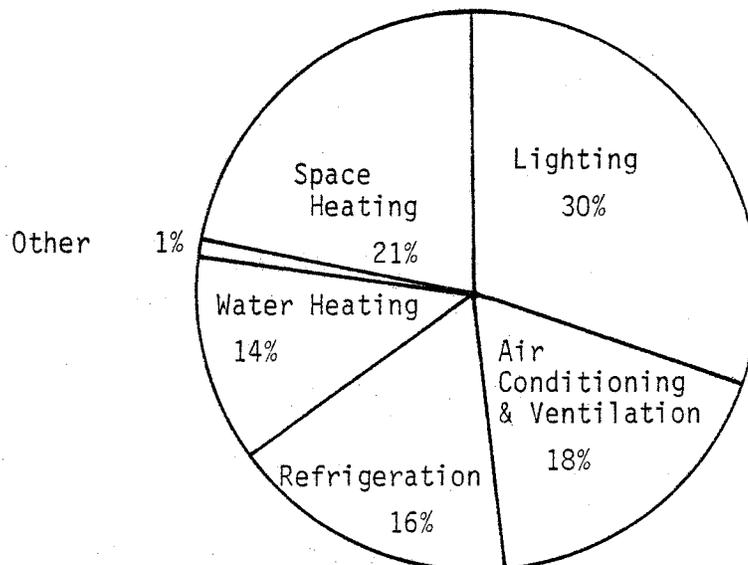


FIGURE IV

Energy Use by the Commercial Sector in the Portland Metropolitan Area

SOURCE: Portland Energy Conservation Project, 1977.

OFFICE SPACE

The major commercial users of office space are finance, real estate, insurance, communications and utilities. Generally, more energy is consumed in office buildings than in most other commercial structures. This is due in part to design practices and lighting standards. In cold weather, the heat produced by light reduces heating requirements, but, under milder conditions, it adds to the cooling load. The amount of energy used for heating, cooling, ventilating and lighting depends to a large extent on the length of time these systems are kept in operation. Water heating in office buildings requires only modest amounts of energy. Studies of office space energy use suggest that energy use per square foot increases with the size of the building. Thus, overall energy use in small office buildings may be less even though both large and small office buildings use energy in much the same way. In Gladstone, this type of business activity occupies 112,906 sq. ft. of commercial space.

RETAIL AND WHOLESALE SPACE

The major retail and wholesale buildings are stores and warehouses. In retail stores, energy use is directly related to the number of occupants and the hours of use. Cooling, ventilation and lighting are the major users of energy in retail stores. Lighting is usually at high levels to illuminate products on display so customers can see them. Energy requirements for cooking and ventilation increase as the number of occupants increases. Refrigeration is essential in food stores. A large portion of restaurant energy use is needed to cook and refrigerate foods. In wholesale and storage buildings, lighting is less important. The requirements of the items stored determine warehouse heating and cooling energy use. In Gladstone this type of business activity occupies 1,093,942 sq. ft. of commercial space.

SERVICE SPACE

The type of service activity, to a great extent, determines the amount of energy consumed in the wide variety of buildings used by services. Hospitals, laboratories and medical schools use significant amounts of energy to operate equipment. Light is an important use in libraries, galleries, museums and classrooms. Churches, galleries, museums and other buildings with large open areas require proportionally greater amounts of energy for space heating. Hotels, motels and clinics follow residential energy use patterns. In Gladstone, this type of business activity occupies 52,386 sq. ft. of commercial space.

The following table shows energy use by the commercial sector in the Portland Metropolitan Area.

T A B L E X

1975 SMSA EXISTING COMMERCIAL ENERGY USE

SECTOR	No. Jobs ¹	Million Btu's Used Per Job ²	Existing Billion (10 ⁹) Btu's Used Per Year			
			Oil	Gas	Ele.	Total
Retail and Wholesale Trade	112,125	115	7,724	2,317	2,833	12,874
Services (Hotels, Medical, Recreational Buildings, Etc.)	84,650	133	4,940	3,031	3,256	11,227
Finance, Insurance, Real Estate, Communi- cations & Utilities						
Large Office	20,688	51	334	355	355	1,044
Small Office	20,687	45	298	317	318	933
TOTAL	238,150		13,296	6,020	6,762	26,078

¹ Oregon Covered Employment and Payrolls by Industry and County, State of Oregon Employment Division, 1976. Compiled by BPA.

² SOM estimate.

SOURCE: Portland Energy Conservation Project, 1977.

ENERGY USE BY THE COMMERCIAL SECTOR IN GLADSTONE

The estimated total energy use by the Gladstone commercial sector in Table XI has been arrived at by multiplying the total commercial space by the estimated number of BTU's used per square foot. The latter figures were obtained from reports prepared for BPA and PECP. The industrial sector in Gladstone has been disregarded because of its insignificance.

T A B L E X I

1975 ENERGY USE IN GLADSTONE BY THE COMMERCIAL SECTOR

Commercial Space	#Square Feet	Thousand BTU's used per sq. ft.	Million BTU's used in 1975
Office Space	112,906	190	21,452
Retail & Wholesale Space	1,093,942	184	201,285
Service Space	52,386	186	9,744
Totals	1,259,234	184.6	232,481

SOURCE: City Records, PECP and other references cited earlier in this report.

CONSERVATION MEASURES AND POSSIBLE SAVINGS IN GLADSTONE

The Portland Energy Conservation Project describes a number of conservation possibilities in the commercial sector. Some of these are the following:

- (1) Adjusting dampers and resetting controls on heating and cooling equipment to restore it to maximum efficiency. Heating, ventilation and cooling equipment tends to fall out of adjustment after years of operation. Periodical servicing involves minor costs.
- (2) Reducing equipment operating time to 17 hours per day. Doing so will require reducing building occupancy rate.
- (3) Lowering temperatures to 72 degree F in winter and raising them to 78 degrees F in summer.
- (4) Installing automatic thermostat night setback. Estimated savings are about 31% in space heating.
- (5) Reducing the rate of outside air ventilation by adjusting dampers. U. S. Government guidelines suggest that an average rate of 5 cfm would be adequate.
- (6) Reducing illumination in non-work areas to two-thirds or half the average.
- (7) Reducing hot water temperature to 120 degrees F. U. S. Government guidelines recommend it.
- (8) Installing a heat pump system. For small office buildings, heat pumps have been found to be most effective. Estimated savings are approximately 40% of HVAC.
- (9) Insulating walls and ceilings.
- (10) Adding high performance edge insulation to floors.
- (11) Orienting buildings to minimize solar heat gain or loss depending on the season.
- (12) Using double-glazed windows and limiting glass area to 25 to 40% of the wall area.
- (13) Limiting light switching to control no more than 1,000 square feet of floor area where appropriate. This will allow for a portion of a floor to be lit while building is being cleaned after hours. Estimated saving is 1.5% in lighting.
- (14) Using more natural or forced air ventilation to cool buildings. Estimated savings are about 13%.
- (15) Installing solar space and water heating systems. Potential savings could approach 50%
- (16) Using tinted glass. A dark pane of glass cuts solar transference by 41%.

The proper combination of any number of the conservation measures described above could effect maximum savings of about 43% of the energy used by the commercial sector. Had this been done in Gladstone in 1975, the savings would have amounted to 99,967 million BTU's or \$411,864.

TRANSPORTATION

Gladstone's suburban location, present land use configurations, low density development and lack of sufficient local employment means long trips for most activities. On the average, single family households in Gladstone travel about 41.4 miles per day or 15,100 miles annually within the metropolitan area. This is 23% more miles traveled per year than Portland residents. Gladstone's multi-family households travel somewhat less at 12,080 miles per year. Both single family and multi-family households travel an additional 1000 miles annually outside the Metropolitan area on inter-city trips. From 1975 to 1995, total household mileage is expected to increase by 22 percent.

T A B L E X I I

HOUSEHOLDS LIVING OUTSIDE THE CITY OF PORTLAND - 1975					
Typical Daily Vehicle Travel for a Single Family Household (15,100 miles per year)					
	Trips per Household per Day*		Length of Trip (Miles)	Miles Traveled per Household per Day	
	%	No.		No.	%
Work	34%	2.5*	8	20.0	48%
Shopping	21%	1.5	5	7.5	18%
Personal Business	12%	0.9	5	4.5	11%
Doctor-Dentist	2%	0.1	5	0.5	1%
Restaurant	4%	0.3	5	1.5	4%
Social	17%	1.2	4	4.8	12%
Recreational	5%	0.3½	4	1.4	3%
School	5%	0.3½	3½	1.2	3%
Total	100%	7.2	---	41.4	100%

SOURCE: Transportation and Land Use Conservation Choices, Skidmore, Owings & Merrill, City of Portland, 1977.

*NOTE: To work and back again is considered two trips

Table XII above allocates the total daily vehicle trips by activity for suburban locations similar to Gladstone. The largest percent of trips are to and from work. Since 89% of the Gladstone work force is employed outside of the city, the length of trip (8 miles) may in fact be conservative.

Gladstone residents make 96% of their trips by automobile, approximately 3.5% by Tri-Met and about 5% by walking. This percent breakdown by mode is similar to Portland area residents. Interestingly, in 1945 37% of all Portland resident trips were by transit and 63% by auto. It is projected that transit ridership will increase to 7% by 1995.

The average number of occupants in an automobile per trip is 1.4. This average is expected to remain the same at least until 1995. Buses average 8.3 riders per vehicle for suburban routes.

In terms of energy use, about 6868 BTU's are consumed per auto mile assuming 13 mpg and 1.4 occupancy rates. For residents using Tri-Met, 3660 BTU's are used per passenger mile based on 4.5 mpg and 8.3 riders per vehicle. Thus transit is nearly twice as efficient per passenger mile than the automobile in Gladstone. Bus travel for Portland residents is three times as efficient as the auto.

T A B L E X I I I

GLADSTONE TRANSPORTATION ENERGY USE 1976-77

Residential Energy Use via Auto Within SMSA

Dwelling Type	# of Households	Auto Miles/ Year/ Household	Million (10 ⁶) Vehicle Miles Travel/Year	#BTU's Used/Mile	Billion (10 ⁹) BTU's Used/ Year	Percent Total Energy Used
Single Family	2431	14,496	35.2	9123	321.1	
Apts/Mob. Home	837	11,597	9.7	9123	88.5	
Sub-total	3268		44.9		409.6	71%

Residential Energy Use via Auto Outside SMSA

Single Family	2431	1,000	2.4	7353	17.6	
Apts/Mob. Home	837	1,000	.8	7353	5.9	
Sub-total	3268		3.2		23.5	4%
Total					433.1	75%

Transit Energy Inside SMSA

Dwelling Type	# of Households	Bus Miles/ Year/ Household	Million (10 ⁶) Bus Miles Travel/Year	#BTU's Used Per Pass. Mile	Billion (10 ⁹) BTU's Used/ Year	Percent Total Energy Used
Single Family	2431	528.5	1.3	3660	4.8	
Apts/Mob. Home	837	422.8	.4	3660	1.5	
	3268		1.7		6.3	1%

Truck and Other Transportation Energy Use

Type of Use	Billion (10 ⁹) BTU's Used/ Year	Percent Total Energy Used
Truck Energy Use (assuming to be 11% of total transportation energy use)	63.6	11%
Other Transportation Energy Use (Planes, trains, barges, etc. are assumed to be 13% of total)	75.2	13%
Total	138.8	
Total Gladstone Transportation Energy Use	578.2	100.0%

SOURCE: Transportation and Land Use Conservation Choices, and Gladstone Data.

As shown above, 75% of all transportation energy use by Gladstone residents is consumed through use of the automobile. Only 1% is used for transit. Gladstone consumes 578.2 billion BTU's per year for transportation purposes, excluding city vehicle use and roadway development and maintenance.

Trucks, planes, trains, barges, etc. account for approximately 24% of the total transportation energy use. (These percentages are derived from the Department of Energy State Statistics.) Table XIV below shows the various efficiencies by mode in transporting goods and materials.

T A B L E X I V

BTU PER TON MILE FOR FREIGHT CARRIED PER MODE	
MODE	BTU PER TON MILE
Pipeline	450
Water	540
Railroad	680
Trucks	2,300
Air	37,000

SOURCE: Transportation Engineer Journal, "Energy Intensification of Transportation," 1973.

Another significant impact on transportation energy use results from roadway development and maintenance. Road right-of-way in Gladstone totals over 280 acres, representing approximately 18% of the total land area. Within the older sections of town, about 25% of the land area is reserved for road right-of-way. As more development takes place on presently vacant land, the total percent of land area utilized for road right-of-way will increase. Presently there are about 37 miles of roads within the city.

Table XV below is an excerpt from the Gladstone Subdivision Ordinance identifying the required right-of-way and roadway widths for new development.

T A B L E X V

GLADSTONE SUBDIVISION REQUIREMENTS
RIGHT-OF-WAY AND ROADWAY WIDTHS

<u>TYPE OF STREET</u>	<u>RIGHT-OF-WAY WIDTH</u>	<u>ROADWAY WIDTH</u>
Arterials	60-120	42-52
Commercial and Industrial Streets	60-80	42-52
Collector Streets and Continuing Residential Streets	60-80	36-48
Minor Streets (Disconnected streets not exceeding 1800 feet in length)	50	34
Cul-de-sacs	50	34
Radii for Turnarounds at Ends of Cul-de-sac	50	42-44
Alleys	20	20

SOURCE: Gladstone Subdivision Ordinance #843, December 26, 1974

There are a number of policies and programs which can be developed to encourage the conservation of energy used for transportation. Some energy saving strategies include:

- Promote the development of more local employment opportunities
- Centralize shopping and service facilities for one-stop multi-purpose trips near mass transit
- Allow for the development of convenience shopping stores within walking distance of neighborhoods
- Provide neighborhood park and recreation facilities
- Encourage higher density development with high density residential development near mass transit stations
- Provide park and ride lots
- Support car and van parking programs
- Improve pedestrian and bicycle facilities
- Improve traffic flow
- Lower speed limits
- Develop traffic circulation policies which discourage the use of the automobile
- Reduce right-of-way and roadway width standards

The energy savings resulting from the implementation of any or all the above strategies is difficult to assess. However, since 75% of all transportation energy use is used for fueling the private automobile, any reduction in the number of total automobile miles traveled or shift to a more economical mode of travel, will have a significant impact on energy savings.

FACILITIES AND SERVICES

A wide range of public facilities and services are offered in Gladstone. Energy used to provide these services totals approximately 136 billion BTU's per year. As shown below, city government is the largest energy user of the three service entities.

T A B L E X V I
FY 1976-77 ENERGY USE FOR CITY SERVICES

<u>Service Entity</u>	<u>BTU's - Billions (10⁹)</u>	<u>Percent of Total</u>
City Government	9.66	26.3%
School District	24.36	66.3%
Solid Waste	2.69	7.3%
Total	36.71 Billion BTU's	99.9%

SOURCE: City, School District and County Records and Government Conservation Choices, City of Portland, 1977

CITY GOVERNMENT

Services and facilities offered by city government have been disaggregated in Table XVII. Over 34 % of the total energy budget is used to fuel vehicles. This is very dissimilar to the City of Portland where 75% of the total energy budget is used to fuel vehicles and within the SMSA only 35%.

T A B L E X V I I
CITY GOVERNMENT ENERGY USE, FY 1976-77

<u>Category</u>	<u>BTU's - Billion (10⁹)</u>	<u>Percent of Total</u>
City Vehicles	3.32	34.4%
City Buildings	1.40	14.5%
Sewer and Water	3.42	35.4%
Street Lighting	1.29	13.3%
Traffic Signals/Park Lighting	.23	2.4%
Total	9.66	100%

SOURCE: City and County Records

A further disaggregation of energy use for city vehicles by city department has been identified below. The two departments using the most energy for transportation are Police (44.3%) and Street (30.23%).

T A B L E X V I I I

VEHICLE ENERGY USE BY DEPARTMENT FY 1976-77

Dept.	Vehicles	Gas (Gal)	Diesel (Gal)	Total BTU's	%
Admin.	2	817		102,125,000	3.08
Police	5	11,752		1,469,000,000	44.29
Fire	4	732	124	108,364,000	3.27
Parks	3	544	57	75,752,000	2.28
Water	5	1,584		198,000,000	5.97
Sewer	1	726		90,750,000	2.74
Street	19	7,378	591	1,002,626,000	30.23
TRAM	1	1,897		237,125,000	7.15
Planning	1	267		33,375,000	1.01
Total	41	25,697	772	3,317,117,000	100.02

SOURCE: City and County Records

Table XIX shows the total miles traveled and miles per gallon for each vehicle of the Police and Administration Departments. The two patrol cars are the largest consumers of energy, both in terms of total miles traveled and lowest miles per gallon. It must be remembered, however, that city vehicles in general are subject to irregular driving habits such as much stop and go travel, long periods of idling, etc. In addition, although several heavy equipment vehicles of the Public Works Department have poor gas mileage, more economical vehicles are not available.

T A B L E X I X

TOTAL VEHICLE MILES TRAVELED AND MPG, FY 1976-77

Department	Vehicle Type	Miles Traveled	Gal. Gas Used	Miles per Gal.
<u>Police:</u>	Patrol	59,839	4,846	12.35
	Patrol	59,193	4,620	12.81
	Investigation	7,703	1,872	4.11
	Chief/Admin.	----- sold mid year-----		
Admin:	Dog Control	5,199	415	12.53
	Administrator	4,252	354	12.01
	Assistant	4,983	463	10.76
SOURCE: City and County Records		141,169	12,570	11.23

There are two basic strategies which can be employed to reduce the total energy used by city government for transportation. These include: 1) Purchase vehicles which get more miles per gallon, and 2) Reduce the total number of miles traveled.

Energy used to operate city government buildings totals only 1.3% of the government's total energy budget. The city maintains three principal buildings which are City Hall/Fire Department, City Shops and the Library. City Hall accounts for

about 60% of the total energy used to operate buildings. City Hall and the Library are equipped with heat pumps and fluorescent lighting...both energy saving equipment. The Fire Department uses 222.2 million BTU's per year for heat and has only two employees.

T A B L E X X

TOTAL ENERGY USED TO OPERATE CITY BUILDINGS, FY 1976-77					
City Buildings	Electric BTU's	Fuel Oil BTU's	Natural Gas BTU's	Total BTU's Million(10 ⁶)	%
City Hall	465,567,600	336,750,000	---	832.3	59%
City Shop	47,607,936	92,100,000	---	139.7	10%
Fire Department	113,870,506	---	108,360,000	222.2	16%
Library	206,988,211	---	---	207.0	15%
Park (Restrooms)	3,000,027	---	---	3.0	0%
	867,043,280	428,850,000	108,360,000	1404.2	100%

SOURCE: City Records

The City Shop heating system is being updated from oil to gas. The construction of a partition necessitating the heating of only one vs. three vehicle bays will also save energy.

Energy saving programs which would be appropriate for city buildings include:

Request PGE and/or Northwest Natural Gas Company to inspect all city buildings and make recommendations regarding needed improvements to conserve energy.

Lower thermostats

Prudent thermostat adjustment before non-use hours or install a timing system

Use crankcase heaters for fire trucks rather than heat entire equipment room

Install insulation jackets around the library and city shop hot water heaters

Initiate weatherization and insulation actions

Plant deciduous trees on south side of buildings

Adopt ASHRAE* 90-75 Code for new buildings.

Energy used to operate the city's sewer and water system totals about 3.4 billion BTU's annually. The city has four sewerage pumps using 485.5 million BTU's per year. The pump located at Cason Road and Ridgewood Subdivision is scheduled to be eliminated by allowing the sewerage to flow by gravity into the Clackamas County Service District, saving 21 million BTU's per year. By eliminating the Doncaster and Oatfield Road sewerage pump station in a similar fashion, an additional savings of 34 million BTU's would be realized annually.

*ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.

The city has two water system pumps consuming 2.9 billion BTU's per year. One pump is located at the Clackamas River intake, the other pumps water from the Webster Road tanks to the Kirkwood tank.

Street lighting is provided by the city on its 37 miles of roadway. Presently the city maintains 440 175 watt mercury vapor and 10 400 watt mercury vapor street lights. As shown below, use of sodium fixtures rather than mercury vapor will usually result in a greater amount of light emitted and be more energy efficient.

T A B L E X X I

ENERGY CONSUMPTION OF TYPICAL STREET LIGHTING FIXTURES

Kwh. Used per Fixture per Year	Amount of Light Produced (Lumens)	Type of Fixture; Color of Light
RESIDENTIAL STREETS		
372	5,200	70-watt Yellow (HPS)
534	4,000	100-watt White (MV)
562	8,500	100-watt Yellow (HPS)
803	16,000	150-watt Yellow (HPS)
*835	7,000	175-watt White (MV)
1,164	10,000	250-watt White (MV)
ARTERIAL STREETS		
1,205	25,500	250-watt Yellow (HPS)
*1,847	21,000	400-watt White (MV)
1,847	48,000	400-watt White (HPS)
4,425	55,000	1,000-watt White (MV)

*Lights most commonly used in Gladstone
 MV = Mercury Vapor
 HPS = High Pressure Sodium

SOURCE: Government Conservation Choices, City of Portland, 1977

If the 175 watt mercury vapor lights of the city were replaced with 100 watt yellow high pressure sodium, the lumens would be 1500 greater per light and result in a per light energy savings of 273 Kwh per year. Total system savings would be 410 million BTU's annually. Should the 400 watt fixtures be replaced with 250 watt sodium, the light produced would increase from 2100 to 25,500 lumens. Total energy saving for 10 fixtures would be 2.2 million BTU's per year. By converting the entire lighting system to pressure sodium fixtures, a 32% reduction in energy use would be realized for lighting.

Another use of energy is for the operation of traffic lights. Gladstone has three traffic signals located along Highway 99E at Arlington, Gloucester and Glen Echo. Two additional signals are planned for Oatfield at 82nd and Portland Avenue at Gloucester. Each signal consumes about 22,000 Kwh per year. Energy used to light parks and restroom facilities is an insignificant amount.

SCHOOL DISTRICT

The school district consumes 18% of the total facilities and services energy budget. For Portland, schools are the largest governmental consumer amounting to 38% of the total budget.

T A B L E X X I I

SCHOOL DISTRICT ENERGY USE FY 1976-77

Fuel	Total Energy Used	BTU's Billion (10 ⁹)
Fuel Oil	31,635 gal.	4.75
Natural Gas	9,0490.3 Therms	9.05
Electric	2,280,225 Kwh	8.12
Automobile/Maintenance Fuel	4,827.6 gal.	.60
Bus Fuel	13,546 gal.	.15
Driver Education Fuel	1,181 gal.	1.69
	Total	24.36

SOURCE: School District Records

The old elementary school building is heated by an oil furnace. Replacement of this system with a newer model will likely result in at least a 25% energy savings. The elementary gym, Kraxberger Middle School and Gladstone High School are heated by natural gas furnaces. The High School has a heat pump as does the district administration building (electric heat pump and furnace). Kitchen facilities and lights are electric for all district buildings.

The Rinkes Bus Company, a private organization, provides school bus service for the Gladstone School District. Rinkes operates nine gasoline powered buses on 44 separate routes with a total annual mileage of 41,117 (FY 1976-77). This operation is unique in that the buses have the highest occupancy rate in the state. Generally, the nine buses average about 5 MPG, whereas diesel buses get around 8-10 MPG, with less maintenance. Adequate financing to purchase the more expensive diesel buses is not available at this time.

Through the establishment of a radial path system for student access to schools, students can walk rather than ride the bus in several instances. This path system has been established in some of the newer subdivisions upon Planning Commission request (Ridgegate and Donna and Barbaba Heights subdivisions just north of Oatfield).

SOLID WASTE

Solid waste in Gladstone is collected by the Gladstone Disposal Company, a private company, and disposed of at the Rossman's Landfill site near Oregon City. The Metropolitan Service District, in cooperation with various public and private refuse collection companies, handles solid waste disposal for the entire SMSA.

Gladstone uses approximately 2.69 billion (10⁹) BTU's per year for solid waste disposal. This figure is based on a regional average of 299,400 BTU's per person per year and a 1976-77 city population of 8985. 79% of the solid waste energy budget is used to fuel collection vehicles and 21% for disposal site operations. Due to Gladstone's close proximity to the landfill site, total fuel costs may be somewhat less.

The preceding discussion has summarized the energy used to provide public services and facilities for Gladstone. Local improvements, as suggested, will result in significant overall savings, both energy and dollar savings.

DESIGN CONSIDERATIONS

There are a number of building, site and landscape design techniques which can help maximize use of solar energy, provide protection from winter winds, create shade in the summer months, and so forth. As an example, establishing dense evergreen plantings, earthforms, fences, or walks on the northern exposure of a house or business will help break-up and alter winter winds. Planting deciduous trees on the south will allow sunlight to penetrate in the winter and provide shade in the summer. Because the sun's angle varies from winter to summer, properly designed roof overhangs can shade a structure in the summer and allow the sun to shine through in the winter. By exposing a basement to the sun (daylight basement) the effects of cold and wet soils can be minimized. There are several such techniques which can be employed to maximize use of natural energy sources and man made elements. An indepth discussion of these techniques is beyond the scope of this study; however, this application can result in important energy savings.

FINDINGS

1. Increasing energy costs at present consumption rates could lead to a situation where sufficient energy supplies could not be guaranteed at any price.
2. By the early 1960's, electricity demand in the Pacific Northwest began to exceed economically and environmentally acceptable sources of hydro-power, which resulted in increased reliance on thermally generated power and thus higher electricity prices.
3. Since much energy is wasted in this country and this region, the potential for energy conservation is tremendous.
4. The primary sources of end-use energy in the Portland Metropolitan Area are electricity, fuel oil and natural gas.
5. Older housing units are extremely wasteful of energy, while new one can be very energy efficient.
6. The family's auto uses 56% of the energy used by a typical single family household; 26% is used for space heating; 16% is used for water heating and appliances; and only 2% is used for lighting.
7. The size of the house, how well it is insulated, and the temperature setting of the thermostat, are the primary determinants of the amount of energy used for space heating.
8. The amount of energy used for water heating is directly related to the size of the household and the hot water consumption habits of each householder.
9. The application of 10-11 selected and evaluated residential energy conservation measures could effect annual savings ranging from \$101.39 per typical new multi-family unit to \$178.64 per existing unit, and from \$255.30 per typical new single family unit to \$353.00 per existing unit. This adds up to nearly one million dollars per year in savings by single and multi-family homes in Gladstone.
10. Other conservation measures can be as effective and, if instituted, could effect significant additional savings.
11. Energy savings estimates for the commercial sectors are much more difficult to arrive at because of the variation in the size and scope of commercial operations. Energy use depends on building size and the activities taking place there.
12. The commercial sector in Gladstone used approximately 232,481 million BTU's in 1975. Conservation could save up to 43% of that, or 99,967 million BTU's worth \$411,864.00.
13. Gladstone residents make 96% of their trips by automobile averaging 41.4 miles per day per household.
14. Total household mileage is expected to increase by 22% between 1975 and 1995.
15. Transit is nearly twice as efficient per passenger mile than the automobile in Gladstone, and three times as efficient in Portland.
16. 34.4% of the total energy used by city government is used to fuel vehicles.

17. The two departments within city government using the most energy for transportation are Police (44.3%) and Street (30.23%).
18. A 32% reduction in energy use can be realized for street lighting by shifting from mercury vapor to high pressure sodium fixtures.
19. 55 million BTU's can be saved annually through the elimination of three sewer pump stations and diverting sewage to outlying sewer districts via gravity flow.

FACILITIES AND SERVICES

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FACILITIES AND SERVICES

INTRODUCTION

The provision of urban public services and facilities is a basic function of city government. Such services as water, sewer, fire and police protection, among others, help guide and support existing and needed development in the city. The following analysis is an attempt at assessing the present level of public services in Gladstone, the capacities of its public facilities and services, their deficiencies and the costs associated with providing them.

INVENTORY AND ANALYSIS

WATER

Gladstone is almost totally served by its own water system. Infiltrated Clackamas River water is provided by means of a unique system of horizontal collectors. The collectors are perforated pipes projected radially under the river bed from a vertical concrete caisson on the river bank. Naturally filtered river water is collected by the pipes from water-bearing strata 16 to 20 feet below the river bed. Atop the caisson is the pump station housing three pumps which move the collected water into the distribution system and to the reservoirs.

Before the completion of the Gladstone water system in 1960, water was purchased from the Clackamas Water District. At that time, the population of Gladstone was about 3,600. The water supply was quite limited during the summer since total storage was limited to a 600,000 gallon steel reservoir. Moreover, it appeared that the Clackamas Water District would soon be unable to supply water to Gladstone. The cost of developing the water system and a one million gallon tank was about \$250,000. The system's collector is capable of producing 5.5 MGD with added pumping capacity. However, present pumping capacity is limited to 2.5 MGD; while peak summer demand has been 2.6 MGD.

The quality of the water very closely approximates that of the Clackamas River except that it is clear and free from turbidity, organic matter and pathogenic bacteria. The water is suitable for all uses without treatment except for preventive chlorination as required by the State Board of Health.

Water service costs are the lowest not only in this area, but in all of the State of Oregon. Residential water services constitute the bulk of the 2,800 services provided by the city. Water consumption is close to 300 gallons per day per household, which costs about 10¢ per day per household or about 3.6¢ per day per person.

The main problem with the water system is inadequate storage at the Webster reservoirs, or the inability to pump an adequate supply to the reservoirs during peak demands and/or without increasing pressures above 125 PSI in the lower levels of the city. An extension of the 24" transmission line at Barton and W. Clarendon Street will greatly increase the volume of water that may be pumped from the collector to the Webster tanks, because it will remove the friction loss of the smaller pipes and a much lower power demand (cost) but it will also allow for the installation of a larger pump or pumps to increase the volume pumped to the Webster tanks. The higher level areas should be adequately supplied by the addition of a gas operated pump should electrical power fail. There are parts of the city wherein the water distribution system needs increased sizes of lines to provide adequate fire flows. At present, the pumps may pump 2. MGD but this will be greatly increased with the completion of the 24" water line. Plans are underway to increase storage capacity at the Webster site. The new 24" extension will be controlled by pressure regulating valves at three locations in the lower level distribution system, i.e. the transmission line may have a much higher pressure; therefore, the ability to pump more water to the Webster tanks without affecting the pressures in the lower parts of the town. The regulators will permit water to enter the distribution system at only a predetermined setting of less than 125 PSI. The size of the line - 24" - in itself will greatly reduce the friction of pumping through smaller lines of the distribution system and will result in a larger volume at a lesser cost.

The Oak Lodge Water District serves nearly a dozen of Gladstone's residents, in addition to some 30,000 people in the communities of Oak Grove and Jennings Lodge. It provides water to 6,416 residential, 207 commercial and 7 industrial units. Its storage capacity is presently 7-8 million gallons and its pumping capacity is in excess of 10 MGD. Growth rates in this district are declining because the area is approaching saturation. Future expansion plans, according to John Dodd, District Superintendent, include, but are not limited to, additional storage and extension of transmission lines. The water supplied to customers meets or exceeds Oregon State requirements. The Oak Lodge Water rates are higher than Gladstone's. Oak Lodge customers are charged \$5.00 for the first 1000 cubic feet and .50¢ for each additional 100 cubic feet of water used.

SEWER

Gladstone drains towards three streams: 1) the Clackamas River, 2) the Willamette River, and 3) Kellogg Creek. The basins these streams drain are named after them (see Map V). Consequently, Gladstone is served by three waste treatment facilities: 1) the Oak Lodge Sanitary District, 2) Clackamas County Service District No. 1, and 3) the Oregon City Waste Treatment Plant.

The Oak Lodge Sanitary District serves an area about five square miles which drains towards the Willamette River with the exception of a small area at the North end which slopes toward Kellogg Creek. In addition to Oak Grove and Jennings Lodge, this district serves 582 units in Gladstone, 50 units in Milwaukie and 14 units in Clackamas County Service District No. 1. The population it serves is estimated at about 30,000, which translates into 10,800 units, 9110 of which are residential. The number of Gladstone units served include 503 residential, 30 commercial and 49 school.

The Oak Lodge Plant is currently operating at about 70% capacity. The initial sewage treatment plant and collection system were completed in 1962 with a design capacity of 1.5 MGD (million gallons per day). This was followed by the construction of a new service building in 1963. In 1969, a new chlorine contact basin with a one-hour detention time for 2.0 MGD was constructed. In 1971, the sludge secondary treatment plant was expanded to its current design capacity of 4.0 MGD.

Two main sewer lines are reaching capacity. The District is in the planning process to enlarge them by Summer, 1977. The District is also planning to convert the plant to tertiary treatment in the near future. The plant is designed to serve an ultimate population of 40,000, which is the saturation level of the area it serves now. Enlarging the two lines reaching capacity will cost approximately \$90,000. The cost of converting the plant to tertiary treatment is estimated at \$1,100,000.

Because of the dwindling supply of buildable land in the District, the number of new sewer connections per year has been generally declining (see Table I below).

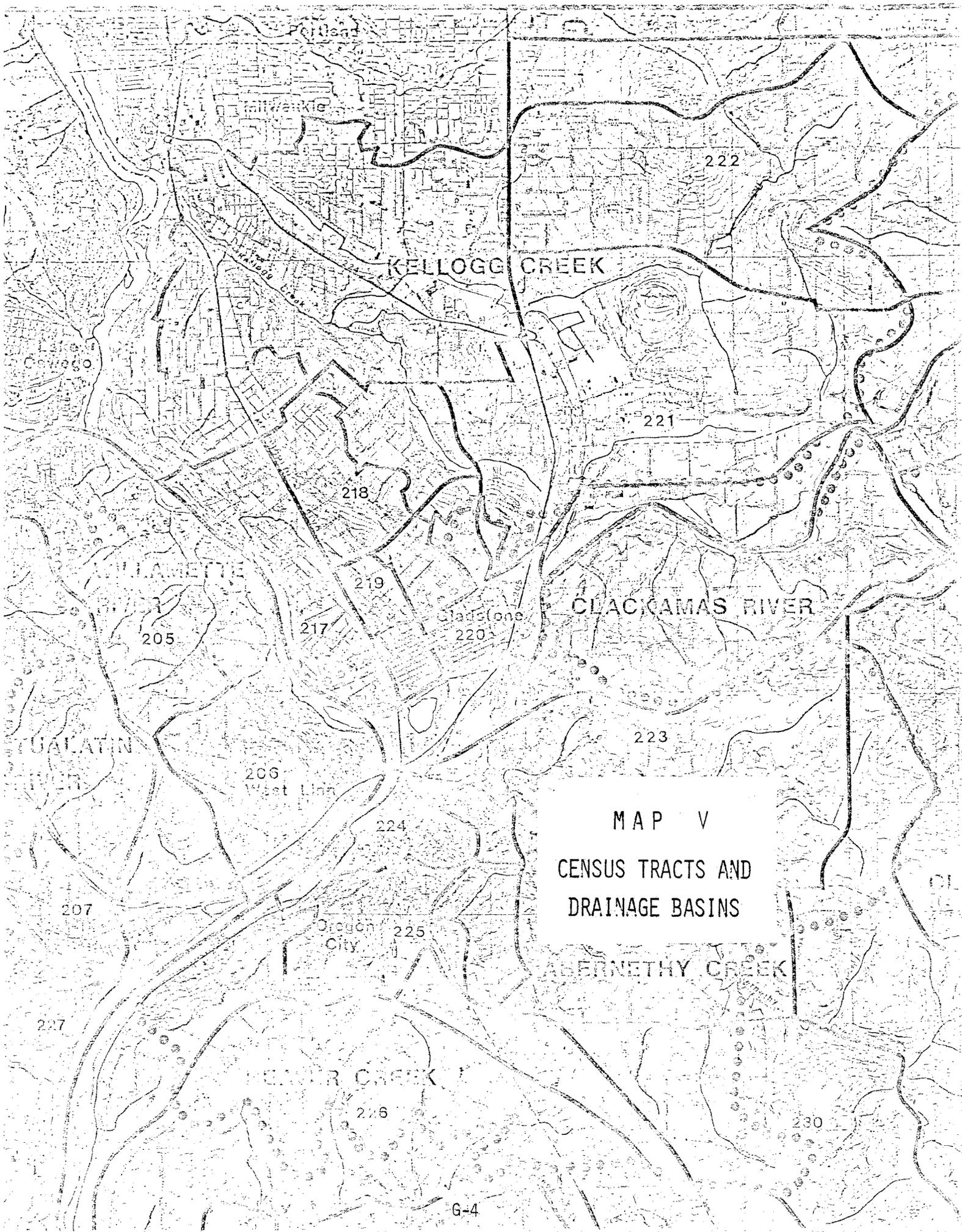
T A B L E I
OAK LODGE SANITARY DISTRICT
SEWER CONNECTIONS, 1971-77

<u>YEAR</u>	<u>NEW CONNECTIONS</u>
1971-72	590
1972-73	663
1973-74	316
1974-75	244
1975-76	337
1976-77	110

SOURCE: Responses by Jeanette E. Norman, Oak Lodge Sanitary District General Manager, to a questionnaire, June 29, 1977.

Clackamas County Service District No. 1 presently serves 34 residential units in the northern and northeastern section of Gladstone. The sewerage is moved to the Kellogg Creek secondary treatment plant. This plant provides sanitary sewer service to a large area of North Clackamas County, which includes Mt. Scott, Sunnyside, Clackamas, Johnson City, Milwaukie and other parts of the Kellogg Creek area. The plant is designed to serve a population of 100,000 and is planned for future expansion. Its design capacity is 10 MGD. It went into operation in August of 1974 and construction was completed in 1975. Total construction cost was \$22,500,000.

The Kellogg Creek Plant is operating at about 40% capacity, and is expected to take care of the needs of the District until 1995. The plant now serves about 40,000 people, or 9,210 units. Expansion and conversion of the plant to tertiary treatment is planned for 1995.



MAP V
CENSUS TRACTS AND
DRAINAGE BASINS

The plant now exceeds State and Federal Water Quality Standards by achieving a removal efficiency substantially better than 90%. The major issue of concern is that the plant has no facilities to dispose of its sludge. Some 400,000 gallons of sludge must be trucked to Portland each month.

Since this plant is operating considerably below capacity, plans are underway to divert some 600 to 700 sewer connections in Gladstone to it in order to reduce the pressure on the Oregon City Waste Treatment Plant.

Most of Gladstone is served by the Oregon City Waste Treatment Plant, which provides secondary sewage treatment. The plant has a design capacity of 3.0 MGD and 90% removal efficiency. The population it now serves is estimated at about 20,000. The plant was completed in 1953 to treat the waste water of Oregon City and Gladstone. It was enlarged in 1963 to increase its efficiency and to treat the waste from Safeway's warehouses and milk processing plant in Clackamas.

Despite the fact that Safeway's waste has been recently diverted to another plant, the Oregon City Plant is being forced to operate with over capacity flows for eight to nine months out of the year. Thus the eight-stage treatment process is rushed during these months resulting in a poor effluent into the Willamette River. The additional demand on this plant during the rainy season is created by the substantial number of storm sewers connected to the sewage system both in Oregon City and Gladstone. There are 19 known points where raw sewage from Oregon City overflows directly into the Willamette River during appreciable rainfalls. It is estimated that this occurs 180 days out of each year. Raw sewage from Gladstone is also known to overflow into the Clackamas River at two points when excessive amounts of rain water get into the sewer system. Raw sewage overflows into the Willamette River from West Linn, too. This occurs in eight locations and on approximately 90 days of each year due to sewerage flows exceeding the capacity of West Linn's two plants.

This problem has attracted the attention of State and Federal Governments prompting the Oregon State Department of Environmental Quality to provide an interest-free loan in excess of \$100,000 to find an effective solution to the pollution problem in the Willamette, Clackamas and Tualatin Rivers. The engineering and planning firm of Stevens, Thompson and Runyan was retained to conduct a study of the problem and recommend a solution. To no one's surprise, the firm concluded that existing plants are severely handicapped and that upgrading them would require extensive improvements ranging from expansion of present facilities to the replacement of existing equipment. Therefore, the solution they proposed called for the creation of a Tri-City Service District that would serve Oregon City, West Linn, parts of Gladstone and adjacent unincorporated areas of Clackamas County through one treatment plant. The proposed system promises to address most, if not all, the problems related to waste water treatment in this area, and to do so in a cooperative and equitable fashion in light of the increased cost of sewerage works, State and Federal environmental standards.

The industrial area north of Oregon City is proposed as the site for the Tri-City Sewerage Plant. It would replace the three existing obsolete plants, which now serve an estimated population of close to 30,000. The population of the area is approximately 36,000 and is projected to be about 62,000 by the year 2000 (see Table II). The Tri-City Service District would include, in addition

to the plant, pumping stations, the larger size interceptor sewers, and portions of the existing sewerage systems, for which the cities would be reimbursed their cost. According to the proposal, the cities would continue to administer their own sewerage collection systems along with development within their boundaries. Sewerage facilities and services in unincorporated areas would be administered by the proposed Tri-City System.

T A B L E I I

POPULATION TRENDS BY DRAINAGE AREA

Drainage Area	Present	1980	1990	2000	2010	Ultimate	Area, Acres
Abernethy Creek	3,645	4,875	5,925	6,525	7,125	49,236	7,782
Oregon City	8,010	8,900	9,810	11,600	13,600	19,870	2,030
Beaver Creek	4,590	6,300	7,290	9,100	11,300	19,231	2,404
Gladstone	5,240	6,460	9,080	9,250	9,500	10,500	1,050
Clackamas River/ Rock Creek	2,700	3,440	4,970	6,840	9,500	58,308	7,636
Bolton Area (West Linn)	6,630	9,500	11,700	13,700	17,000	18,240	2,815
Willamette Area (West Linn)	2,444	3,170	4,040	5,320	7,000	16,649	3,106
TOTALS	33,259	42,645	52,815	62,336	75,025	192,034	26,832

SOURCE: Comprehensive Sewerage Plan Tri-City Area, Clackamas County, Oregon, Stevens, Thompson & Runyan, Inc., 1974.

The proposed system is supported by both Federal and State agencies and the cities concerned. The project costs have been estimated at \$27 million. A Federal (EPA) Grant would pay 75% of these costs. But the proposal was defeated in an election held on March 9, 1976. The proposal will go once more this year (1977) before the electorate, but this time only the cities concerned will vote.

Should the Tri-City sewerage plan be approved and implemented, Gladstone is likely to continue to rely on three sewer districts for service. The city will probably rely more on the proposed Tri-City system and on the Kellogg Creek Plant than on the Oak Lodge Plant, which is approaching capacity. On the other hand, should the proposed Tri-City system be turned down again and the project abandoned, Gladstone would have the option to rely more heavily on the Kellogg Creek Plant and the Oak Lodge Plant for existing and new services. The least that could be done to the Oregon City plant is to improve it and Gladstone would not have to make further demands on it. In fact, Gladstone's demand on the Oregon City Plant would be reduced substantially if and when 600 to 700 sewer services are diverted to the other plant/s, and should diversion be permanent rather than temporary.

Gladstone's waste water situation, therefore, is not as critical as Oregon City's or West Linn's. If the Tri-City sewerage plan is not approved and implemented, Oregon City and West Linn would have to take drastic and costly measures; Gladstone would not have to, or at least not to the same extent.

DRAINAGE

The Federal Water Pollution Control Act of 1972 stipulates that applicants for water treatment works grants (after July 1, 1973) must identify and correct all excessive infiltration/inflow* (I/I) entering each sewer system discharging into treatment works projects proposed for federal grant assistance. Since the proposed Tri-City Treatment Plant will have to rely heavily on federal grant assistance, a survey** of the existing tri-city sewer systems has been made to identify infiltration/inflow problems and to determine needed correction measures. The survey indicates that major portions of the sewer systems in Gladstone, Oregon City, and West Linn are contributing "large amounts of infiltration and storm water inflow during the winter months." Twelve overflows were located in Oregon City, nine in West Linn, and two in Gladstone. The consultants indicate that there may be more overflows which they were not able to locate. Table III below shows total infiltration and inflow within existing systems in the three cities.

T A B L E I I I

EXISTING PEAK INFILTRATION/INFLOW RATES			
City	Peak Infiltration MGD	Peak Inflow MGD	Total MGD
Gladstone	7.2	28.4	35.6
Oregon City	12.2	36.4	48.6
West Linn	21.6	11.9	33.5
(Willamette Area)	0.3	0.3	0.6
	21.9	12.2	34.1
Total	41.2	76.7	118.2

SOURCE: Stevens, Thompson & Runyan, Sewer System Evaluation Survey, 1977.

It is important to assess existing peak infiltration/inflow rates from each city because planned transportation and pumping facilities would have to carry peak sewage flows which are not cost-effective to eliminate. The consultants' analysis indicates that it is "cost-effective to eliminate much of the existing infiltration and inflow within the three cities" by grouting or replacing defective sewers. They recommend the grouting of approximately 17,400 lineal feet of sewer in Gladstone and the replacement of about 500. The consultants have concluded that it is cost-effective to separate combined sewers in Gladstone by constructing new storm sewers. It is also recommended that house laterals be repaired and roof drains disconnected from the sanitary system. In Oregon City, the consultants recommend the replacement of 95,100 lineal foot of existing sanitary sewers and the grouting of approximately 17,200. In West Linn, 53,000 lineal feet of sewer are in need of grouting and 1,700 should be replaced.

*Infiltration is water that enters the existing sewer system through cracks in the sewer pipes.

Inflow is surface water that enters the sewer system through roof drains, catch basins, low manholes, etc.

**Conducted by Stevens, Thompson & Runyan, Inc. Report published December, 1977.

In addition, a number of catch basins and roof drains should be disconnected and some house laterals replaced. Table IV shows peak inflow by source type.

T A B L E I V

EXISTING PEAK INFLOW BY SOURCE TYPE

City	Catch Basins		Roof Drains		Misc* MGD	Total MGD
	Number	MGD	Number	MGD		
Gladstone	121	28.3	13	0.1	Neg.	28.4
Oregon City	314	36.1	98	0.3	0.02	36.4
West Linn	34	11.4	28	0.3	0.2	11.9
Total	469	75.8	139	0.7	0.22	76.7

*Includes low manhole rims, area drains, etc.

SOURCE: Stevens, Thompson and Runyan, Sewer System Evaluation Survey, 1977.

The separation of storm water inflow sources from the existing sanitary system in Gladstone will cost a little over one million dollars. Another one third million dollars will have to be spent on grouting and other rehabilitation work. Rehabilitation should reduce infiltration/inflow within Gladstone by 91 percent. Implementation of the rehabilitation program in each city will be integrated with the overall implementation schedule for the phased construction of the proposed comprehensive sewerage facilities plan. Table V below provides estimates of costs and predicted effects of the rehabilitation program in the tri-cities area.

T A B L E V

ESTIMATED COST AND GENERAL EFFECTS
OF THE REHABILITATION PROGRAM

City	Existing Peak I/I MGD	Peak I/I After Rehab.MGD	Percent Removal	Rehab. Costs
Gladstone	35.6	3.4	91%	\$1,364,200
Oregon City	48.6	3.5	93%	\$6,190,500
West Linn	34.1	7.5	78%	\$1,066,200
Total	118.3	14.4	88%	\$8,620,900

SOURCE: Stevens, Thompson & Runyan, Sewer System Evaluation Survey, 1977.

SOLID WASTE DISPOSAL

Gladstone solid waste is collected by a private garbage collection company and trucked to the landfill in Oregon City. But this landfill is expected to reach capacity by 1980, when an alternative to it would have to be found. The area lacks long term landfill disposal sites. Moreover, increasing involvement by the Federal Environmental Protection Agency in solid waste disposal problems, the priorities of the Oregon Department of Environmental Quality, local land use regulations, and a wet climate prevent total reliance on landfills for garbage disposal.

By a vote of the area's people in May of 1970, the Metropolitan Service District was created and charged with the responsibility of solving the solid waste disposal problems of the Portland Metropolitan Area. Using State funds, the MSD sponsored a Solid Waste Management Study that resulted in a solid waste management program for the area. In May of 1976, the State Legislature authorized the expenditure of \$11.2 million by the MSD for the implementation of a modified version of the program.

The program authorized calls for one processing station in Oregon City, one in North Portland, and a transfer station in Washington County. Fees would be charged in proportion to the amount of waste delivered to the facility. The processing stations would mechanically separate ferrous metals from paper and plastics and similar refuse. The latter would be used as fuel to produce processed steam and energy for industrial uses. Publisher's Paper Company of Oregon City has already committed itself to the use of such fuel produced by the Oregon City Processing Station.

This program will, no doubt, reduce dependency on landfills by removing 65% to 70% of the refuse for resale or reuse. There is the possibility that 90% of the total refuse generated may be recovered in future years. The program will save significant amounts of energy which are currently being wasted. It is estimated that the energy saved would provide total residential energy requirements for over 30,000 homes. The program promises to offset system costs by generating revenue, and it will ensure that those using the system pay for it. Finally, the program will prolong the life of existing landfills.

Thus, like any other city in the Metropolitan Area, Gladstone's solid waste disposal problems have been addressed and solutions found on an area-wide basis. Garbage collection has not been, and is not likely to be, a problem; disposal is and will be. The Metropolitan Service District has found a solution through a plan and is in the process of implementing it. According to MSD, the Oregon City Processing Station will be in operation by 1980.

POLICE

The City of Gladstone Police Department is presently serving an area of 2.34 sq. mi. with a population of approximately 9,000. The police are patrolling 3268 residential units, 121 business establishments, about 100 Ac. of park land and 37 miles of roadway.

The Police Department has established a policy of responding to all calls whether police or non-police responsibilities. The department offers patrolling of homes of vacationing households, investigations of minor as well as major motor vehicle accidents, police liaison to schools and more.

The twenty-four hour dispatching system provides for a three to five minute maximum response time to emergency calls anywhere in the city. Stacked phone calls rarely total more than two to three.

There is a total of 19 police personnel utilizing approximately 3000 square feet of office space. The department has three marked patrol cars, two administrative cars and one animal control vehicle.

There are presently two basic deficiencies or needs within the Police Department. One, there is a need to separate the frequencies between the city public works department and the police department. Costs to separate the frequencies are estimated to total approximately \$4,000 (1977 dollars). Two, there is a need for expanded parking facilities at the police department office. Presently, there are only four long term parking spaces with three to four short term spaces. There is a need to increase the long term parking to fifteen spaces.

There are no future expansion plans anticipated other than the increased personnel requirements relative to the increase in population. The city's population is growing at an annual rate of about 6% with sworn police personnel maintained at approximately 1.75 per thousand population ratio.

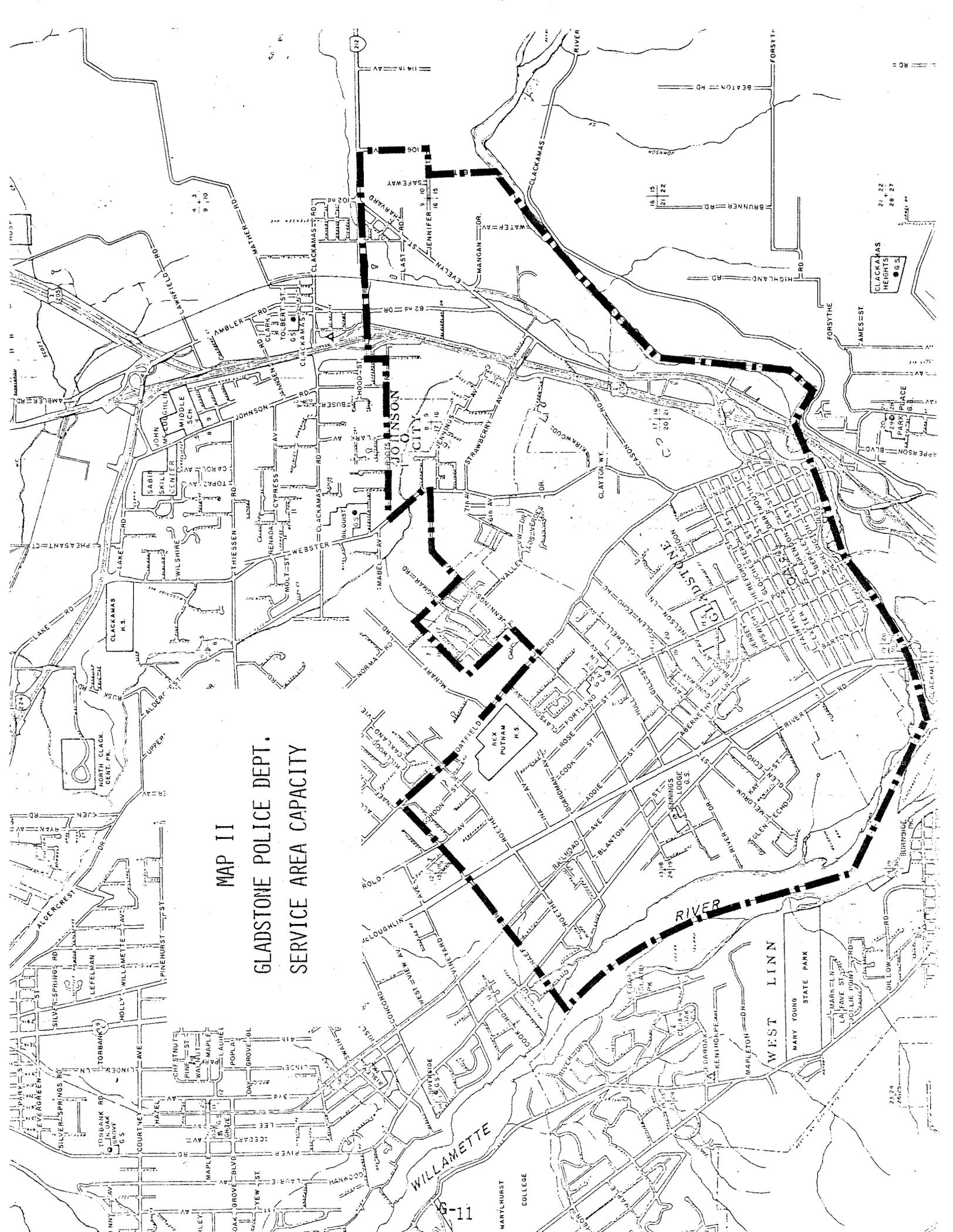
Given the present facilities, the Gladstone Police Department could serve an ultimate population of approximately 22,000 (see Map II). The existing dispatching system, which is dispatching from 12-14 vehicles, has a capacity of dispatching from 20-25 vehicles. The existing 3000 square feet of office space could accommodate 41 personnel on a three shift basis. An additional two 6 x 8 foot custody holding rooms would be required if the department were to serve a 22,000 population. Eleven vehicles would likewise be required to include four patrol cars, three investigator's cars, two dog control vehicles and two administration cars. Approximately 15-20 long term and 4-6 short term parking spaces would be required.

T A B L E V I
POLICE PERSONNEL REQUIREMENT FOR POPULATION
of 9,000 and 22,000

POSITION	NO/9,000 POP.	NO/22,000 POP.
Patrolman	6	18
Supervisor (Sergeant)	3	5
Investigator	1	3
Dispatcher	5	9
Dog Control Officer	1	2
Administrative Secretary	1	2
Lieutenant	1	1
Chief	1	1
TOTAL	19	41

SOURCE: Gladstone Police Chief Interview, May, 1977.

MAP II
GLADSTONE POLICE DEPT.
SERVICE AREA CAPACITY



CLACKAMAS HEIGHTS
● G.S.

0 25 50 75 100
FEET

Operating at capacity, the police department could serve an area approximately twice the present city area. The projected service area is depicted on Map III.

Results from the 1975-76 cost/revenue study indicate that the police department expenditures totaled \$293,977 for 26.6% of total city expenditures. This amounts to a \$36.20 per capita cost for a 1975-76 population of 8120. If one were to assume the police department were to be financed totally by property taxes, a \$3.64 tax rate per thousand assessed value would have been required.

If the Police Department were to have operated at capacity to include the costs of additional personnel and equipment, the total expenditure during the same 1975-76 period would have totaled approximately \$723,180 for a per capita cost for 22,000 population of \$32.87. However, the saving in per capita costs is not substantial.

FIRE

There are several factors that the Insurance Services Office of Oregon (ISO) use to rate the effectiveness of a fire department. On a scale of 1 to 10, Gladstone is presently rated as a Class 5. Grading for classification is based mainly on, A. Fire Department, and B. Water Supply.

The Gladstone Fire Department employs a fire marshal/training officer and a volunteer fire chief with a 34 member volunteer fire fighting force. The department has three rated fire trucks with a combined pumping capacity of 2850 gallons per minute (GPM). The city has a central dispatching system backed with electronic receivers in the homes of all the volunteers to handle all emergency calls. During the last year, the Gladstone Fire Department responded to an average of nine calls per month, excluding drills. The city allocates \$5,000 per year to a fund toward the purchase of a new fire truck. The fire station is located on Portland Avenue next to City Hall.

Gladstone's water source is the Clackamas River. The 2.5 million gallon per day (GPD) pumping capacity of the water system feeds the water directly into the distribution sub-system with two low level and one upper level storage tanks at the other end. The water supply serves mainly residential development characterized by extreme variations in water demand depending on the hour of the day and the season of the year. The most recent peak demand was the summer of 1976 when the city was forced to go on a limited irrigation program.

The ISO below has offered suggested improvements to the fire department and water supply system to correct major deficiencies.

Fire Department:

1. That an additional engine be installed to increase the pumping capacity to a minimum of 3500 GPM.

Water Supply:

1. That the present tele-metered signals be received in a manned location and in addition to the present system, the pumps should be electrically supervised with signals sent to a manned station.
2. That the grid system be strengthened to provide the recommended flows indicated on the fire flow test sheet.
3. That additional hydrants be installed so that commercial, industrial and institutional districts have one hydrant per 110,000 square feet.

Generally, for adequate fire protection, the ISO recommends 1000 GPM for residential areas...the city averages fall between 750 and 1,000 GPM. Water supply is low near all schools within the city. The ISO recommends 5500 GPM instead of the existing 1900 GPM for the high school. Recent water supply improvements have been made at the elementary and middle schools. Most recent tests, prior to these improvements, indicated flows of 800 GPM and 1300 GPM, versus the 2250 GPM and 3500 GPM recommended for the elementary and middle schools respectively. 1000 GPM is recommended at the Seventh Day Adventist School rather than the present 750 GPM.

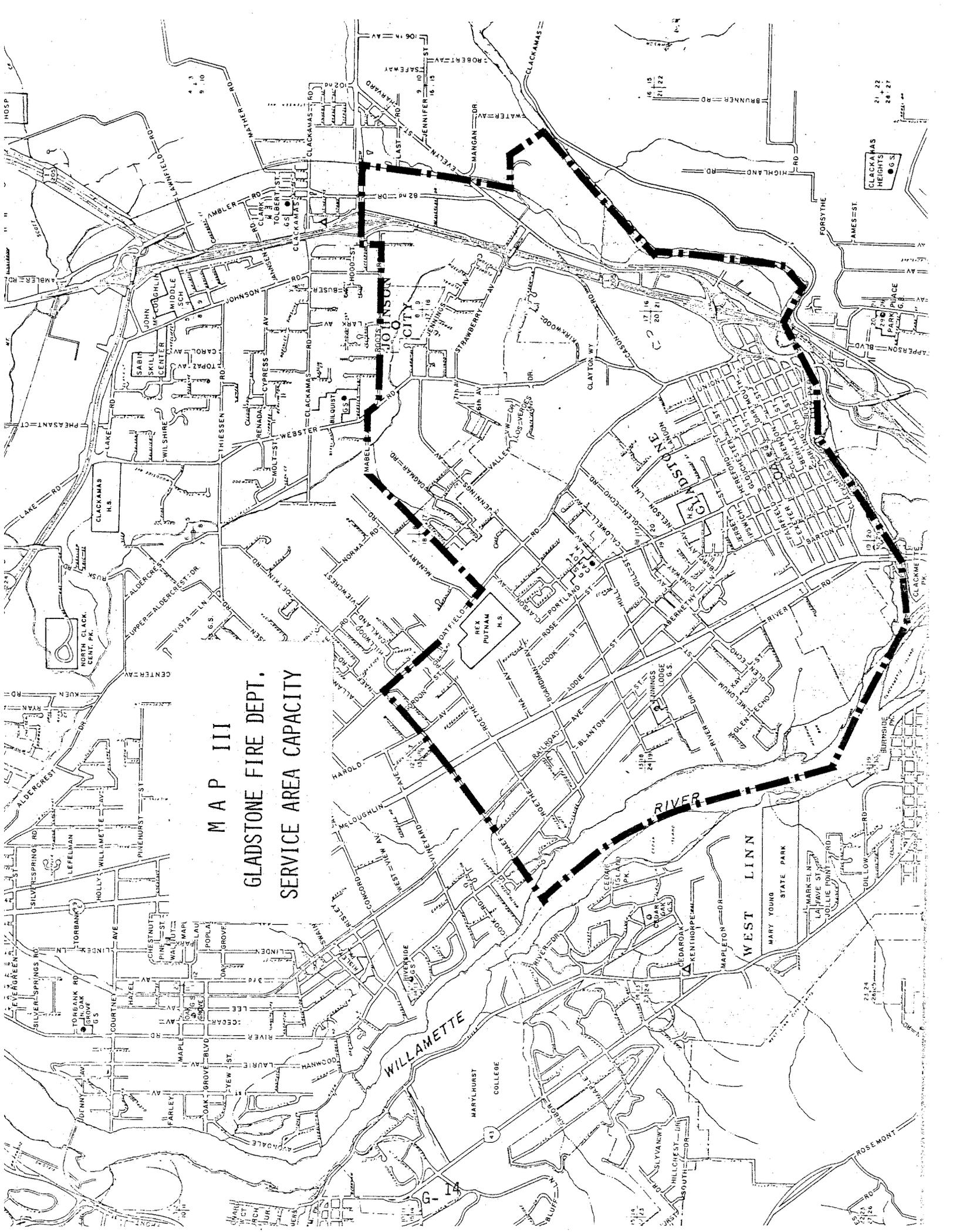
Along Highway 99E, the ISO recommends hydrants to be located one every 110,000 sq. ft. rather than the existing 500 feet apart. Recommended also are flows of 3500 GPM and 5000 GPM at Clarendon and the Poolside Motel, respectively, vs. the existing 1800 GPM and 950 GPM water supply within the area.

There are presently no expansion plans for the fire department other than the anticipated purchase of another fire truck. Recent improvements to the water supply system include the construction of a transmission line from the Clackamas River pumping station directly to the water storage tanks. Plans are being developed to add another storage tank to the system.

A study to assess the feasibility to merge and consolidate all Portland Metropolitan Fire Services (to include Gladstone) was conducted in 1976 by the Tri-County Local Government Commission. This study resulted in a plan calling for a "Metro" fire department which would include all 30 fire agencies into one department. The alternative plan called for the establishment of three fire agencies: The City of Portland, Metro-West, and Metro-East. The City of Gladstone, under this plan, would consolidate with nine other fire districts to form "Metro-East." The plan called for a 5 or 7 member elected board to oversee the Metro-East Fire Department. The plan estimated employing approximately a 100 volunteer fighting force and 450 paid personnel with operation to begin on July 1, 1978. Operating costs for the fiscal year 1977-78 were estimated at approximately ten million dollars requiring a \$2.84 per thousand tax rate. Public response to the proposed Metro-East from affected agencies was negative and thus makes such a merger and consolidation unlikely at this time.

Based on a three to five minute response time (from time of alarm signal to arrival at fire) with the consideration for the grade of roadways, the Gladstone Fire Department could serve an area approximately twice its present size, as depicted on Map III. This expansion would, however, require shifting to a paid full time fire fighting force or similar arrangement. Since Oregon City is presently serving the area south of the Clackamas River, this area was not considered for an extension of service.

MAP III
GLADSTONE FIRE DEPT.
SERVICE AREA CAPACITY



Findings from the cost/revenue study for the fiscal year 1975-76 indicate that the Gladstone Fire Department accounted for 4.5% of the total expenditures for that year. This amounted to \$49,642.55 which served a population of 8,120 for a per capita cost of approximately \$6.11. If one were to assume the fire department was to be financed totally by property taxes, a .615¢ tax rate per thousand would have been required. This tax rate is significantly lower than the \$2.84 per thousand tax rate required of the proposed Metro-East Fire District.

If we were to assume the Gladstone Fire Department were operating at its projected capacity serving the area as identified on Map III, the area would encompass a population of approximately 23,000 by the year 1990. This would amount to a \$2.16 per capita cost (1975-76 costs) compared to the 1976 per capita costs of \$6.11.

STREETS

There are approximately 37 miles of streets in Gladstone. A grant from the Economic Development Administration (EDA) has enabled the city to resurface several streets in the downtown area recently. The enforcement of street standards in new subdivisions along with a continuing maintenance program has kept most city streets in a relatively good condition. However, a number of streets continue to suffer from frequent erosion of road edges and surfaces and many areas lack curbs, sidewalks and gutters.

PARKS

Gladstone is fortunate to be bordered on three sides by the Willamette and Clackamas Rivers. Their banks offer a wilderness playground for local youths, as well as an opportunity for local anglers to fish for trout and salmon. The flood plains offer excellent soils for the area's community garden. At Cross Park families have picnicked and swam along the riverbank and, for the adventurous, diving from Hi Rocks offers many thrills. The new play equipment at City Park has drawn children from all over the area. In all, Gladstone can boast an excellent park system which offers a variety of activities for all age groups.

Planning a park system which will meet the present as well as future park needs requires following a number of steps. These steps include:

1. An inventory of existing parks
2. A comparison of present park land with national standards to determine park needs
3. Identifying future park sites
4. Implementing the park plan through land acquisition and development

Within Gladstone there are approximately 93 acres of publicly owned park land with an additional 6 acres of private open space within existing subdivisions. Public parks include Meldrum Bar (73.21 acres), Buzzard's Cave (6.95 acres), Cross Park (4.588 acres), City Park (4.13 acres), Dierickx Memorial (2.02 acres), Hi Rocks (1.97 acres), Stocker Park (.23 acres), a small public park abutting Welter Park Subdivision on the south (.23 acres), and the Sherwood Forest Tot Lot (.11 acres). In addition, park and recreation facilities are provided at the three Gladstone Schools.

Minimum standards have been established regarding the number, type and size of parks needed for a given population. As identified in Table VII, below, Gladstone is in need of more parks for its present (9,000) and saturation level (12,000) populations.

T A B L E V I I
P A R K N E E D S

PARK TYPE	9,000 POPULATION	12,000 POPULATION	21,000 POPULATION
Tot Lots (1 per 2500 pop.)	(#) 3.6	(#) 4.8	(#) 8.4
Pocket Park (1 per 2500 pop.)	(#) 3.6	(#) 4.8	(#) 8.4
Neighborhood (2.25 acres per 1,000)	18-22.5 acres	24-30 acres	42-52.5 acres
Community (2-3.5 acres per 1,000)	18-31.5 acres	24-42 acres	42-73.5 acres

SOURCE: Urban Planning and Design Criteria, Dechiara, Joseph; Kppelman, Lee, Van Nostrand Reinhold Co., 1975 and Anatomy of a Park, Rutledge, Albert J., McGraw-Hill Book Co., 1971.

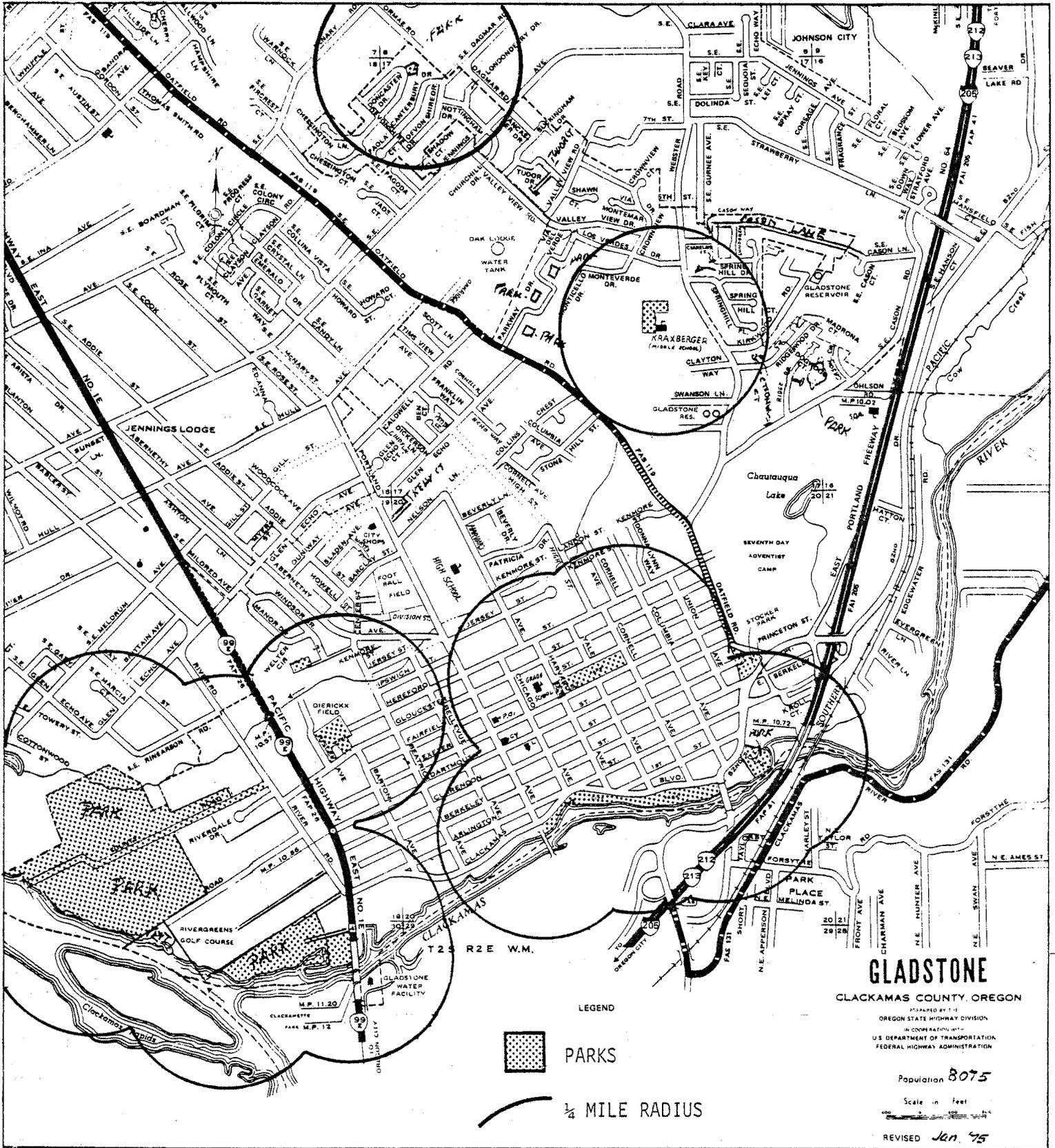
Tot lots normally include play areas with equipment for small children. Play areas at the City Park/Elementary School, Dierickx Memorial and Sherwood Forest Lot 23 would be classified as tot lots. There is need of one additional tot lot for the present population and a need of two additional lots for the ultimate 12,000 population.

Pocket parks are usually located in areas characterized by large numbers of pedestrians such as commercial centers and high density residential areas. The city presently lacks any pocket parks, although such are proposed within the Gladstone Center along the Clackamas River at Hi Rocks. There is a present need of five pocket parks and a future need of nine.

Neighborhood parks generally serve a radius of 1/4 to 1/2 miles, or one neighborhood, providing a variety of passive and active recreational facilities. Neighborhood parks within Gladstone include City Park, Cross Park, Hi Rocks Park, and Dierickx Field. There is need of an additional one or two neighborhood parks within Gladstone adding from 12 to 30 acres of neighborhood park land.

Community parks which serve several neighborhoods are typically 40-100 acres in size per site or about 2.35 acres per 1,000 population. Essentially, Meldrum Bar and Buzzard's Cave serve as community parks, which would serve an ultimate population of approximately 21,000 or a radius of two miles.

Although Gladstone has a substantial amount of park land offering a variety of activities, accessibility by area residents is varied. As shown on Map IV, the older section of Gladstone is well within a reasonable walking distance to park and recreational facilities. The newer sections of town to the north, however, except for the area near the Kraxberger Middle School, generally must rely on the automobile to reach the parks in the southern sections of town. For pre-schoolers and the elderly, mobility is extremely limited and thus such distances are critical.



MAP IV
NEIGHBORHOOD PARK SERVICE AREAS

The majority of the population, however, is quite mobile and thus most of the parks are within a reasonable distance to area's residents. Completion of the bikeway system would be effective in linking the parks with residential neighborhoods and thus add to their accessibility.

There are presently no plans for the purchase of additional park land within the city. Some thought has been directed toward development of a park/recreational facility at the Kraxberger Middle School.

One of the main deficiencies of the Hi Rocks/Cross Park area is parking. The Cross Park area, and abutting vacant land, accommodate from 40 to 50 cars. There is need for approximately 50 parking spaces at Cross Park and from 75 to 100 parking spaces at Hi Rocks.

Parking at Meldrum Bar is very adequate though undefined. Implementation of the park plan will address the parking needs of this area.

Park expenditures for fiscal year 1975-76 totaled \$53,186.00 for a 4.8% of the total city expenditures. This amounts to a per capita cost of approximately \$6.59. To supplement city funds, a number of state and federal grants have been sought. A \$38,000 grant to finance a portion of the Meldrum Bar Park improvements has been secured. Improvements include the construction of a boat ramp, improved access roads, paved parking, restrooms, ramp riprap and picnic tables. The grant was awarded by the Oregon State Marine Board. The community garden, also located at Meldrum Bar, is operated by the Needs Council and the Clackamas County Community Action Agency.

For Cross Park, a \$12,000 Bureau of Outdoor Recreation Grant and a \$12,000 Gladstone General Fund match have been obtained to finance the development of restrooms, picnic facilities, regulation signs, landscaping, improved parking area and bicycle and hiking trails.

City Park will see several improvements from a \$12,000 allocation through a \$6,000 Bureau of Outdoor Recreation Grant and a \$6,000 match by the city. These improvements include construction of a surfaced parking area, curbing along the perimeter of the park, benches, landscaped berms, horseshoe pit improvements and play equipment construction. The play equipment at City Park was financed by a number of organization to include the City of Gladstone (Revenue Sharing), Dant and Russell Lumber Company, Bureau of Outdoor Recreation and the Gladstone Parents Club. In addition, the city purchased a slide to replace an existing slide on the new play equipment which proved to be inadequate.

Play equipment recently installed at Dierickx Field was donated by the Gladstone Lions Club.

Hi Rocks Park is to see some improvement upon the development of the Gladstone Center abutting the park to the north. Improvements include the adding of dirt fill to the parking area to provide for more parking space and the development of a bikeway along the Clackamas River in front of the Gladstone Center creating a riverside bikeway.

In summary, Gladstone should begin to expand its park system so as to meet the needs of present and future populations. The number, type, size and location of future parks have been identified above. Continued improvements to existing parks will naturally result in their increased use and thus maximize use of the city's facilities.

RECREATION

Supplementing the park facilities are the programs being offered by the Gladstone Community School and the City Department of Recreation. The Community School began in the Spring of 1973, and was created to meet the recreational, continuing educational, and cultural needs of Gladstone area residents. In order to accomplish this goal, the following objectives were established:

1. The increased use of school facilities.
2. The increased use of city facilities.
3. Increased involvement of local citizens and their schools.
4. Discover wants and needs of the community and design programs to meet these.
5. Maximize use of special skills and talents of local residents in a volunteer capacity.
6. Provide year-round program with involvement and activities for children, youth and adults.
7. Strengthen communications among residents within the community.
8. Improve communications between agencies serving the community.
9. Facilitate delivery of available social services.
10. Develop special programs, i.e. pre-school, handicapped, senior citizens, single parents, etc.
11. Supplement established school curriculum by making community resources available.

The City Department of Recreation had its inception in the Fall of 1976. This department assumed the recreation programs being offered by the Community School and, in turn, expanded the program to better utilize the city's park facilities.

The school recreation facilities available to the city recreation department include two regular and one small-sized gym at the high school, and two regular sized gyms at Kraxberger. Due to heavy school use of these gyms during the Winter-Fall, however, use is very limited by the city recreation department. The grade school gym is used extensively by the Community School/Recreation Department. However, no day use is allowed. In addition, the recreation programs must compete for gym use with other organizations such as the Girl and Boy Scouts.

Programs offered through the Community School and Recreation Department are directed to serve all age groups from pre-schoolers to senior citizens. A city-wide "Needs Assessment Survey" is underway by the City Department of Recreation to determine their effectiveness in meeting the community's recreational needs.

Various forms of recreation and entertainment are offered by quasi-public and private organizations within the Gladstone area. The Gladstone Community Club, located at 255 E. Exeter, provides a meeting hall for several organizations to include: The Gold Star Club, JayCees, Veterans of Foreign Wars, Garden Club, Golden Age Club, Alcoholics Anonymous, Community Club and various dance and art classes. Of these organizations, the Gold Star Club is in need of a larger facility with the 80 to 100 membership. The Gold Star Club is considering utilizing the basement of the St. Stephens Lutheran Church which would accommodate approximately 100 to 150 persons.

A recreational hall is located within the Travelodge Mobile Home Park along River Road. The park offers various recreational activities to area residents such as pot lucks, games, dances and more.

The Oregon City Senior Center located at 706 Jefferson in Oregon City offers a variety of programs to Clackamas County residents. These activities include the Loaves and Fishes Noon Meals Program, dancing, games, crafts and more. Of the 400 registered members at the Oregon City Center, 1/2 to 2/3 of the membership are from Gladstone.

Within the private sector, six clay tennis courts are proposed for the 82nd Drive area east of I-205. Within the same area a roller skating rink with a capacity of serving approximately 700 skaters is also proposed. The Milwaukie Racket Club and the Milwaukie Elks, both located along McLoughlin Blvd., although not within Gladstone, do serve several Gladstone residents.

In summary, the data regarding demand for recreational activities and park use in Gladstone is extremely limited. Monitoring procedures instituted by the recreational department, together with the results from the city-wide needs assessment survey will help fill this void. Recent developments in the private sector indicate a response to the recreational needs of area residents. There is, however, an expressed need for a multi-purpose center either operated by the private sector such as a YMCA, or the public sector. The multi-purpose center would need to meet the recreational needs of all age groups and be large enough to support a swimming pool and gymnasium at a minimum. A senior center, in conjunction with the multi-purpose center, is also urgently needed in Gladstone.

LIBRARY

The Gladstone Library is a regular city department supported by city funds and a county allocation. A five member Library Board sets library policy guiding the librarian in running the day-to-day affairs of the library. The Board has been very supportive of the library and its staff and in the words of its chairman, Kent Lloyd, "if the community is expected to grow by three times, we needed to grow by four."

The 1966-67 Library Budget was \$78,258.00. Actual expenditures amounted to \$76,142.98. About 70% of the expenditures went to paying personnel salaries, 12.5% was spent on books and 1.4% on periodical subscriptions. The present library building, at 135 E. Dartmouth Street, was completed in 1962. Since then, it has been expanded in 1972 and again in 1977.

The library holds over 24,000 cataloged volumes and some 3,000 to 4,000 uncataloged paperbacks, 62% of which constitute adult reading material. The books are stored on over 3,000 linear feet of shelving that is almost 100% open to the public, and restrictions on their use are kept to a minimum. The library subscribes to 82 periodicals and is open for service 53 hours per week. Its seating capacity is 34 seats. A staff of about five full-time people, including the librarian, help run the library.

Users of the Gladstone Library also have access to libraries in neighboring cities. The Clackamas County cooperative library service plan promises to make use of all public libraries in the county free and more convenient. Such a system would assist small cities like Gladstone in providing adequate library service through a cooperative effort based on the pooling of resources.

The Library sponsors coffee hours (under the auspices of the Friends of the Library), social hours, displays, guest speakers and recreational programs. It works with city clubs, the Gladstone Art Guild, and the Community School to create interest in the library and to encourage the use of its materials. "The main objective of the Library," according to Gladstone Librarian Ruthalys McKinney, "is service, and service with good will. We try very hard to perform a one to one guidance service in every way possible" to both Gladstonians and non-Gladstonians. She reports an increasing demand on professional resources and the need for a children's librarian. The number of registered borrowers is 3,425 and the per capita circulation is very high.

Up to about a year ago, the county used to provide cataloging services, so little cataloging was done by the Gladstone Library staff. Lack of both space and staff has thus forced the librarian to consider having a private firm do the cataloging of up to 80% of the books purchased. Other books and non-book materials will be processed by the staff at the Library.

This rather quick inventory of library facilities and services shows that the Library actually meets and exceeds minimum public library standards in the area of book holdings and periodical subscriptions, and in the number of hours it is open for service. At the same time, the staff has attempted to utilize library facilities and to provide the needed services, given the size of both the Library and the city, and the nature of its clientele.

However, the Library, despite the latest expansion, is already about 400 sq. ft. below minimum floor space standards. Its total floor space now, including the new addition, is 5,100 square feet, which is 400 square feet short of the minimum required for a city the size of Gladstone. Its seating capacity is below minimum; six additional seats are needed to meet minimum requirements. Those six seats would require close to 200 square feet of floor space to accommodate them. More work space for the library staff is also needed.

One way to keep demand for shelving space low is to weed out (or withdraw) about 5% of the collection annually. The Gladstone Library has been withdrawing or weeding books at the rate of 2% a year. This is partly due to the fact that the collection is relatively new; but as it gets older, more is likely to be withdrawn.

Library requirements for an ultimate population of 12,000 sometime between 1990 and 1995, would be as follows:

Books	30,000 volumes
Periodicals	100 titles
Shelving	3,750 linear feet
Floor Space for Shelving	<u>3,000 square feet</u>
Reader Space	<u>1,500 square feet</u>
Library Hours	50-55 per week
Personnel	1 professional 1 college graduate 2 library assistants 2 clericals 1 page
Staff Work Space	<u>1,000 square feet</u>
Other Floor Space	1,300 square feet
Total Floor Space	6,800 - 7,000 square feet

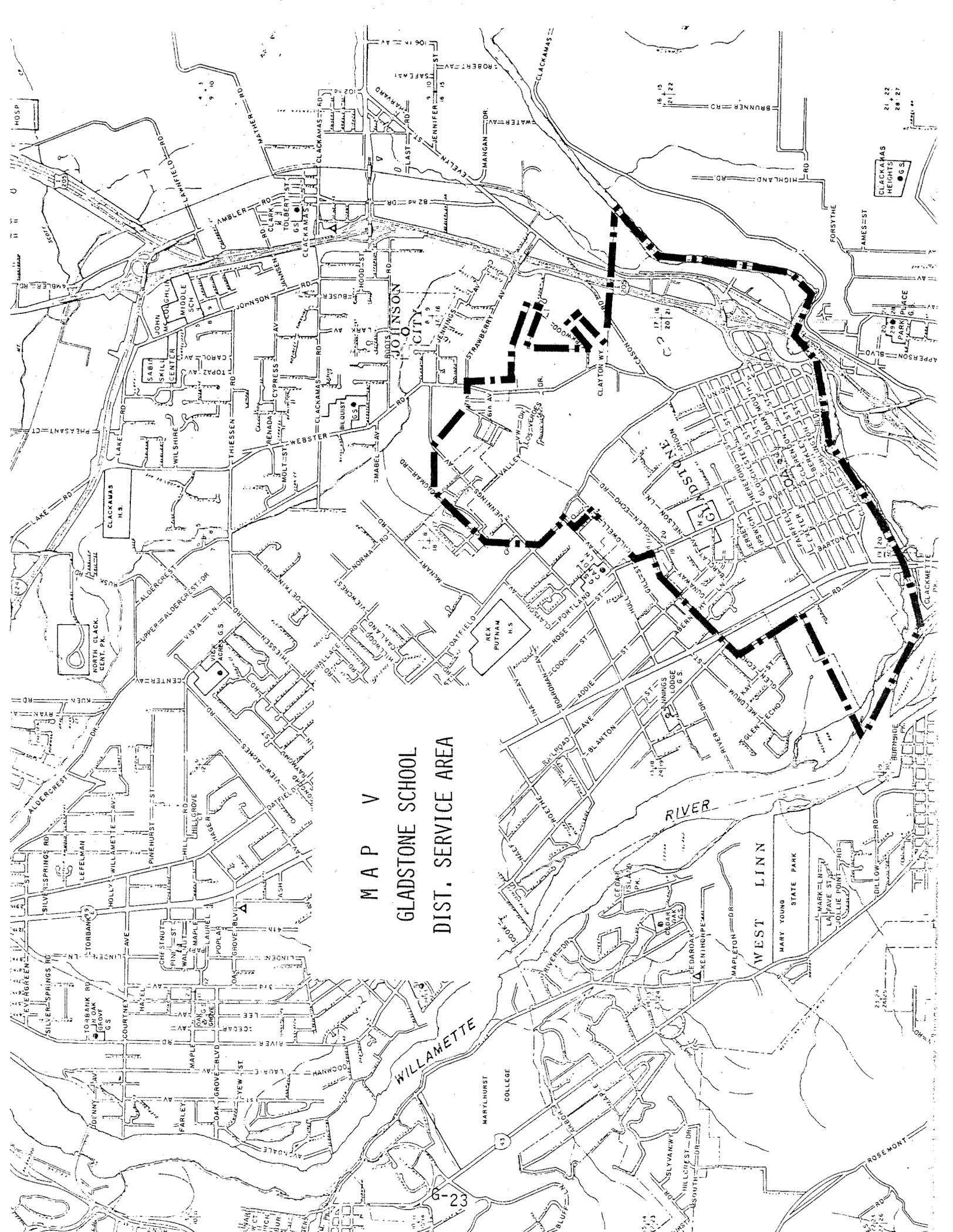
SOURCE: American Library Association Standards

SCHOOLS

The Gladstone School District presently operates three schools, Gladstone Elementary serving grades K-4, Walter Kraxberger Middle School serving grades 5-8, and Gladstone High School serving grades 9-12. The Community School, which operates in the evenings, utilizes all three schools.

Other schools serving the approximately 100 school age children in the city but outside the Gladstone School District include: Candy Lane Elementary serving grades K-6, Jennings Lodge Elementary serving grades K-6, Rivergate Adventist School serving grades K-8, Ogden and Moss Junior High serving grades 7-9, and Oregon City High School serving grades 10-12. A few students attend schools in the North Clackamas District.

As depicted on Map V, the Gladstone School District serves the majority of the city with the inclusion of some residences outside the city. There are approximately 2,173 (June, 1977) school-age children within the district. Of this number, approximately 7% are either attending private schools or simply not attending school, leaving a total student enrollment of about 2,040.



MAP V
GLADSTONE SCHOOL
DIST. SERVICE AREA

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There are 37, 29 and 41 teachers at the elementary, middle and high schools respectively. This represents a very favorable student/teacher ratio of 18 to 1 and a student/class ratio of 22 to 1. Class size variations exist according to the type of instruction and the subject matter. A federally financed special education program is available to students with speech, hearing, learning and/or emotional problems.

T A B L E V I I I
GLADSTONE AREA SCHOOL ENROLLMENTS AND CAPACITIES

<u>SCHOOLS</u>	<u>TOTAL SEPT. 1976 ENROLLMENT</u>	<u>TOTAL ENROLLMENT CAPACITY</u>
Gladstone High School	604	900
Kraxberger Middle School	612	650
Gladstone Elementary	724	700
Candy Lane Elementary	274	350
Jennings Lodge Elementary	213	275
Rivergate Adventist School	96	120

SOURCE: City Survey, July, 1976.

As shown on Table VIII, Kraxberger, Gladstone Elementary and Rivergate are near or exceeding capacity. Ideally, maximum student population per elementary school should be from 300 to 500 students. The Gladstone Elementary School is far exceeding this maximum level.

Based on a standard of five acres per school plus one acre per 100 students, the Gladstone Elementary School should have 12.5 acres of land vs. the present 8 acres. Kraxberger Middle School, on the other hand, has 20 acres whereas only 10.5 acres would normally be required. The High School has approximately 18 acres with 11.5 (plus) requirement. Although situations vary and standards are not always applicable, the Gladstone Elementary School is far exceeding its capacity and a sizable amount of land is available for expansion at the Kraxberger School.

Overall, the Gladstone School District has been growing at an average annual rate of approximately 7% with the median annual rate about 5%.

T A B L E I X
GLADSTONE SCHOOL DISTRICT #115
STUDENT ENROLLMENT PROJECTIONS

<u>YEAR</u>	<u>5% (MEDIAN)</u>	<u>7% (MEAN)</u>
1977	2040	2079
1978	2142	2224
1979	2249	2380
1980	2361	2547

SOURCE: Gladstone Planning Department Projections, 1977.

Given the present zoning and land use, population saturation levels for the City of Gladstone are expected between 1990 and 1995. The Gladstone School District can expect to serve an ultimate student population of about 2600 to 2700. The district can anticipate a 5% annual growth until 1980 followed by a gradual slow down as the area approaches zero population growth.

Generally, the total student population in the Gladstone School District is allocated as follows: 37% elementary students, 32% middle school students, and 31% high school students. This would result in an ultimate population of approximately 1000 students enrolled in the elementary school, 900 students enrolled in each of the other two schools. Thus, the high school would reach capacity, the middle school would require some expansion to accommodate an additional 250 students, and given the 300 to 500 maximum students per elementary school, another elementary school should be constructed.

T A B L E X

GROWTH RATE BY SCHOOL
(5% GROWTH RATE)

YEAR	TOTAL POPULATION	ELEMENTARY SCHOOL POPULATION (37%)	WJK POPULATION (32%)	HIGH SCHOOL POPULATION (31%)
1977	2040	755	653	632
1978	2142	793	685	664
1979	2249	832	720	697
1980	2361	874	756	732
1990-1995	2700	999	864	837

For Fiscal Year '76-'77, the Gladstone School District operated on a total tax of \$1,832,855.65 for a tax rate of \$20.32 per \$1,000 assessed valuation. This was the highest tax rate in Clackamas County. Per student costs were \$1950.20 for high school, \$1046.44 for middle school and \$981.49 for the elementary school with an overall average of \$1301.82.

For the immediate future the Gladstone School District anticipates receipt of Federal Funds for the construction of a remedial center, 3 to 5 additional classrooms, additional office and storage space at the elementary school. Costs are estimated at \$610,000. Presently there are no plans for expansion at the other two schools. The construction of a new elementary school is anticipated to cost between \$1.7 to \$2 million.

In summary, the Gladstone School District, with the addition of a new elementary school and an increased capacity at the middle school from 700 to 900 students, can adequately serve the ultimate population of the district. A 5 to 7% growth rate can be anticipated during the next few years with a slowdown beginning in the early 1980's.

UTILITIES

Electric power is supplied to Gladstone by Portland General Electric Company. Northwest Natural Gas Company provides natural gas to Gladstone's residences and businesses through a system of underground distribution lines. Telephone communication is provided by Pacific Northwest Bell.

FINDINGS

1. Gladstone is almost totally served by its own water system. The Gladstone water system could potentially supply water to a city twice its present size in both area and population. But Gladstone does not, and may never have need, to supply water to areas outside its present boundaries since Oak Lodge and Clackamas Water already serve these areas well.
2. Gladstone is served by three waste treatment facilities. One of these is the Oak Lodge Sanitary District treatment plant which is operating at about 70% capacity and plans are underway for its expansion. Another is Clackamas County Service District #1 which is operating at about 40% capacity. Most of Gladstone, however, is served by the Oregon City waste treatment plant which is operating with over capacity flows most of the year. A Tri-City Service District has been proposed as a solution to Gladstone's waste treatment problem, as well as the problems of its two sister cities.
3. The area is adequately provided with basic public facilities and services, with the exception of the storm drainage system and an inflow and infiltration problem.
4. Gladstone has no sanitary landfill site within its boundaries. Gladstone's solid waste is collected by a private garbage collection company and transported to Oregon City's landfill. Like other cities and communities in the Portland Metropolitan Area, Gladstone's solid waste disposal problems have been addressed by the Metropolitan Service District on a long-range, area-wide basis.
5. Given the present facilities, the Police Department could, with the additional needed personnel, serve an ultimate population of about 20,000-22,000.
6. The Gladstone Volunteer Fire Department is providing adequate fire protection to maintain a fire rating of 5. In order to maintain this rating in the future, the city may have to shift to a paid full time fire fighting force or some other similar arrangement.
7. Many of the city streets have been blacktopped recently, but several streets continue to suffer from frequent erosion of road edges and surfaces and many areas lack curbs and sidewalks, gutters or storm drains.
8. Major park facilities in Gladstone include City Park, Cross Park, Dahl Park and Meldrum Bar Park. Meldrum Bar Park has the potential capacity to serve an ultimate population of approximately 21,000. These parks are presently open to and are being used by non-city residents. Gladstone lacks sufficient indoor recreation facilities to adequately carry on its recreation programs.
9. The Gladstone Public Library presently does meet library standards in the area of book holdings and periodical subscriptions, and in the number of hours it is open for service. However, library space is about 400 square feet below minimum floor space standards for a city the size of Gladstone. It's seating capacity is below minimum, and the work space for the library staff is also below minimum.
10. The city has no direct responsibility to provide school facilities and services. This responsibility is vested in Gladstone School District #115 and it is this district that is currently planning for future population growth. According to the school board and administration, there is need for an additional

elementary school and expansion of the middle school.

11. Portland General Electric and Northwest Natural Gas serve the Gladstone area. Telephone communication service is provided by Pacific Northwest Bell.

STATE AND REGIONAL GOALS

LCDC GOAL

"To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development."

CRAG GOAL

"To foster...orderly development of land within urban areas, within governmental fiscal capabilities and optimal use of existing facilities, utilities and services."

G R O W T H M A N A G E M E N T

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GROWTH MANAGEMENT

INTRODUCTION

The Urbanization Goal of the Land Conservation and Development Commission requires local jurisdictions to designate their urban growth boundaries so rural land can be identified and separated from urban land. The Land Use Framework Element of the Columbia Region Association of Governments (CRAG) Regional Plan calls on local jurisdictions to define their immediate growth, future urbanizable and urban service areas. The purpose is to determine when and where new developments will be allowed in the region and which city or service district will provide services to these areas in order to accommodate population growth to the year 2000.

The CRAG Land Use Framework Element defines immediate growth areas as lands within and outside city limits which are currently served or fiscally committed to water and sewer, or land identified by cities and counties as intended to be urbanized in the next four to five years. Practically all lands within Gladstone and its neighboring areas meet this definition. Future urbanizable areas are defined as those areas lying between the immediate growth boundary and the urban growth boundary necessary to accommodate population growth to the year 2000. Since Gladstone and its surrounding areas are classified as immediate growth areas, all that is required, therefore, is the determination of urban service areas. The city and adjacent service districts will have to work together on the designation and coordination of urban service boundaries. These boundaries can then serve as a basis for planning facilities and services to accommodate expected growth.

Growth and change are inevitable. Gladstone is, and will be, growing and changing regardless of whether or not growth decisions are made. A number of Gladstone residents have expressed the desire to see Gladstone remain as it is. But Gladstone will, of course, not stay as it is. Therefore, if this city is to preserve its best qualities, it will have to respond to the changes that are, and will be, occurring in and around it.

Growth can occur within present city limits by "in-fill" of vacant or undeveloped land according to existing zoning and land use regulations, or by adopting higher density zoning and encouraging more intensive land uses. The city can also grow by annexing neighboring unincorporated areas. In fact, growth by annexation between 1950 and 1970 was considerable. Since 1970, however, annexation has been limited to small parcels of land, generally vacant, with development taking place after annexation. Extensive annexations from now on will have to involve mostly developed areas. While such annexations may have considerable impact on Gladstone, they also are likely to be quite controversial.

PROS AND CONS OF ANNEXATION

Gladstone could benefit from annexation in several ways. One of these is the possibility of expanding the city's industrial and commercial tax base. Another is increasing non-property tax revenues, which are disbursed primarily on a population-related basis. A third benefit is the opportunity to adjust present irregular city boundaries. A fourth benefit is infusing the city with new residents and residential areas as existing housing stock and residents grow older. High value residential areas bring in younger families and help maintain a balance in household composition and income and in property values. Irregular city boundaries are often problematic in that they do not facilitate service delivery in the areas of fire and police protection and school bus service. Natural and man-made boundaries, such as rivers and major roadways, provide more logical and recognizable boundaries, and may contribute to the development of a sense of identity as a city. A commercial/industrial tax base can mean a major source of property tax revenue because it costs considerably less than it generates in income to the city. In Milwaukie, for example, industry and commerce pay about 40% of the property taxes, while residents pay 60%. In Gladstone, commerce and industry pay only about 12.7% of the property taxes. From a policy standpoint, therefore, industry and commerce in Gladstone need to grow commensurate with residential development either through internal growth or annexation so a favorable balance of commercial/industrial to residential tax burden can be achieved.

Annexation must, however, be in the interest of both the city and the area/s to be annexed. Annexations clearly favorable to the city are industrial parks, shopping centers, office complexes and high-value residential areas. Annexations least favorable to the city, from an economic standpoint, are low-value residential areas with inadequate facilities, and tax-exempt lands and buildings. Annexation is clearly favorable to both parties when excess capacity in city systems can be put to work providing lower costs for all users, and when two sets of administrative personnel and overhead costs can be replaced by one.

When excess capacity in city systems can be extended to areas lacking adequate facilities and services without major capital investments, both parties benefit. Both capital and operating costs would be spread over a wider area, reducing costs to all users. The neighboring area gets improved facilities and services at low cost and the city uses its systems more efficiently. However, this is not entirely true of Gladstone and its neighboring areas. Gladstone has excess capacity in parks, police protection, water supply, and perhaps library facilities and services. Neighboring areas are generally well served through special fire, water and sewer districts. Annexation of areas already served by basic public facilities will not mean the outward extension of Gladstone's facilities and services. It would, at the most, mean the transfer of certain services or facility connections to the city from a special district. When this occurs, potential benefits are not evident.

Net benefits to both parties in an annexation clearly flow from intergovernmental transfer payments. Cities have sources of revenue in addition to property taxes, which are not available to special districts operating in unincorporated areas. Most notable are the state and federal tax entitlements (such as the state gas, liquor and cigarette taxes, and federal revenue sharing), and the various fees, fines, licenses and permit charges that cities are authorized to levy. These

revenues constitute a major portion of city revenues. Since special districts serving citizens in unincorporated areas do not have these sources of revenue, they must finance their operations through user charges or property taxes. Water and sewer districts in the neighboring areas are mainly supported through user charges. Fire districts rely on property taxes. The 1977-78 property tax rate for one fire district (Clackamas Fire District #71) is more than two thirds the entire municipal tax rate for Gladstone (see Table I). Gladstone provides full city services, while this one special district provides only fire protection.

T A B L E I

COMPARATIVE TAX RATE, 1977-78

Gladstone (Full Services)	\$6.18
Clackamas Fire District #71	4.31
Clackamas Fire District #54	3.29
Clackamas Fire District #51	2.90

SOURCE: Clackamas County Tax "Rate Book," for year ending June 30, 1978.

Services provided by Gladstone but are not provided, or are provided inadequately, in neighboring unincorporated areas are (1) library, (2) parks, (3) street lights, (4) police protection, and (5) municipal government. Until the recent passage of the County Library Levy, only city operated libraries were available in the county. Parks and recreation facilities, provided in Gladstone, are not provided in unincorporated areas except through county government when funds are available. Street lights are not provided in unincorporated areas except through local lighting districts which levy special charges. Police protection is stretched very thin over unincorporated areas from the County Sheriff's Office. Currently, Gladstone has one sworn officer per 1,000 population; the county has one sworn officer per 10,000. Gladstone has a small and accessible local government, which can be more responsive than a collection of service districts.

Gladstone, therefore, can offer neighboring unincorporated areas full city services at relatively low property tax rates (see Table II) and a more effective voice in local government. Gladstone has pursued alternative sources of revenue to the property tax and has kept costs of city services under control. It has lowered tax rates in response to major increases in assessed value and has minimized its bonded debt.

T A B L E I I

COMPARATIVE TAX RATES, 1977-78

<u>CITIES</u>			<u>UNINCORPORATED AREAS</u>		
	<u>Total</u>	<u>City</u>		<u>Total (Range)</u>	<u>Mean (Average)</u>
Estacada	\$33.21	\$ 9.01	Clackamas Area	\$20.12-26.30	\$24.67
Oregon City	31.21	7.38	(Fire District #71)		
Molalla	28.35	6.70	Oregon City Area (Rural)	20.95-30.33	25.34
Sandy	28.15	6.67	(Fire District #54)		
Canby	27.98	6.60	Oak Lodge Area	22.97-27.58	24.69
West Linn	27.26	6.31	(Fire District #51)		
Gladstone	26.99	6.18			
Wilsonville	25.84	5.03	Mean (Average)	\$24.97	
Lake Oswego	25.61	6.47			
Milwaukie	23.77	3.71			

SOURCE: Clackamas County Tax "Rate Book" for year ending June 30, 1978.

A further potential benefit to Gladstone and its annexed areas is in the contemplated revision of the financing of certain county services. City residents presently pay for their own police and planning departments and for a county sheriff's office and county planning services. Since these services are provided primarily for unincorporated areas by the county, the residents of those areas should pay for them. A revision of present financing arrangements should result in lower taxes for city residents and higher taxes for residents of unincorporated areas.

GLADSTONE PLANNING AREA (URBAN GROWTH) BOUNDARY ALTERNATIVES

After adopting, on February 6, 1978, the present city boundary as the immediate growth boundary for Gladstone, the Citizen Advisory Committee began considering future growth boundary alternatives. The committee examined five alternatives and made a tentative decision, based on the amount of knowledge available then, with the stipulation that a final recommendation be made only after a detailed study of the chosen alternative is made. It was felt that researching all the five alternatives in depth would require a tremendous amount of time and effort on the part of a small staff within a limited time frame. The following are the five alternatives and the reasons for their rejection or acceptance:

Alternative #1: No change to the present city boundaries. This alternative was thought unacceptable because it would not solve the nagging problem of irregular boundaries, would limit the expansion of the city's commercial and industrial sectors, and would not help in achieving economies of scale. See Map I.

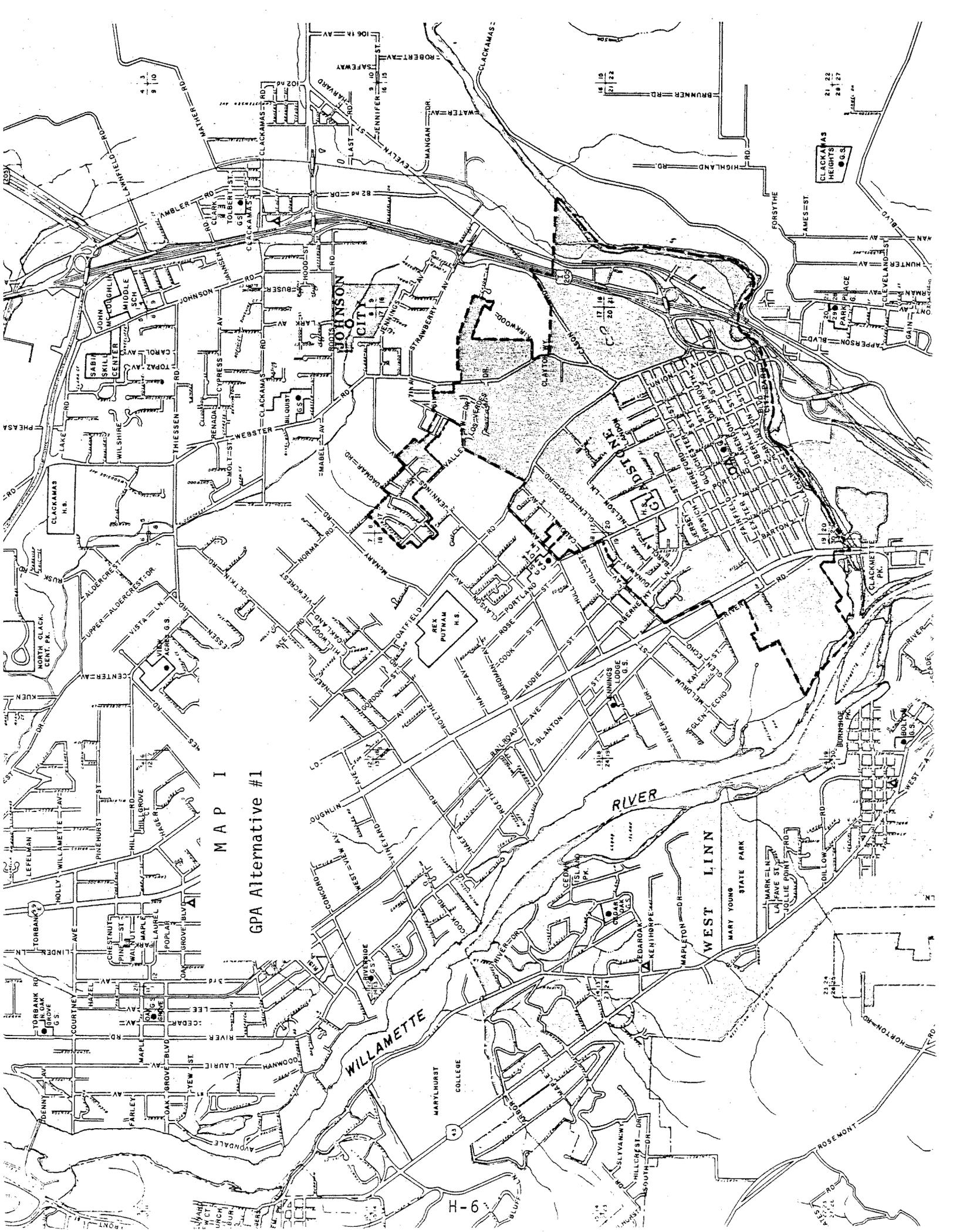
Alternative #2: Add the area to the east of the city bounded by I-205 on the west, Highway 212 on the north, 106th and Robert Avenues to the east, and the Clackamas River to the south-east. This alternative would add 2,000 to 3,000 to present city population, but would at the same time add a significant amount of industrial and commercial property to the city. It was thought that this alternative would be considered as a scheme to grab economically advantageous commercial and industrial land, and may be unfair to surrounding communities. See Map II.

Alternative #3: Extend the northern city boundary to Jennings Avenue including the area north of Jennings within present city limits, to Strawberry Lane in the east with minor modifications to the southern boundary between Park Place Bridge and the Electric Rail Bridge. The boundary on the west would be unchanged except for the extension to Jennings Avenue. This alternative would almost double the population of the city and would eliminate the undesirable irregularities in the boundaries. But it would add much residential and little commercial property. It was, therefore, deemed economically disadvantageous to the city. See Map III.

Alternative #4: Essentially the same as Alternative #3 with two exceptions: a) Jennings Avenue would be the boundary on the east rather than Strawberry Lane, and b) the area east of I-205 would not be included. This alternative would also double the present population of the city. It would add more residential property to the city without adding any commercial or industrial areas. Therefore, this alternative would be even less advantageous than Alternative #3. See Map IV.

Alternative #5: Extend the northern boundary to Jennings Avenue, including the area north of Sherwood Too, running along Jennings Avenue up to Webster Road, then north along Webster to Roots, Roots to Johnson Road,*Johnson to Jefferson Street, Jefferson to McKinley, McKinley to Highway 212, and then east along Highway 212 to 106th, 106th south to Jennifer Street, Jennifer west to Robert Avenue, Robert south to the Clackamas River, and then along the Clackamas River to present city boundaries. The rest of the boundary along the two rivers would remain unchanged with minor modifications between the Park Place Bridge and the Electric Rail Bridge. This alternative was thought to balance the economic advantages of Alternative #2 against the economic disadvantages of Alternatives #3 and #4. At

*Excluding Johnson City



M A P I
GPA Alternative #1

CLACKAMAS
HEIGHTS
21 22
26 27

21 24
24 25

24 26

24 27

24 28

24 29

24 30

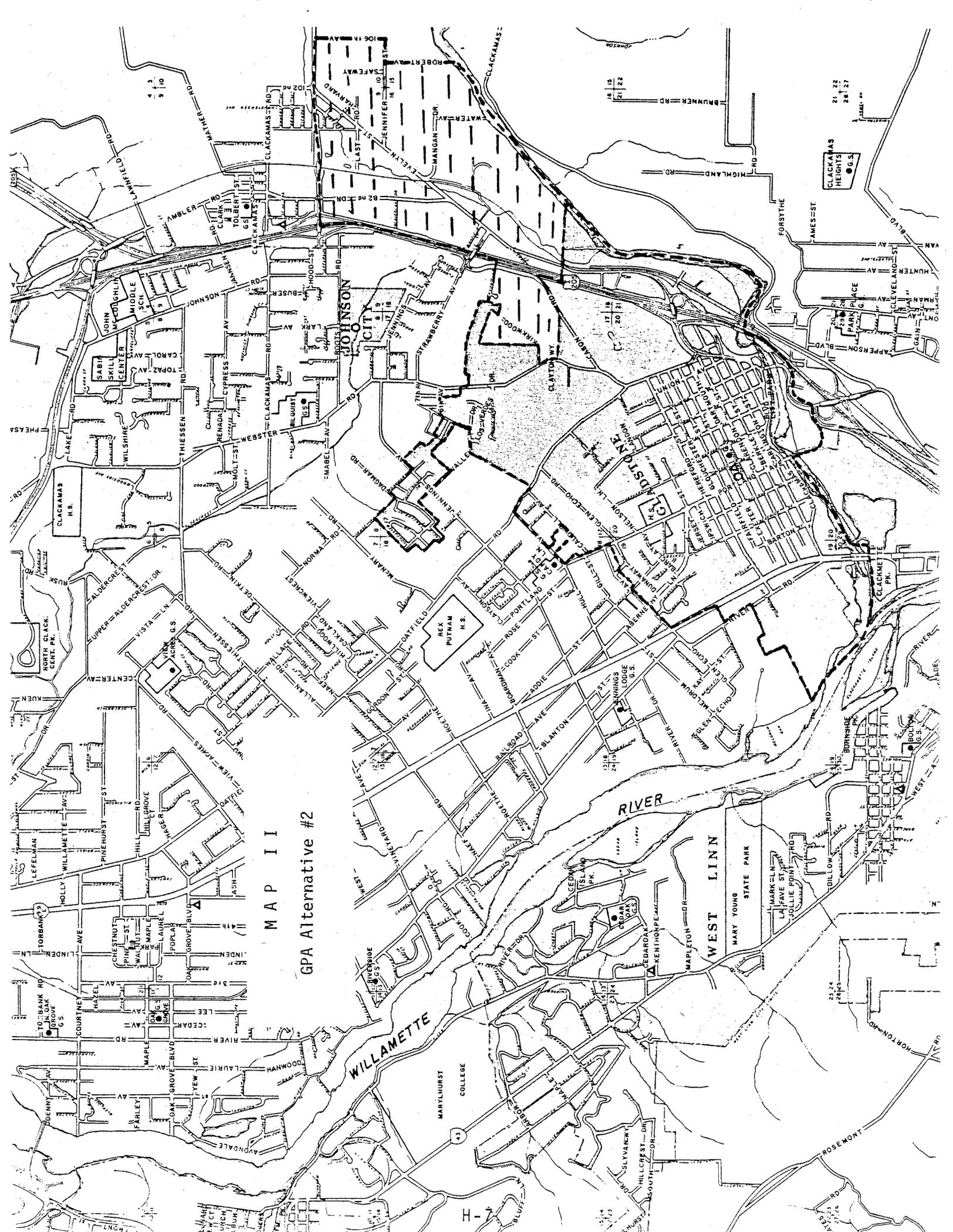
24 31

24 32

24 33

24 34

24 35



MAP II
GPA Alternative #2

WILLAMETTE RIVER

RIVER

WEST LINN

MARYLHURST COLLEGE

MARY YOUNG STATE PARK

ROSE MONT

MARKLEW LA FAVE ST JOLLIE POINT

CLACKAMAS HEIGHTS G.S.

BORERSIDE

CLACKAMAS H.S.

1/4 1/2 3/4

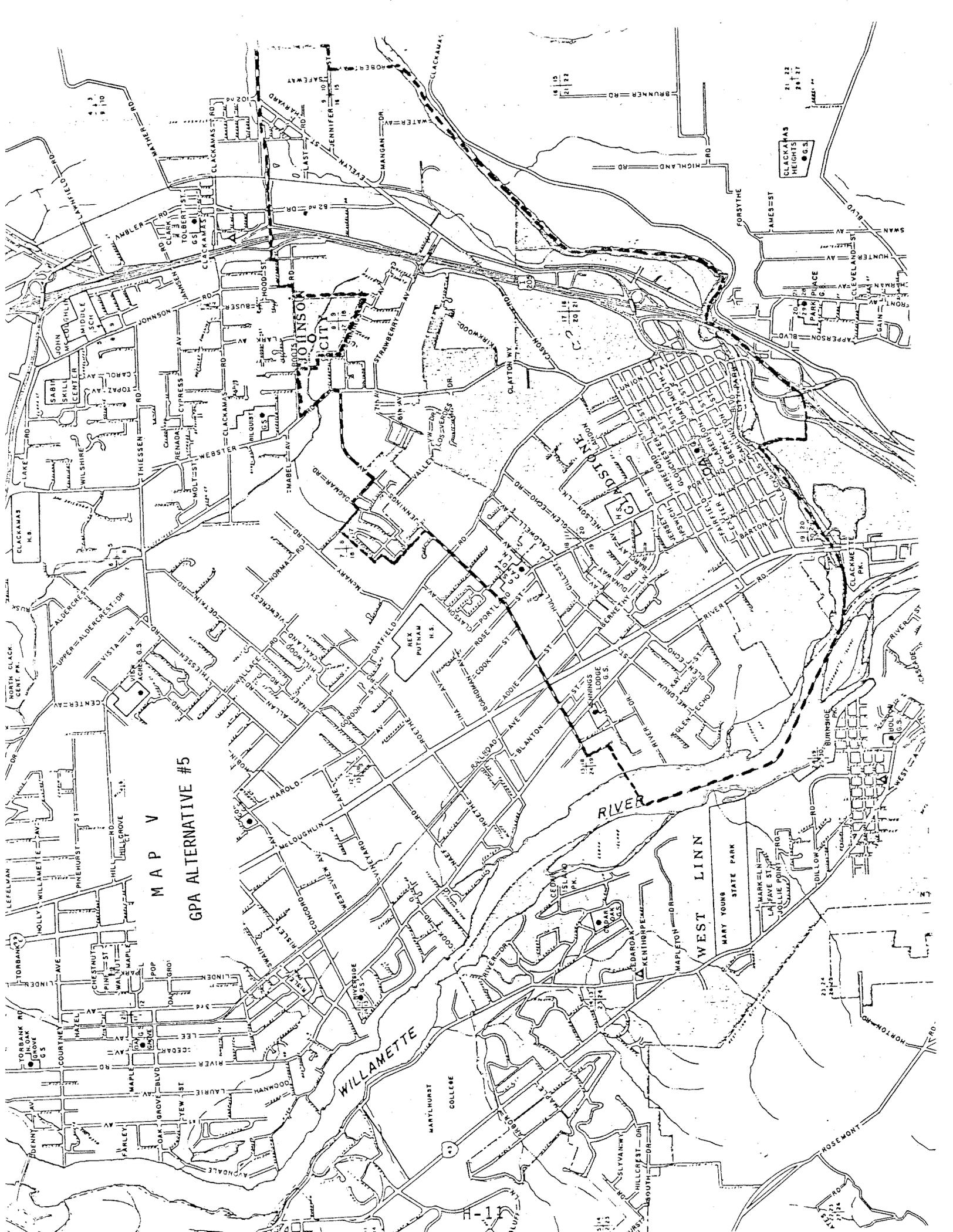
21 22 23 24 25 26 27

CLACKAMAS HEIGHTS G.S.

the same time, it would help the city realize some economies of scale. Moreover, the projected ultimate population of the Gladstone Planning Area, should this be the boundary, would not be more than 20,000 to 21,000, which is not much more than the estimated population of Alternatives #3 and #4. See Map V.

The Committee adopted Alternative #5 with the stipulation that the areas to the north and east come into the city together so the economic balance perceived may remain undisturbed.

MAP V
GPA ALTERNATIVE #5



COMPARATIVE LAND USE ANALYSIS

Unincorporated areas make up 47% of the proposed Gladstone planning area. The unincorporated part of this planning area has more vacant land than Gladstone, which is mostly zoned residential, but also some 137 acres zoned commercial or industrial in addition to 120 acres already developed. It has about half the number of single-family homes in Gladstone, but the area they occupy is larger than the area occupied by single-family homes in Gladstone.

T A B L E I I I
LAND
GLADSTONE PLANNING AREA
1977

	City	Unincorporated Areas	Total	Percent Increase
SF	477 acres	480 acres	957 acres	100.6%
MF	37	17	54	46%
MH	21	12	33	57%
Com.	94	21	115	22.3%
Ind.	4.5	99	103.5	2,200%
Pub./Semi Pub.	184	29	213	15.8%
Parks	97	24	121	24.7%
Vacant	305	448	753	147%
Roads	209	153	362	73.2%
Hwy/Frwy	57.6	46	103.6	80%
R.R.	14.4	12	26.4	83.3%
Total	1,500.0	1,341	2,841.5	89.4%

T A B L E I V
Vacant Land In Unincorporated Areas
1977

<u>Zone</u>	<u>No. Acres</u>
R-7	16
R-10 (20 acres probable open space)	205
R-20	11
RA-1	58
RM-1	6
MG	15
C-2	65
I-2	72
Total	448

Gladstone has twice as many housing units as the unincorporated areas. The inclusion of these housing units in the Gladstone planning area increases the number of single family units by about 50%, multi-family units by 68% and mobile home units by 21%.

T A B L E V
HOUSING UNITS

	<u>City (1977)</u>	<u>Unincorporated Areas</u>	<u>Total</u>	<u>Percent Increase</u>
SF	2,431	1,227	3,658	50.5%
MF	588	399	987	67.8%
MH	249	53	302	21.3%
Total	3,268	1,679	4,947	51.4%

The condition of housing seems to be slightly better overall in the city than in the unincorporated areas. Nearly 84% of single family homes in the city are judged "good," while less than 80% of single family homes in unincorporated areas are given the same classification. However, unincorporated areas have a higher percentage of "good" multi-family units than does the city. The percentage of "poor" units in the unincorporated areas is significantly higher than in the city, but both the city and the unincorporated areas seem to have an equal percentage of combined "fair" single family and multi-family housing units.

T A B L E V I
HOUSING CONDITION
 1978

	<u>CITY</u>					
	Good	Percent of Total	Fair	Percent of Total	Poor	Percent of Total
SF	2,037	(83.8)	368	(15.2)	26	(1)
MF	539	(91.7)	48	(7.3)	6	(1)
Total	2,576	(85.3)	411	(13.6)	32	(1)

	<u>UNINCORPORATED AREAS</u>					
	Good	Percent of Total	Fair	Percent of Total	Poor	Percent of Total
SF	973	(79.3)	216	(17.6)	38	(3.1)
MF	385	(96.5)	6	(1.5)	8	(2)
Total	1,358	(83.5)	222	(13.6)	46	(2.8)

Housing density is generally higher in the city than in unincorporated areas. The one exception is multi-family housing, which is more dense in unincorporated areas. The average assessed value per single family unit in unincorporated areas is nearly 21% higher than the average assessed value of a single family housing unit in the city. Mobile homes in the unincorporated areas are assessed at 11.6% higher per unit than in Gladstone. On the other hand, the average assessed value per multi-family unit is slightly lower in the unincorporated areas than in the city. Thus,

in the case of housing, assessed value per unit is inversely related to density; i.e., the lower the density the higher is the assessed value and vice-versa.

T A B L E V I I
HOUSING DENSITY

1977

	<u>City</u>	<u>Unincorporated Areas</u>
SF	5.1 units per acre	2.56 units per acre
MF	16 units per acre	23.5 units per acre
MH	12 units per acre	7.56 units per acre

T A B L E V I I I
ASSESSED VALUE PER UNIT

1977

	<u>City</u>	<u>Unincorporated Areas</u>	<u>Percent Difference</u>
SF	\$30,101	\$36,333	+20.7%
MF	12,022	11,939	-00.7%
MH	9,196	10,404	+11.6%

When considering assessed value per acre, housing density and assessed value are directly related. Here, the assessed value per acre in the half-as-dense single family housing developments in the unincorporated areas is nearly 40% less than in the city. Multi-family housing, needless to say, is higher and mobile homes are lower. Thus, higher density is associated with higher assessed value, while lower density is associated with lower assessed value per acre of housing development.

T A B L E I X
ASSESSED VALUE PER ACRE, 1977

	<u>City</u>	<u>Unincorporated Areas</u>	<u>Percent Difference</u>
SF	\$153,511.90	\$ 92,875.08	-39.5%
MF	195,006.49	282,165.29	+31%
MH	110,352.00	78,654.24	-28.7%

The present population of Gladstone is 8,993. Using the same household size and vacancy rates as Gladstone's, the computed number of people in the unincorporated areas is 4,601. This brings the present total population of the Gladstone planning area to 13,591. The ultimate population of the planning area is projected to be 20,000.

T A B L E X

POPULATION

	<u>Present</u>	<u>Ultimate</u>
City	8,993	12,000
Unincorporated Areas	4,601	7,850
Total	13,591	19,850

The unincorporated areas have 21 acres of commercially developed and 99 acres of industrially developed land. That is an increase of 22.3% and 2,200% in developed commercial/industrial land respectively. The addition of these developments increases the assessed value of commercial land uses in Gladstone by 29% and the assessed value of industrial land uses more than 172 times.

T A B L E X I

ASSESSED VALUE

COMMERCIAL/INDUSTRIAL LAND USES

1977

	City	Unincorporated Areas	Total	Percent Increase
Commercial	\$11,799,260	\$ 3,431,960	\$15,231,220	29%
Industrial	102,570	17,650,950	17,753,520	17,208.7%
Total	\$11,901,830	\$21,082,910	\$32,984,740	177%

The assessed value per acre of commercial land use in the unincorporated areas is 30.2% higher than in the city. The assessed value per acre of industrial land use in the unincorporated areas is 3,069% higher than in the city.

T A B L E X I I

ASSESSED VALUE PER ACRE

COMMERCIAL/INDUSTRIAL LAND USES

1977

	City	Unincorporated Areas	Percent Difference
Commercial	\$125,524	\$163,427	+30.2%
Industrial	22,793	722,288	+3,069%

For a comparison between assessed value per commercial and industrial units in the city and in the unincorporated areas, see Table XIII below.

T A B L E X I I I
 ASSESSED VALUE PER UNIT
COMMERCIAL/INDUSTRIAL LAND USES
 1977

	City	Unincorporated Areas	Percent Difference
Commercial	\$97,514.55	\$ 43,442.53	-124.5%
Industrial	102,570.00	928,997.37	+805.7%

The overall increase in the assessed value of housing and commercial/industrial development is more than 77%, 18.7% of which is industrial.

T A B L E X I V
ASSESSED VALUE
 1977

	City	Unincorporated Areas	Total	Percent Increase
SF	\$73,174,517	\$44,580,039	\$117,754,556	61%
MF	7,068,936	4,763,661	11,832,597	67.4%
MH	2,289,804	2,673,828	4,963,632	116.8%
Com.	11,799,260	3,431,960	15,231,220	29%
Ind.	102,570	17,650,950	17,753,520	17,208.7%
Total	\$94,435,087	\$73,100,438	\$167,535,525	77.4%

At the present, commercial land uses in the city pay about 12.5% of taxes derived from residential and commercial/industrial land uses; industry pays 0.11%. The addition of commerce and industry in the unincorporated areas would decrease the commercial share of the tax burden to about 9% and increase the industrial share to 10.6%. The combined commercial/industrial share of the tax burden would be more than 20%. This contrasts with the present 12.7% commercial/industrial share of the tax burden. In addition, the unincorporated areas have 72 undeveloped acres zoned industrial (I-2) and 65 acres zoned commercial (C-2). These could considerably increase commercial/industrial development relative to residential development in the proposed Gladstone planning area.

Unincorporated areas have approximately 200 acres of road right-of-way or about 25 miles of roads. Included is one mile of freeway (I-205) and one half mile of highway (99E) in addition to other streets. The condition of these streets is comparable to the condition of streets in Gladstone.

ADOPTION OF THE GPA BOUNDARY BY THE CAC

On June 5, 1978, the Citizen Advisory Committee made a final decision on the Gladstone Planning Area boundary and map (see Map VI) based on the preceding analysis and findings.

PROVISION OF SERVICES

Oak Lodge and Clackamas Water Districts are currently providing water to the unincorporated parts of the Gladstone Planning Area. There is no need, therefore, for the City of Gladstone to plan on supplying water to these areas in the future. Sewer service is provided to these areas by the Oak Lodge Sanitary District and by Clackamas County Service District #1. These districts will continue to provide this service. Gladstone's involvement in the provision of water and sewer services is likely to be limited to the collection of fees and perhaps the collection of sewer, and most probably will never be involved in sewer treatment. Solid waste disposal has received regional consideration by the Metropolitan Service District. The solution provided by MSD is a solid waste processing plant for the area to replace the Rossman Landfill. Solutions to drainage problems in the area are likely to be arrived at through joint planning among those affected.

Police protection can be provided by the Gladstone Police Department. With additional personnel, the present Police Department facilities are deemed adequate to provide protection to areas within the Gladstone Planning Area. On the other hand, the extension of fire protection to the unincorporated parts of the Gladstone Planning Area will require a paid fire department with expanded facilities and some additional equipment.

Park and recreation facilities and services in the Gladstone Planning Area will have to meet the needs of an ultimate projected population of about 20,000 people. Based on national standards, three tot lots, three pocket parks, 18-23 acres of neighborhood park land and 16-35 acres of community park land are needed in addition to existing park facilities in Gladstone. The unincorporated areas of the Gladstone Planning Area have 24 acres of dedicated park and open space. About 12 acres are developed as a regional park along the Clackamas River known as Riverside Park. Together with Meldrum Bar Park, Riverside Park helps meet the area's community park needs. Leon Lake Park, consisting of five acres, serves as an excellent neighborhood park. Two additional neighborhood parks totaling 13-18 acres will be needed. There are no identified tot lots or pocket parks in the unincorporated parts of the planning area. These can be provided on portions of land zoned for residential development but have severe site development limitations.

Extension of library services to unincorporated areas will, of necessity, require the expansion of library facilities and services. The table below shows those increases in facilities and services which might become necessary.

MAP VI
GLADSTONE PLANNING
AREA BOUNDARY



T A B L E X V
LIBRARY REQUIREMENTS

	<u>Gladstone</u>	<u>Gladstone Planning Area</u>
Ultimate Population	12,000 people	20,000 people
Books	30,000 volumes	40,000 volumes
Periodicals	100 titles	100 titles
Shelving	3,750 linear feet	5,000 linear feet
Shelving Floor Space	3,000 square feet	4,000 square feet
Reader Space	1,500 square feet	2,400 square feet
Seats	48	80
Library Hours	50-55 per week	50-60 per week
Personnel:		
Professionals	1	2
College Graduates	1	1
Library Assistants	2	3
Clericals	2	2
Pages	1	2
Staff Work Space	1,000 square feet	1,450 square feet
Other Floor Space	1,300 square feet	1,800 square feet
Total Floor Space	6,800 square feet	9,650 square feet
Total Personnel	7	10

SOURCE: American Library Association Standards

The Gladstone School District serves most of the planning area. The boundaries of this district are not likely to undergo any major changes; minor adjustments are possible. The rest of the planning area is served by the North Clackamas School District and by Oregon City Schools. Schools in the unincorporated areas include Jennings Lodge and Candy Lane. Jennings Lodge high school students attend Oregon City Schools. Jennings Lodge residents have considered merger with the North Clackamas or the Gladstone School District. However, all decisions involving school boundary changes are made by the Intermediate Education District (I.E.D.).

FINDINGS

1. Gladstone is surrounded by urban development.
2. Determination of urban service areas is the most important consideration for the city and special service districts.
3. Gladstone's tax base is weak; as a result, it relies heavily on a residential tax base.
4. Commercial/industrial land uses are financially advantageous to the city.
5. The unincorporated areas are already provided with basic services by special service districts.
6. The city provides full urban services to its residents for a modest cost.
7. The city receives non-property tax revenues distributed on a per capita basis, which are not available to special service districts operating in unincorporated areas.
8. The city provides a full range of municipal services, while unincorporated areas have to rely on the county and special service districts for the provision of these services.
9. Unincorporated areas make up 47% of the Gladstone Planning Area and have more vacant land than does Gladstone.
10. The number of housing units in the unincorporated areas is about 3/5 the number of units in Gladstone.
11. The condition of housing in these areas is generally almost as good as the condition of housing in Gladstone.
12. Housing density is higher in the city than in unincorporated areas.
13. The assessed value per single family and mobile home unit is higher in the unincorporated areas than in the city; while the assessed value of multi-family units is slightly lower.
14. The total present population of the planning area is 13,591, and the ultimate population is projected to be around 20,000.
15. Developed industrial land in the unincorporated areas is 22 times that in the city (99 acres vs. 4.5 acres) but only about 1/5 commercial (21 acres vs. 94 acres).
16. The assessed value of developed industrial land in the unincorporated areas is 172 times higher than that within the city; the assessed value of commercially developed land is less than 1/3.
17. The commercial/industrial share of the tax burden in the city is 12.7%; in the planning area as a whole, it is 20%.
18. Unincorporated areas have 72 undeveloped acres zoned industrial (I-2) and 65 acres zoned commercial (C-2).
19. Gladstone's present boundary in the north and east is quite irregular and does present problems in the delivery of some services.

STATE AND REGIONAL GOALS

The Gladstone Policy Plan must address the Urbanization Goal of the Oregon Land Conservation and Development Commission (LCDC), as well as the stated goals and objectives of the Columbia Region Association of Governments (CRAG).

LCDC GOAL

"To provide for an orderly and efficient transition from rural to urban land use."

"Urban growth boundaries shall be established to identify and separate urbanizable land from rural land.

Establishment and change of the boundaries shall be based upon consideration of the following factors:

1. Demonstrated need to accommodate long-range urban population growth requirements consistent with LCDC goals;
2. Need for housing, employment opportunities, and livability;
3. Orderly and economic provision for public facilities and services;
4. Maximum efficiency of land uses within and on the fringe of the existing urban area;
5. Environmental, energy, economic and social consequences;
6. Retention of agricultural land as defined, with Class I being the highest priority for retention and Class VI the lowest priority; and,
7. Compatibility of the proposed urban uses with nearby agricultural activities."

CRAG GOALS AND OBJECTIVES

CRAG's goal directs that the plan shall foster "orderly development of land within urban areas, within governmental fiscal capabilities, and optimal use of existing facilities, utilities and services."

Substantive Objectives

"All lands in the region shall be included in one of the following three general classifications:

- a. "Urban: Lands shall be inventoried and designated within urban growth boundaries for future urban growth to meet urban population needs forecast for a minimum of twenty (20) years. The primary use of lands within urban growth boundaries shall be urban development.
- b. "Natural Resource: Agricultural lands shall be inventoried, preserved and maintained and forest lands shall be inventoried and conserved for farm and forestry uses or other natural resource activities, within designated Natural Resource Areas.

- c. "Rural: Lands shall be designated within rural growth boundaries to meet a variety of use patterns allowing flexibility of housing location. Typical uses include: small farms and large-lot homesites. Development within rural growth boundaries shall remain non-urban in character and density, but shall occur in a manner that would not preclude future urban development. Lands within rural growth boundaries may be converted in the future to urban use only upon determination of public need."

Procedural Objectives

- a. "Cooperative Designation of Land Use Classifications. Designation and change of Urban, Natural Resource and Rural Area boundaries shall be a cooperative process between the Columbia Region Association of Governments and affected cities and counties.
- b. "Urban Inventory. For purposes of establishing initial urban growth boundaries, 'Inventory' shall mean an identification and quantification of vacant land five (5) acres or larger within Urban Areas.
- c. "Economic Monitoring. Procedures shall be adopted by the CRAG Board to provide monitoring of the economic and related social impacts of the urban and rural growth boundaries.
- d. "Natural Resource Inventory. For purposes of establishing initial Natural Resource Areas, 'Inventory' shall mean an identification and quantification of agricultural and forest land based on data available from the Soil Conservation Service, U. S. Department of Agriculture.
- e. "Agricultural and Forest Lands in Rural Growth Boundaries. Unless exempted through the exception procedures of LCDC Goal 2, Part II, agricultural or forest lands within designated rural growth boundaries shall be preserved and maintained for farm use or conserved for forestry.
- f. "Mineral and Aggregate Resources. Lands containing mineral and aggregate resources shall be inventoried. Those mineral and aggregate lands that are not in conflict with the public need for the preservation of other natural resources shall be identified and conserved to the extent determined necessary to support future development.
- g. "Hazard Areas. Lands subject to natural disasters and hazards shall be identified and inventoried for purposes of preventing loss, damage or destruction of life and property by limiting uses to those compatible with the character of the natural disaster or hazard areas.
- h. "Resource Lands and Hazard Areas Within Urban Growth Boundaries. Lands within urban growth boundaries designated for preservation or conservation of mineral and aggregate resources or for protection within hazard areas shall not be included in lands calculated to meet urban population need."

