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BOZEMAN

HILLSIDE HOUSING

HILLSIDE HOUSING DEVELOPMENT

Part I

Undergraduate Thesis in Architectural Design

by
Glen A. Cloninger

Submitted to the School of Architecture as partial fulfillment of the requirements for the degree of Bachelor of Architecture

at

Montana State University

Bozeman, Montana
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October 10, 1968

Glen A. Cloninger
1216 Elk Street
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Mr. Gough, Mr. DeHaas, Mr. Carver,
Mr. Wessel, Mr. Rand, Mr. McClure
School of Architecture
Montana State University
Bozeman, Montana

Gentlemen:

I have spent nearly two weeks in preparing the revisions of my thesis. Directly following the section of economics is a complete new section labled "A Building Program." The building program section contains new information and some revisions that were requested in Mr. Carver's, Mr. DeHaas's, and Mr. McClure's letters. After the building program is the Bibliography followed by the Appendix which also contains explanations and clarification of the previously mentioned letters.

I do hope that you will find all of the points that have been discussed in your letters fully answered in the building program and Appendix. Upon your decisions of the resubmitted thesis, I can begin the design stages. I can honestly say that the building program section has been very beneficial to me. It has helped me to define my project which I am sure it will help immensely in the design stages.

Sincerely,

Glen A. Cloninger

Glen A. Cloninger

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PROPOSAL

From the time that I first entered Montana State University I started formulating my ideas of a "Garden Housing Development." Since that time many revisions and additional plans have added to my original program.

The purpose of this thesis is to design a hillside housing complex which provides a park-like atmosphere for faculty members, single students, married students, and also persons not affiliated with Montana State University. I have also considered this to be a solution to the problems that arise when all single students live in an area of their own, mass dormitories; faculty members reside within their faculty housing, and married students, because of their restricted budgets and available housing, reside in sub-standard conditions.

Included in this thesis, attention will be given to a community park and a north-south arterial for the east side of the city.

CONDITIONS CREATING A NEED

"Once there was a hunter who spent his days tracking the wide prairies of North Dakota with his gun and dog and sometimes with a small boy who would beg to trot along. On this particular morning hunter and boy, far out on the prairie, sat watching intently a rise of ground ahead of them. It was pecked with gopher holes. From time to time a small striped gopher would nervously whisk from the mouth of his den to the cover of the matted prairie grass and soon reappear to dive back into his den with cheek food pouches bulging.

'Smart little outfits, the gophers,' the hunter observed. 'I mean the way they have things figured out. Whenever you come upon a gopher village you can be sure it will be near a patch of grain where they can get their food, and close by a creek or flough for water. They'll not build their towns near willow clumps or alders for there's where the owls or hawks will be roosting. And you'll not be finding them near a pile of rocks or stony ledges where their enemies the snakes will be hiding ready to snatch them. When these wise little fellows build their towns they search out the southeast slope of a knoll that will catch the full sweep of the sun each day to keep their dens warm and cozy. The winter blizzards that pound out of the north and west and leave the windward slopes of the rises frozen solid will only drift loose powder snow on top of their homes.

'When they dig their den,' continued the hunter, 'do you know what they do? They slant the runway steeply down for two or three feet and then double back up near the surface again where they level off a nice dry shelf. That's where they lie - on their ledges, close to their food and water, as far as they can get from their enemies, and surrounded by all their gopher friends. Yes sir, they sure have it all planned out!'

'Is our town built on a southeast slope?' the small boy asked thoughtfully.

'No,' said the hunter, 'our town slopes down to the north, in the teeth of the bitter winter winds and cold as a frosty gun barrel.' He frowned. 'Even in summer the breezes work against us. When we built the new flax mill, the only mill for forty miles, where do you think we put it? We built it right smack on the only spot where every breeze in the summertime can catch the smoke from its chimney and pour it across our houses and into our open window!'

'At least our town is near the river and water,' said the boy defensively.

'Yes,' replied the hunter. 'But where near the river did we build our houses? On the low flat land inside the river bend, that's where. And each spring when the snows melt on the prairies and the river swells, it floods out every cellar in our town.'

'Gophers would plan things better than that,' the small boy decided.

'Yes,' said the hunter, 'a gopher would be smarter.'

'When gophers plan their homes and towns,' the boy philosophized, 'they seem to do it better than men do.'

'Yes,' mused the hunter, 'and so do most of the animals I know. Sometimes I wonder why.'"[1]

---

[1]John Ormsbee Simonds, Landscape Architecture (New York: McGraw-Hill Book Company, Inc., 1961), p. 1.

Most residents of a city are aware of the community's increasing growth. Bozeman, Montana is a typical city trying to adjust and expand to accommodate the demands of increased population. The city is in one sense of the word completely developed, free from interior voids, except for one. Therefore expansion has only one way to go, enlarging its boundaries in a circular manner around the Central Business District. The void which I referred to is the area south of the Bozeman Cemetery, north of Kagy Boulevard, west of Highland Boulevard, and east of Black Street. All future descriptions of this site will be referred to as the Sourdough Road site.

The reason that this area is undeveloped is due mainly to the steep slope and cliff-like effect that the Sourdough Road site possesses. Sites which tend to deviate from a flat terrain are usually more expensive to develop and improve. The increased expense of developing such sites is in a direct proportion to the amount of inclination.

The city of Bozeman's planning studies made by the Consulting Services Corporation of Seattle, and Theodore J. Wirth and Associates of Billings,

in September, 1967, proposed:

> "In order to provide a north-south cross-town arterial on the east side of Bozeman, a short new road paralleling the north side of the Milwaukee Railroad Line is proposed to connect South Wallace Avenue with South Church Avenue (Sourdough Road) (See Figure X). This community arterial, couples with the North Wallace Avenue primary arterial, will supply a convenient north-south arterial route at the east end of the Central Business District."

The firm also stated under the heading Land Acquisition and Development Costs for Park Expansion that

> "the Sourdough Road area should be obtained and left in its natural condition, approximately thirty acres at $600.00 per acre, a total of $18,000.00."

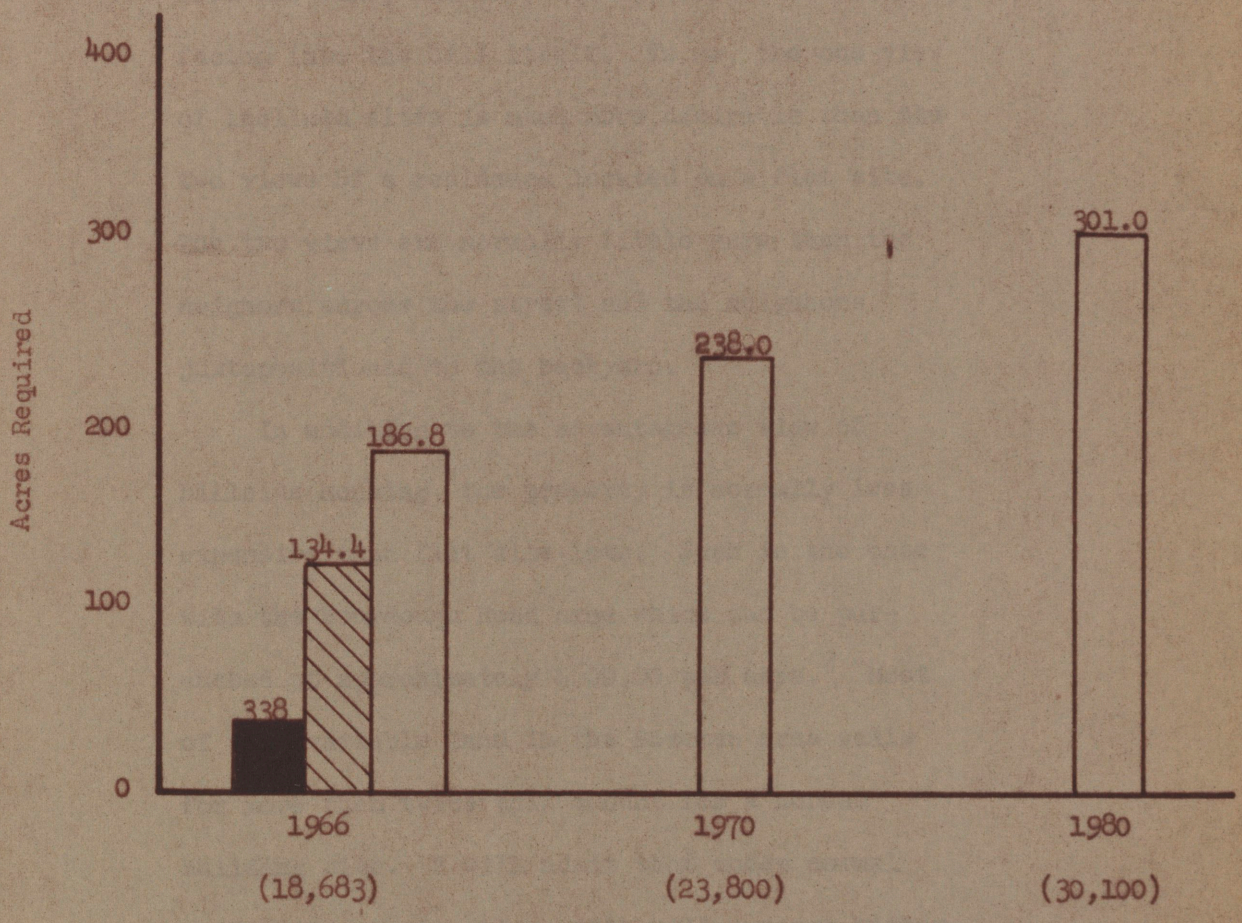
My reactions to the Consulting Services Corporation are negative for I feel that a hillside housing complex could be a very successful development with all the advantages of the Sourdough Road site being very evident. Furthermore, I feel a park and recreational area on a hillside is a very inconvenient situation.

It is only obvious that a park on a relatively non-sloping site would be much better oriented for the recreational capacities that a park should possess; whereas, a hillside park would be quite limited. I do agree with Mr. Wirth that additional park space in Bozeman is in great demand.

BOZEMAN'S PARKLAND NEEDS Figure I

(Based Upon Natl. Rec. and Park Assoc. Standards of 10 Acres Per 1000 Population)

Source: T. J. Wirth and Associates



Existing Developed Parkland (1.8 Acres Per 1000 Population)

Total Existing Dedicated Parkland (7.2 Acres Per 1000 Population)

Dedicated Parkland Needed (10 Acres Per 1000 Population)

Hillside housing presents many advantages, such as an unobstructed view. Residences on an inclination of any degree would only have a view from one side; whereas, the opposite side would be facing into the hill itself. To me, the one view of inclined sites is much more desirable than the two views of a residence located on a flat site. The two views are normally little more than the neighors across the street and the neighbors juxtapositioned to the backyard.

In addition to the advantageous view of hillside housing, the property is normally less expensive than flat site lots. Such is the case with the Sourdough Road area which can be purchased at approximately $600.00 per acre.[2] Most of the available land in the Bozeman area sells for more than twice this amount for a normal building site. I will admit that under normal conditions construction costs will average higher for hillside construction as compared to non-hillside construction. But reduced site costs and the possibility of stacked mechanical: plumbing,

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[2]T. J. Wirth and Associates, Planning Studies: Bozeman, Montana Planning Area (Billings: T. J. Wirth and Associates, 1967), p. 65.

electrical, heating and air conditioning ducts, and common vertical circulation, will help to compensate for the higher construction costs.

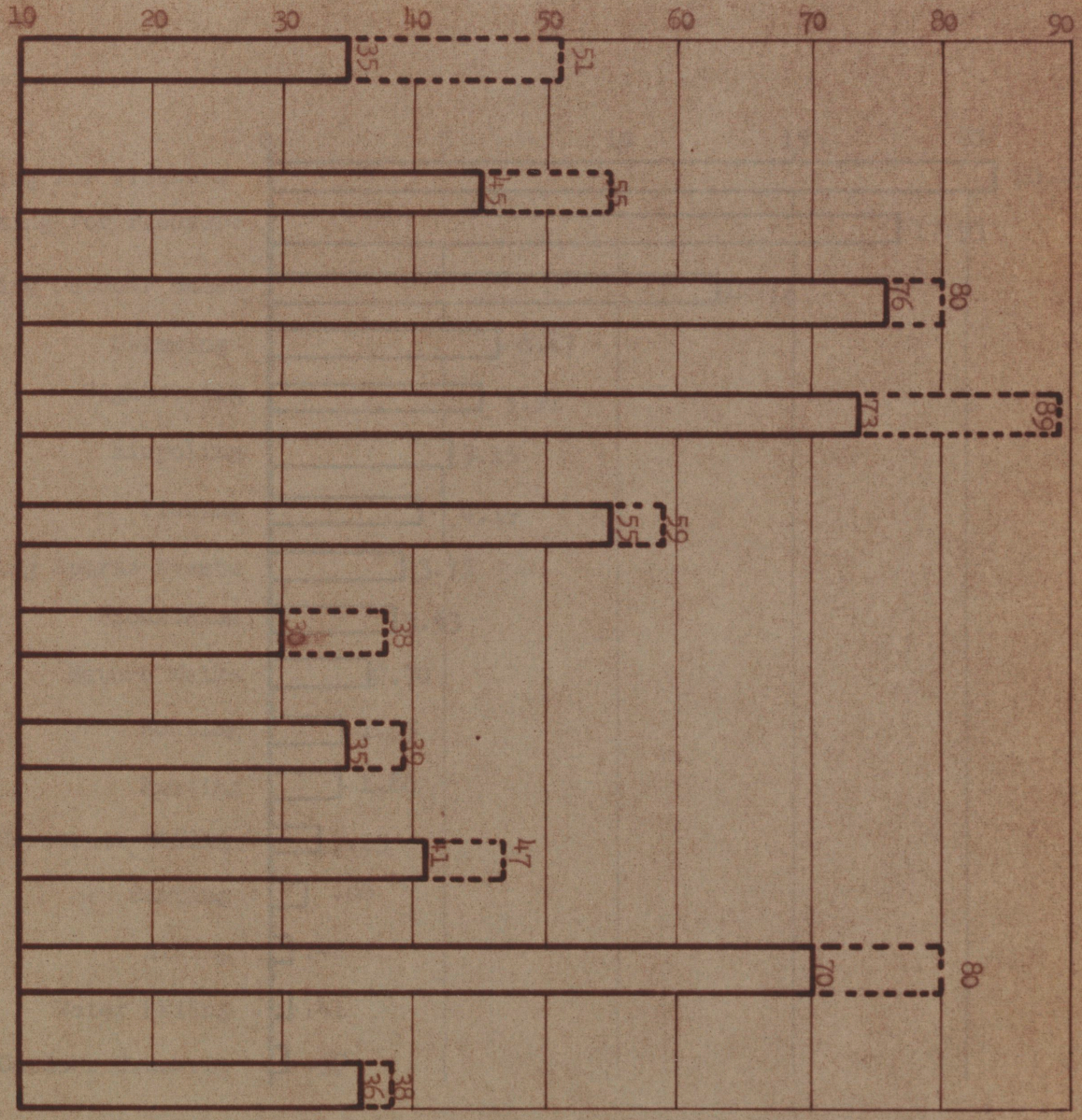
Finally the condition which contributes immensely to a need for hillside housing, is that in the future when available agricultural land diminishes, due to building sites, possibly hillside locations could help to make available some of the flat sites which are so obviously more productive for agriculture.

THE DEMAND IN GRAPHICS

BOZEMAN'S NUMBER OF LIVING UNITS Figure II

Within the City Limits of Bozeman

Source: Don Barrack, City Inspector



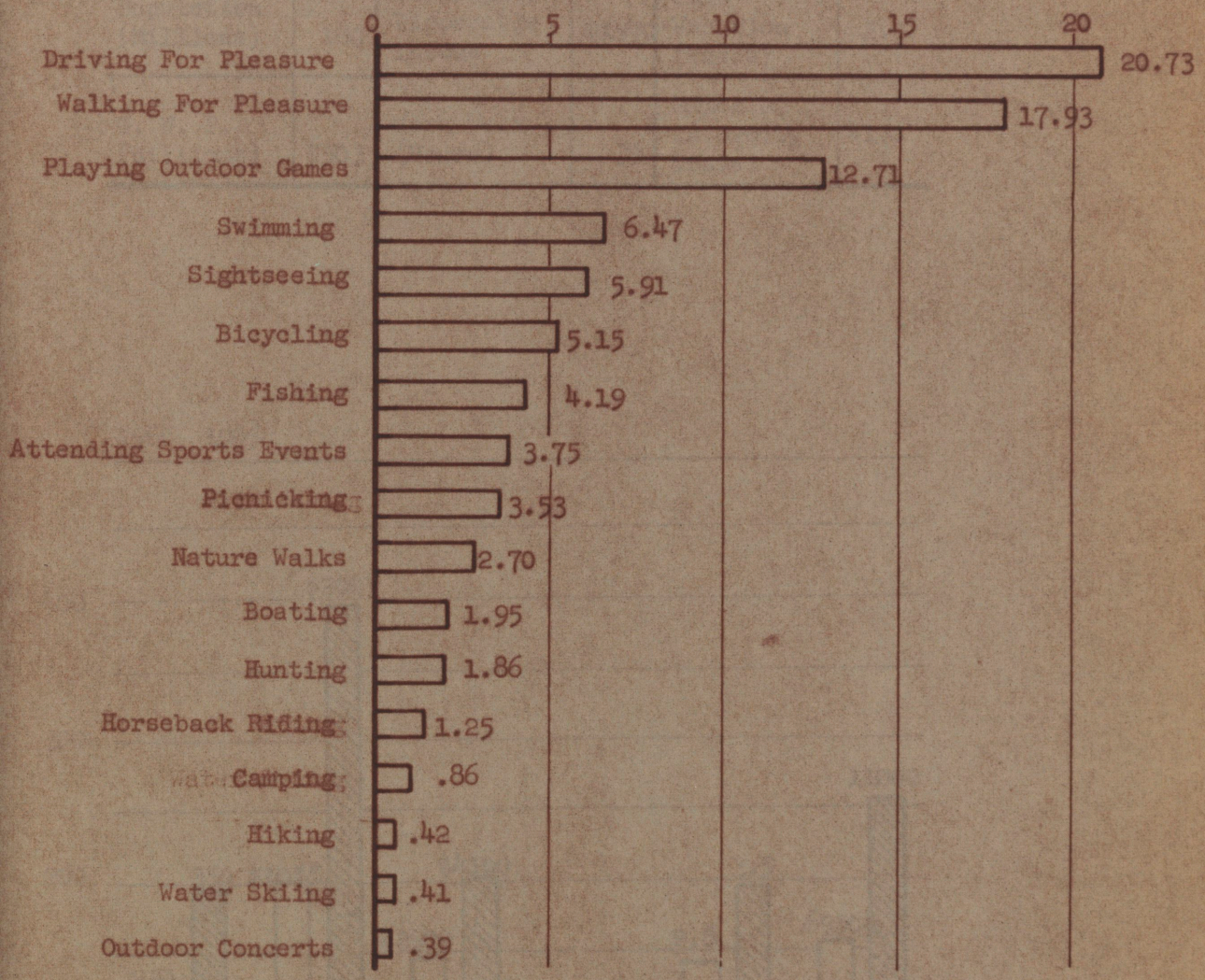
Single Family Homes

Living Units

WHAT AMERICANS DO MOST Figure III

Number of Activity Days Per Person, 12 Years and Over
June 1, 1960-May 30, 1961

Source: Lake Houston Development Studies

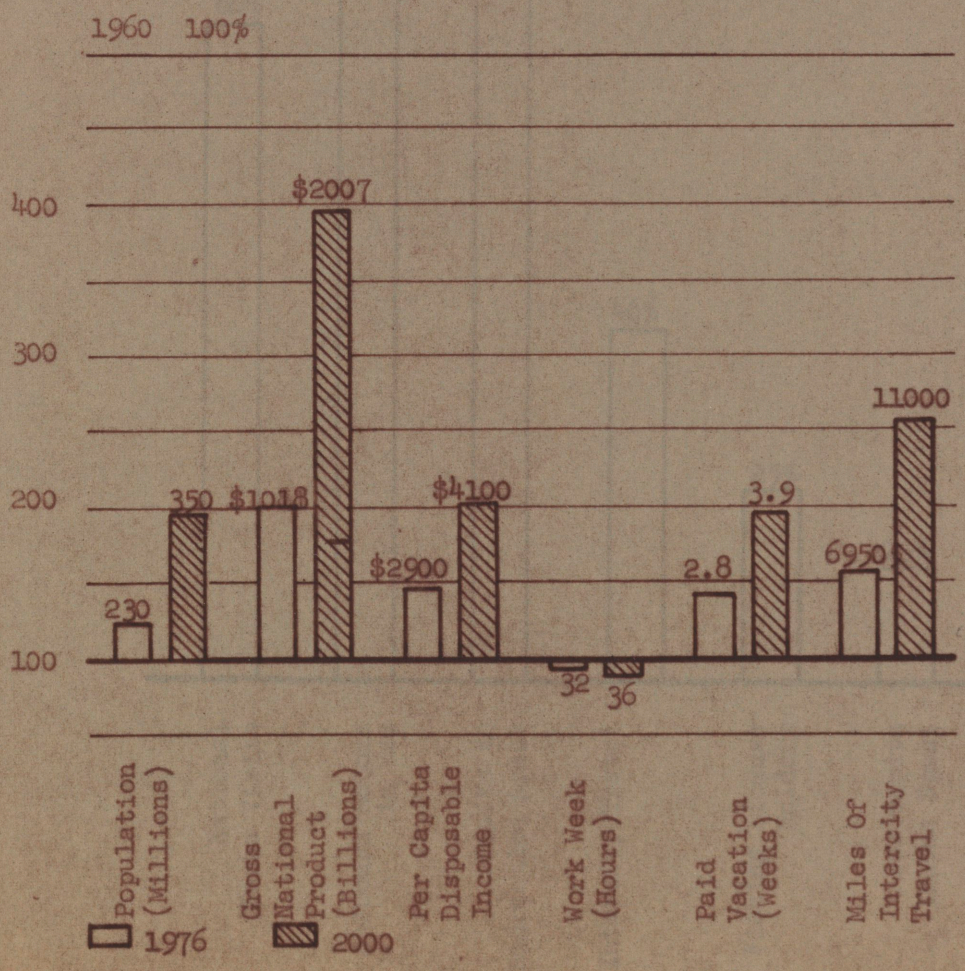


ESTIMATED CHANGES IN POPULATION, TRAVEL, INCOME, AND LEISURE Figure IV

For the Years 1976 and 2000, Compared to 1960

Source: Lake Houston Development Studies

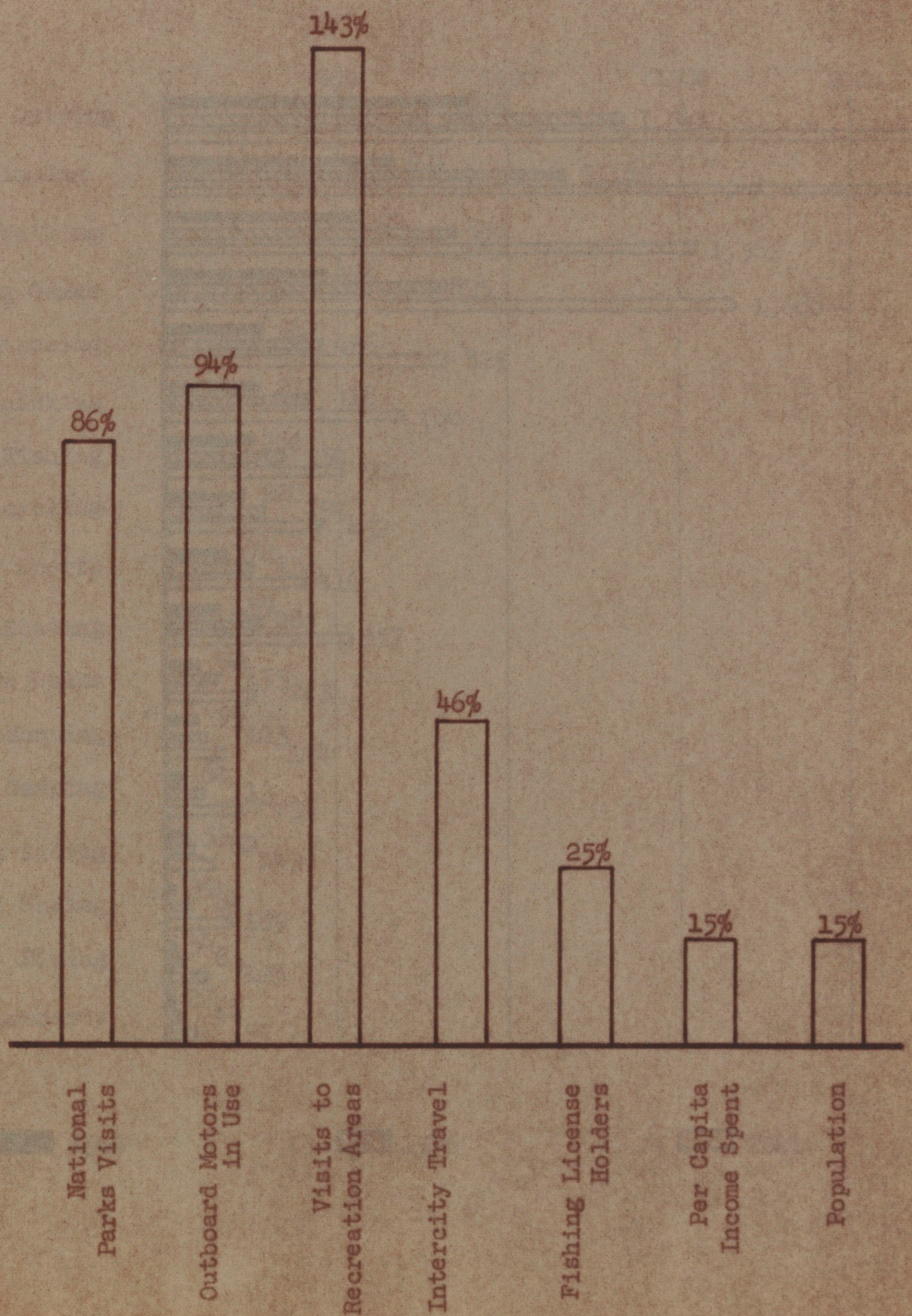
Population (Millions)	180	Per Capita Disposable Income	$1970	Paid Vacation (Weeks)	2.0
G. N. P. (Billions)	$503	Work Week (Hours)	39	Miles of Intercity Travel	4170



INDICES OF CHANGE / 1951-1959 Figure V

Percent Increase Over 1951

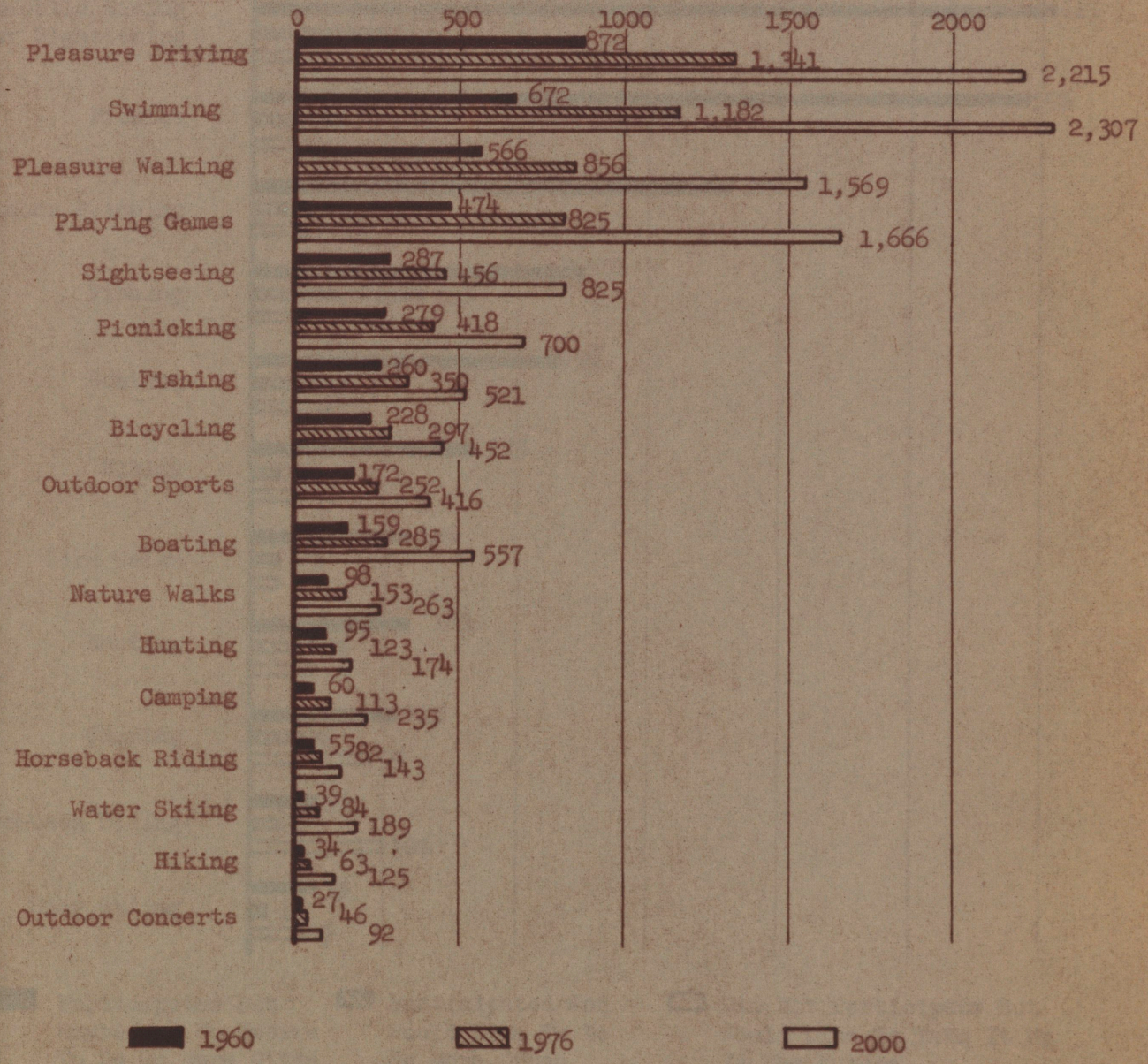
Source: Lake Houston Development Studies



NUMBER OF OCCASIONS OF PARTICIPATION IN OUTDOOR SUMMER RECREATION Figure VI

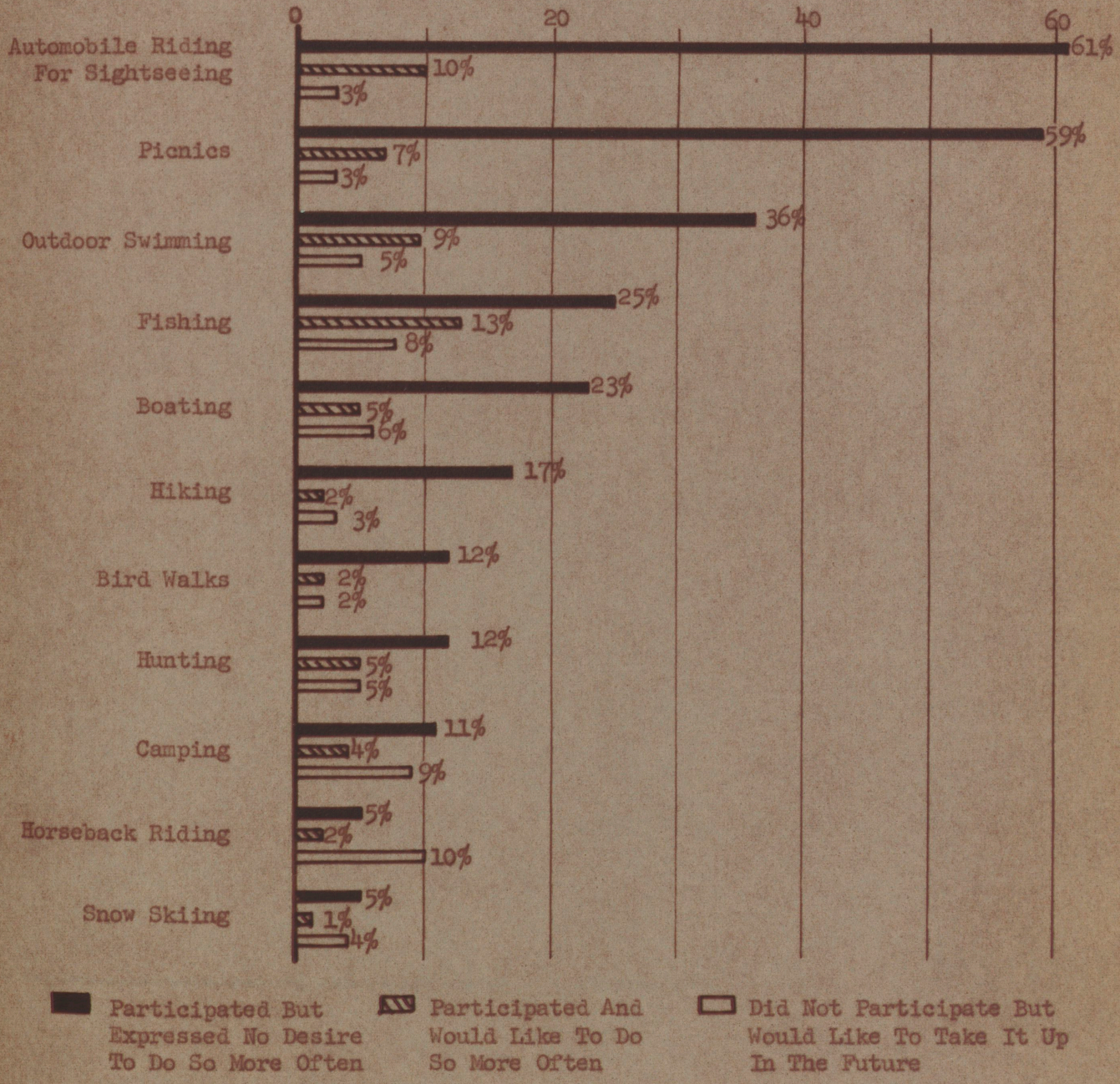
1960 Compared With 1976 And 2000 (By Millions)

Source: Lake Houston Development Studies



EXPRESSION OF PREFERENCE IN OUTDOOR ACTIVITIES Figure VII

Source: Lake Houston Development Studies



LOCAL CONDITIONS

Geography

Bozeman, the county seat of Gallatin County, is located at the southern end of the valley which was previously a lake bed. Bozeman's elevation is 4,793 feet above sea level. Bozeman's actual area is 4,835 acres and Gallatin County has 1,625,600 acres which is more area than Rhode Island or Delaware has.[3]

Population

According to the 1960 United States census, Bozeman contains 15,361 people, which places it sixth among Montana cities for population. Bozeman's population has increased 25.6 percent consecutively for every ten-year period since 1909. The medium age of Bozeman's residences is 24.3 years. Only .5 percent of the population is other than white. The community has the highest average for the amount of years attended in school which is 12.4 years of education per person. In 1920 there were 91.4 men per 100 women which has increased relatively in a uniform manner to 104 men per 100 women. The city

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[3]Bozeman Chamber of Commerce, "Basic Information for Bozeman, Montana," Bozeman Chamber of Commerce.

of Bozeman possesses one other unique criterion as far as a vigorous and healthy population are concerned. This is it has a natural increase because the birth rate for Gallatin County in 1950 was higher than the state and the United States. The death rate was lower than the other counties, the state, and the United States.[4]

Climate

The following information reflects Bozeman's mountainous location. The community has a 43° mean temperature with 107 days of growing season between the last killing frost around May 28, to the first killing frost around September 12.

Average Temperature:

Spring	41.2 degrees F.
Summer	63.0 degrees F.
Fall	44.4 degrees F.
Winter	23.1 degrees F.

Average Rainfall

Spring	5.5 inches
Summer	5.25 inches
Fall	4.02 inches
Winter	2.51 inches

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[4] S. R. DeBoer and Co., A City Plan for Bozeman, Montana (Denver: S. R DeBoer and Co., 1958), p. 7.

Average Snowfall

Spring	23.6 inches
Summer	5.26 inches
Fall	4.02 inches
Winter	2.51 inches

The Bozeman Chamber of Commerce refers to the city's weather as "mild, dry, and invigorating with clean mountain air." I feel that Bozeman has a characteristic of having extreme weather changes. The temperature can change from over 100 degrees above to below freezing in the summer months. High wind velocities are unknown in the Bozeman area. The angle of the sun varies from a high of approximately sixty-eight degrees in the summer to a low of approximately nineteen degrees in the winter.

Economics

The current financial situation in Bozeman as surveyed by the Bozeman Chamber of Commerce depends chiefly on revenue from agriculture, tourism (Over 100,000 persons past through Bozeman to seek the recreational activities available near the city each year) and the Montana State University which employs hundreds of faculty and staff - contributing an estimated $30,000,000.00

annually to Bozeman's economy.

Agricultural operations in Gallatin County center around grain production, livestock, and dairying.

Bozeman is distinctly underdeveloped in industrial operations; however, the area includes operations in cement manufacturing, forest products, grain milling, and heavy construction.

Labor Force - Gallatin County - (1966 Estimate)[5]

Major Industries	7,350
Agriculture (hired workers)	600
Construction	340
Logging	400
Manufacturing	360
Transportation & Utilities	300
Wholesale & Retail Trade	2,000
Service & Finance	2,700
Government	650

Three banks serve the Bozeman area, the total assets of which are $54,483,872.24 and total deposits are $49,853,887.38. Empire Savings and Loan Association with assets of over $17 million also serves the Bozeman area. Debits over the period, January through December, 1967,

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[5]Bozeman Chamber of Commerce, op. cit.

were up six percent over the same period in 1966.

Bozeman is one of the state's major trade centers. In 1966, there were 196 retail and service establishments to serve the Gallatin County with an annual payroll of $6.1 million.

Communications and Transportation

Bozeman's communication outlets include television provided by a community TV cable system with five channels; radio, provided by four radio stations, KBMN (NBC) and KXXL (ABC, Mutual and Intermountain) which have unlimited broadcasting time; KGVW, an Independent; and KGLT (MSU); the two newspapers, the Bozeman Daily Chronicle with a circulation of 6,000 and the weekly Gallatin County Tribune with a distribution of 2,566.

Transportation to and from Bozeman is provided by two railroads, the Northern Pacific Railroad with two daily east and west bound passenger trains and freight service, and the Milwaukee Railroad with scheduled freight service. Northwest Orient Airlines provides daily east-west service and Frontier Airlines provides daily north-south service. Gallatin Field also provides charter flights for commerce and pleasure flights.

The bus lines servicing travel to and from

Bozeman include Greyhound Lines (east and west), Karst Stages (Bozeman-West Yellowstone), and Belt Mountain Transportation Company, Inc. (Bozeman to Great Falls).

Motor freight carriers which serve Bozeman are Garret Freight Lines, Inc., Butte-Bozeman Delivery Service, and Northern Pacific Transport Company.

Bozeman is located directly on U. S. Highway Number 10, a major east-west highway, part of the Federal Interstate Highway Number 90, and U. S. Highway Number 191 South. These provide connections with Numbers 89 North and 287 North.[6]

Social

Bozeman is one of the main centers of cultural activities in the state because of the presence of the Montana State University, the largest school in the Montana University System. The university provides the city with the opportunity to see and hear top entertainers, learned speakers, controversial and political figures, theatre productions, sports events, and many other cultural aspects usually not available to a town the size of Bozeman. Also as a result of the university, the

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[6] Ibid.

proportion of highly educated persons is greater in Bozeman than in any other city in Montana. Bozeman also has an excellent school system which includes kindergartens, grade schools, a city-wide Junior High School, and a city-wide Senior High School. Also located in or near Bozeman is a Catholic High School (Holy Rosary High School) and Mount Ellis Academy Grade and High School (Seventh Day Adventists). The city also provides adult education in evening classes.

Bozeman is provided with an excellent hospital, Bozeman Deaconess, administrated by the Methodist Church. It was a medical staff of thirty-eight physicians and surgeons and a paid staff of 200 persons. Bozeman also has a private convalescent home, a county nursing home, and a new retirement home.

The civic clubs and organizations that are represented in Bozeman are:

Bozeman Housekeeper's Club

Bozeman Women's Club

Business and Professional Women's Club

Civitan

Exchange

Jayceens

Jaycees

Kiwanis

Lions

Optimist

Rotary

Soroptimist

Toastmasters

Toastmistresses

Fraternal groups include:

American Legion

DeMoley

Eagles

Elks

Knights of Columbus

Masons

Moose

Rainbow Girls

Shriners

Veterans of Foreign Wars

Bozeman has twenty-seven churches to welcome its citizens on Sunday:

Assembly of God	Lutheran, 3
Baptist, 4	Methodist, 2
Roman Catholic	Nazarene
Christian	Presbyterian
Church of God	Re-organized LDS

Christian Reformed
Christian Science
Church of Christ
Church of Jesus Christ of Latter Day Saints
Congregational
Episcopal
Evangelical United Brethren
Jehovah's Witnesses
Seventh Day Adventists
Unitarian
Unity Truth Center

Recreation

Due to its topographical location at the head of the Gallatin Valley, surrounded by high mountains and scenic areas, the city is the recreational center of a large territory. It is a gateway to Yellowstone Park and its immediate surroundings include swimming (fourteen hot springs), skiing, hunting, fishing, horseback riding, mountain climbing, and many more.

In Bozeman itself, there are six city parks and one now being constructed, picnic areas, playgrounds, softball and baseball parks, a heated swimming pool, tennis courts, ice skating rinks, and two nine-hole golf courses.[7]

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[7] Ibid.

History

Bozeman has had an exciting history and has played an important part in the development of the West. Some highlights are:[8]

1803 Louisiana Purchase included this area
1806 William Clark and party camped here
1846 Montana, West of the Continental Divide became United States Territory by treaty with England
1864 Montana Territory established on May 26th; town named for John Bozeman
1865 First flour mill completed; first school
1866 First cattle drive from Texas to Montana by Nelson Story
1867 John Bozeman died on Mission Creek some ten miles east of Livingston on April 17th; Bozeman became County Seat of Gallatin County; Fort Ellis established three miles east of town
1869 First school house and first newspaper
1870 Bozeman townsite formally platted; Washburn-Langford-Doane exploration; The "National Park" idea proposed
1872 Yellowstone National Park, the first of the National Parks, created by Act of Congress; Cemetery plot given to city by William Blackmore in memory of his wife on July 18th
1874 Town incorporated
1877 First brick school building - Irving School
1878 Bozeman High School opened
1880 First fire company organized
1882 Bozeman Chronicle began publication; Nelson Story builds large flour mill
1883 Bozeman declared a city; John V. Bogert first mayor; Northern Pacific Railway reaches City
1889 November 8th, Montana admitted into Union

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[8] S. R. DeBoer, op. cit., p. 3-4.

1890 City Hall and Opera House completed; Opera House formally opened October 13th with Mendelsohn's Quintette Company of Boston
1892 Opening of Bozeman Hotel
1893 Montana State College created by the Legislature on February 16th
1896 First hospital built
1899 Gallatin County High School formed
1911 First seed company plant in Bozeman
1917 Pea cannery opened
1922 City Manager Government adopted
1927 Improved highway to West Yellowstone built
1929 Baxter Hotel, a community project completed
1956 High School District changed Gallatin to Bozeman High School. New building at Main and 9th Avenue begun

SITE CONDITIONS

The site which is selected for hillside housing is obviously important. In the title of this thesis, "Hillside Housing," hillside is synonymous with the site. Thus in forming my design approach I will evaluate and consider the following factual and visual information concerning the site for the hillside housing development.

Orientation

The proposed site for this thesis is located south of the Bozeman Cemetery, north of Kagy Boulevard, west of Highland Boulevard, and east of Black Street. The above description provides sites for two basic categories. The described boundaries have a vertical contour rise of approximately 140 feet. This area is proposed for residences. The remaining area is essentially flat and will be proposed for park facilities. The total site is approximately sixty acres, thirty of which are not hillside. Simkins-Hallin, Inc., owns this parcel of land.

Adjacent Environment

To the south of the site is a golf course, Valley View, and residential area. This residential area is probably one of the prominent


PACIFIC STANDARD TIME
MOUNTAIN STANDARD TIME
CENTRAL STANDARD TIME
C A N A D A
Pacific Ocean
Gulf of California
Gulf of Mexico
M E X I C O
Vancouver
Seattle
Portland
Spokane
Calgary
Winnipeg
BOZEMAN
Salt Lake City
Denver
Omaha
Minneapolis
St. Paul
Chicago
Des Moines
Kansas City
St. Louis
Indianapolis
Louisville
Nashville
Memphis
Birmingham
Detroit
Milwaukee
Wichita
Oklahoma City
Tulsa
Dallas
Ft. Worth
Houston
San Antonio
El Paso
New Orleans
Los Angeles
San Diego
San Francisco
Las Vegas
Albuquerque
Phoenix
Tucson
Monterrey
Chihuahua
Hermosillo
Guaymas
Ciudad Obregon
Los Mochis
Mazatlan
Rosario
Ensenada
Tijuana
Mexicali
Yuma
Reno
Sacramento
Fresno
Bakersfield
Santa Barbara
Monterey
Carmel
Eureka
Crescent City
Medford
Boise
Pocatello
Twin Falls
Idaho Falls
Billings
Great Falls
Missoula
Helena
Butte
Havre
Glasgow
Williston
Minot
Fargo
Grand Forks
Bismarck
Jamestown
Moorhead
Duluth
Sault Ste. Marie
Thunder Bay
Kenora
Regina
Medicine Hat
Lethbridge
Brandon
Lake Manitoba
Lake of the Woods
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
Toronto
Detroit
Cleveland
Buffalo
Pittsburgh
Columbus
Indianapolis
Cincinnati
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Nashville
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Miami
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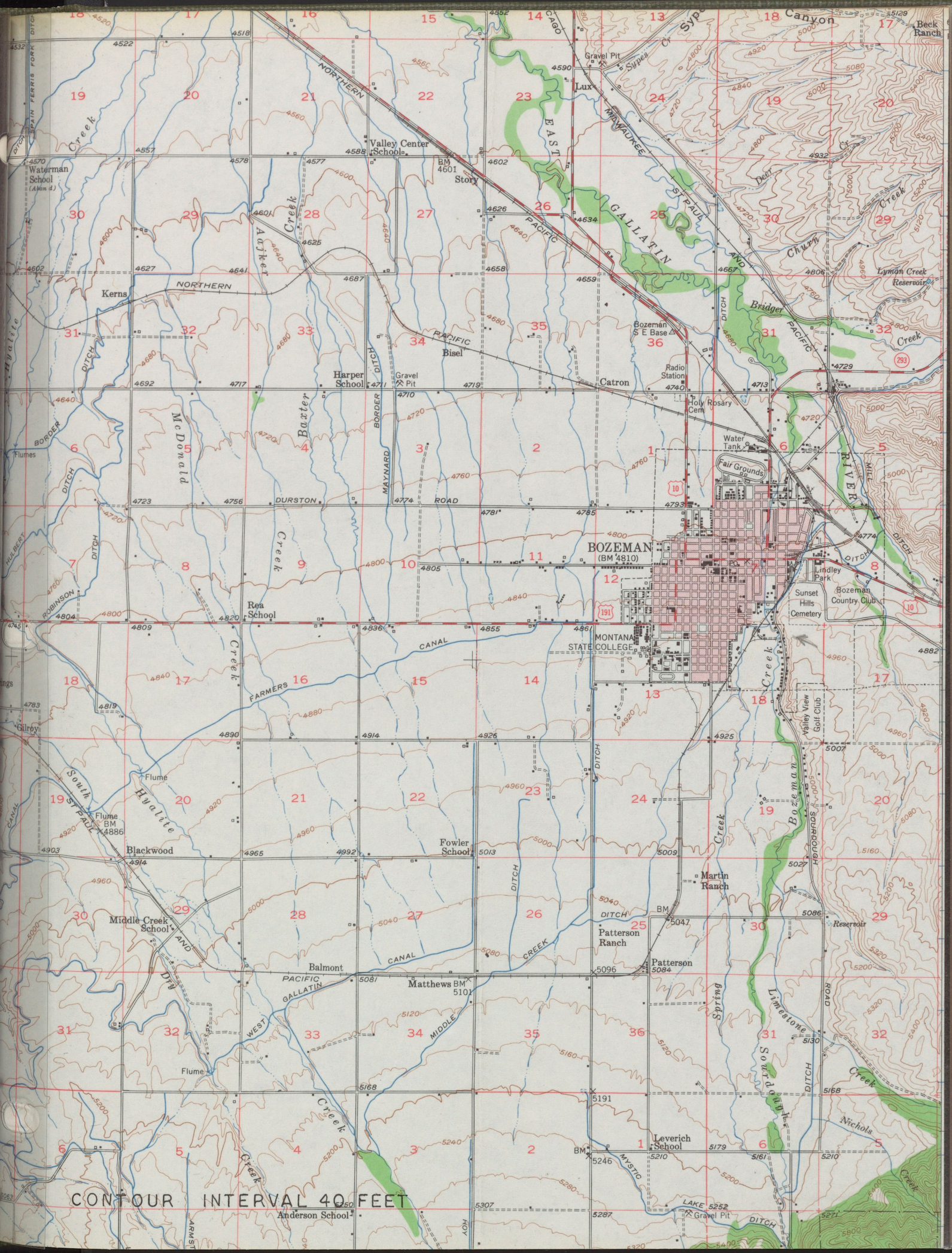
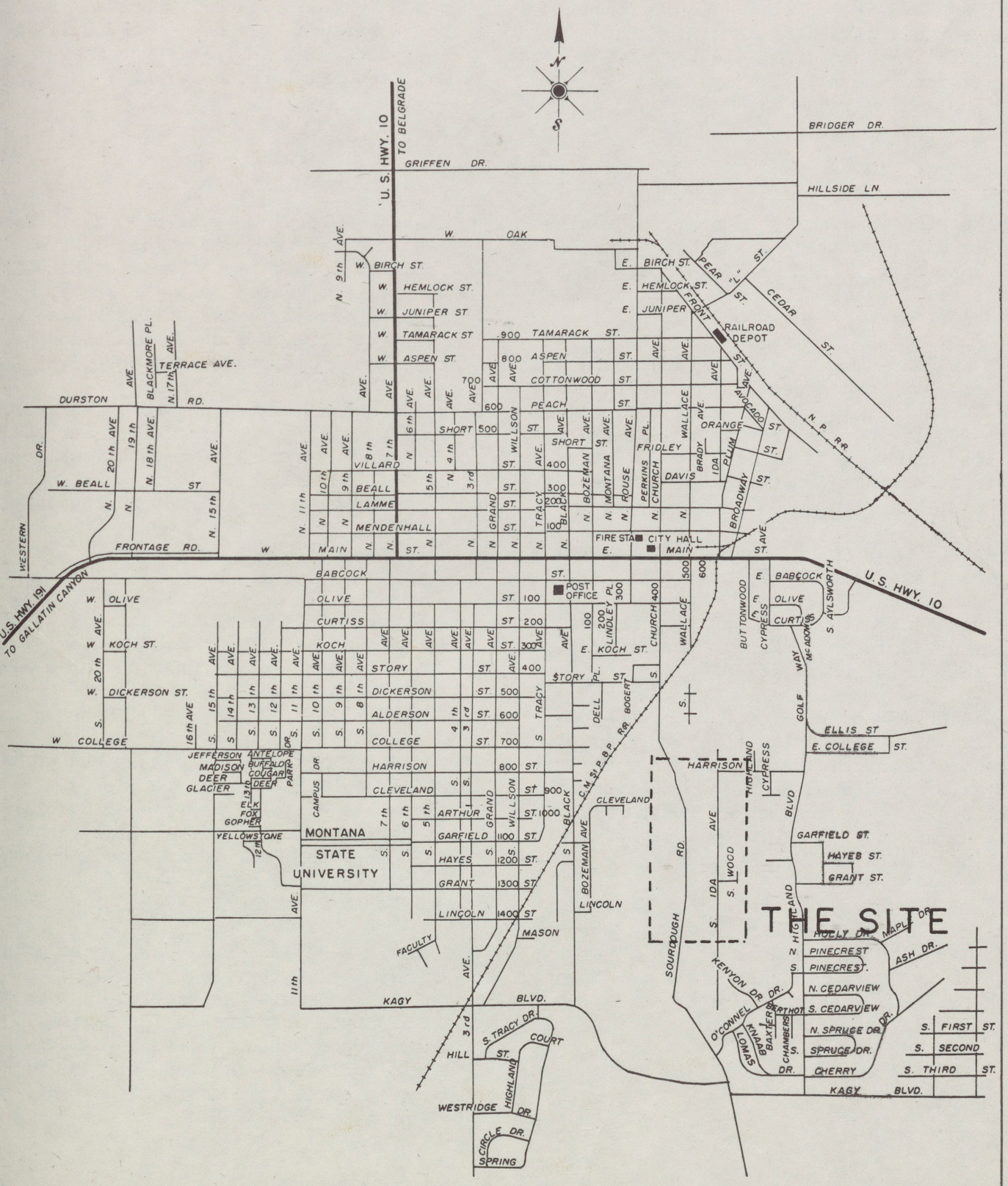
Boston
Albany
Syracuse
Rochester
Niagara Falls
Montreal
Quebec
Ottawa
Toronto
Hearst
Nipigon
Port Arthur
Ft. William
Geraldton
Cochrane
Sault Ste. Marie
St. Ignace
Mackinaw City
Traverse City
Ludington
Manitowoc
Green Bay
Appleton
Wisconsin Dells
Madison
Lansing
Grand Rapids
Muskegon
Bay City
Flint
Saginaw
Toledo
Dayton
Springfield
Columbus
Zanesville
Wheeling
Charleston
Huntington
Ashland
Ironton
Portsmouth
Chillicothe
Hannibal
Quincy
Springfield
Decatur
Bloomington
Peoria
Rockford
Dubuque
Cedar Rapids
Davenport
Burlington
Iowa City
Des Moines
Council Bluffs
Omaha
Lincoln
Grand Island
North Platte
Scottsbluff
Cheyenne
Laramie
Rawlins
Rock Springs
Casper
Riverton
Lander
Worland
Buffalo
Sheridan
Gillette
Rapid City
Pierre
Aberdeen
Watertown
Fargo
Grand Forks
Devils Lake
Minot
Williston
Glasgow
Wolf Point
Fort Peck Reservoir
Lake Sakakawea
Oahe Reservoir
Missouri River
Yellowstone River
Green River
Colorado River
Rio Grande
Pecos River
Red River
Arkansas River
Platte River
Missouri River
Mississippi River
Ohio River
Tennessee River
Cumberland River
Kentucky River
Wabash River
Illinois River
Minnesota River
Snake River
Columbia River
Sacramento River
San Joaquin River
Colorado River
Gila River
Pecos River
Rio Grande
Red River
Brazos River
Trinity River
Sabine River
Mississippi River
Alabama River
Tombigbee River
Apalachicola River
Suwannee River
St. Johns River
Everglades
Okefenokee Swamp
Great Salt Lake
Pyramid Lake
Lake Powell
Lake Mead
Lake Tahoe
Lake Okeechobee
Lake Pontchartrain
Lake Maracaibo
Lake Nicaragua
Lake Titicaca
Lake Victoria
Lake Tanganyika
Lake Malawi
Lake Chad
Lake Eyre
Lake Torrens
Lake Frome
Lake Gairdner
Lake Amadeus
Lake Mackay
Lake Disappointment
Lake Gregory
Lake Argyle
Lake Nash
Lake Woods
Lake Nash
Lake Nash
Lake Nash



Canyon
Beck Ranch
Gravel Pit
Lux
Valley Center School
Waterman School (Aban d)
Story
EAST GALLATIN RIVER
Kerns
Bisel
Harper School
Catron
Bozeman S E Base
Radio Station
Holy Rosary Cem
Water Tank
Fair Grounds
Lyman Creek Reservoir
Churn Creek
Bridger Creek
Flumes
McDonald Creek
Baxter Creek
Aajker Creek
DURSTON ROAD
BOZEMAN (BM 4810)
Lindley Park
Sunset Hills Cemetery
Bozeman Country Club
Rea School
MONTANA STATE COLLEGE
FARMERS CANAL
Gilroy
Flume
Flume BM 4886
Blackwood
Fowler School
Valley View Golf Club
Bozeman Creek
Martin Ranch
Middle Creek School
Patterson Ranch
Patterson
Balmont
Matthews BM 5101
Dry Creek
Spring Creek
Limestone Creek
Sourdough Creek
Nichols Creek
Leverich School
Anderson School
Gravel Pit
CONTOUR INTERVAL 40 FEET

MAP OF BOZEMAN MONTANA



sections of the town. The westward direction reveals new housing in the medium price range. There is also a site in the neighboring area, Thompson addition, for a future grade school. In the northern direction is the Bozeman Cemetery along with older housing. The east side of the site looks mainly out on the open fields and a retirement home along with sparsely spaced housing.

Social Conditions

The site is situated fairly near to the Montana State University campus. The site is mostly underdeveloped, but when it is visualized in its finished stages, a hillside housing development bordering a park with the Sourdough Creek running through it all seems very natural. The site has a peacefulness to it which gives a warm and quiet feeling.

Topography

The site has a relatively steep slope on it which varies up to an approximately 120 foot vertical drop. The Sourdough Creek also meanders through the site. A semi-arterial paved road serves as a north-south transportation route through the described land.

Vegetation and Other Natural Features

The site is spotted with various types of trees ranging in heights from ten to sixty feet. The trees are in groups especially around the creek. Grass cover ranges from medium to very dense. Brush cover is spotted throughout the location and is of medium density.

Soil Analysis

The building site contains a loam type of soil, typical of the Bozeman area. The soil on the flat land near the creek is of a considerably richer black loam. The soil varies from a rich composition to a hard and clay-like substance. Topsoil and subsoil take up about six vertical feet on the average, below this a harder base such as rock is quite common.

In 1931, a survey of soils in the valley was made by the United States Department of Agriculture. The results were general in saying the farmlands are well drained and include many varieties of soil textures. The soils have great fertility and in places are very deep. In other places they are under-laid by a calcareous layer about fourteen to eighteen inches below the surface. The

imperfectly drained farming soils show considerable alkali contents not too far below the surface. Frequently they are the bottomlands along the streams and occasionally the uplands. In prehistoric days these valleys were in a lake which filled up with sediment; erosion formed the present topography. There is still a subterranean dam at the head of the Missouri River, keeping the water table high in the valley.

Immediate and Distant Views

In the distance, mountains dominate the view. The Bridger Mountains are very distant in the north and the northeast. In a northwesterly direction the Horseshoe Hills can be observed. In the southwest the Spanish Peaks along with the peaks of the Gallatin in the south can be seen from the site. All of the immediate mountain ranges are a part of the Rocky Mountains. Essentially Bozeman is completely surrounded by mountains. The site is in a beautiful location high in the Rocky Mountains, elevation 4,793 feet above sea level. Bridger Peak in the north reaches a height of 9162 feet, Mount Ellis in the south, at 8331 feet.

Along the slopes of the valley are National Forests: on the southern and eastern sides is the



BOZEMAN CREEK WITHIN THE SITE



THE SITE LOOKING NORTH



THE SITE LOOKING EAST



THE SOUTHWEST VIEW FROM THE SITE



VIEWING THE SITE FROM THE WEST

Gallatin National Forest; on the western slopes is the Deerlodge National Forest; to the northwest is the Helena National Forest.

Availability of Utilities

It is a generally accepted belief that water is quite ample in the Bozeman area. It is obtained from city-owned reservoirs and also contracted from private concerns such as the Hyalite Reservoir of Middle Creek. The city's Water Works Expansion Improvement Program brings the level of supply up to current demands. The last improvement was in 1958 costing $1,200,-000.00. This cost was to include the anticipated water needs for anticipated growth in population for the next twenty-five to thirty years, which will be to 1985.[9]

Sewerage

Next to water the most important item in a city's health program is sewerage. Bozeman has a reputation for very efficient work in this area. At the present, the site is not serviced by the city sewer. But in the near future, as stated in the City Plan for Bozeman, a main line

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[9]Ibid. pp. 162-165.

along Sourdough Road will have to be provided. Because of the fact that the site does not now have the city sewer, which is shortly to be provided for in this section of the city the sewer can be planned along with the entire development.

Electricity and telephone access is available in the area. Both are overhead services. In the final planning stages, because of the increase in demand, additional lines will have to be provided. At this point in the final planning stages, underground electrical service will be considered along with gas lines.[10]

Wind Conditions

The usual direction for prevailing winds is from the west. The maximum velocity ranges from forty to sixty miles per hour. The average velocity of the wind is ten to twenty miles per hour, zero being the minimum.[11]

Sun Orientation

At a location of 45° and 40' North latitude, and longitude of 111° and 93' west of Greenwich and at an altitude of 4856 feet above

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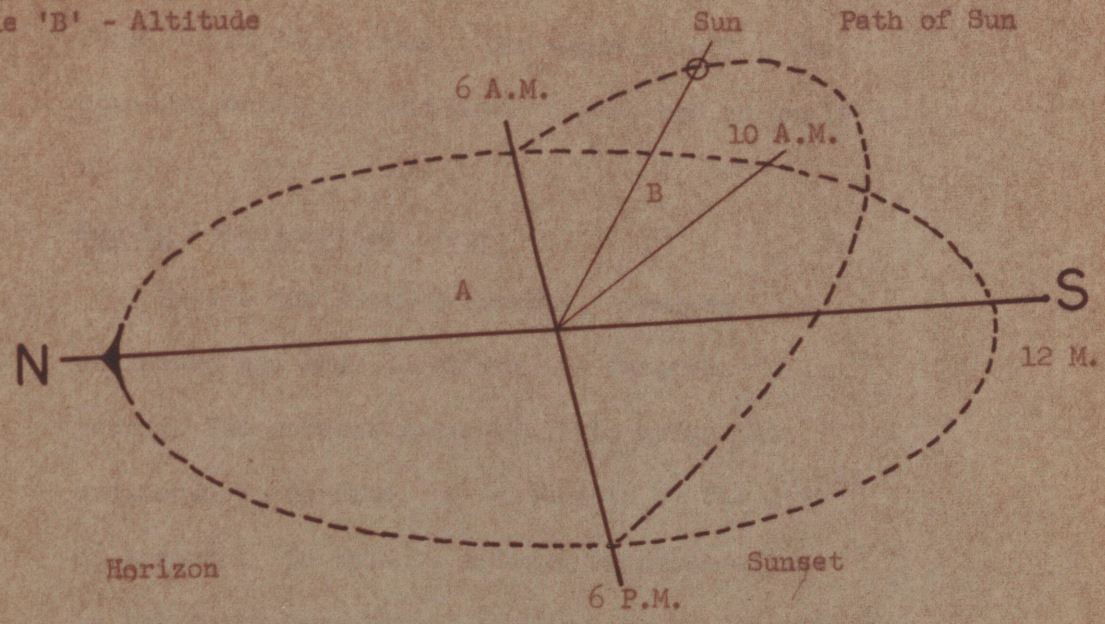
[10] Ibid., p. 166-167.

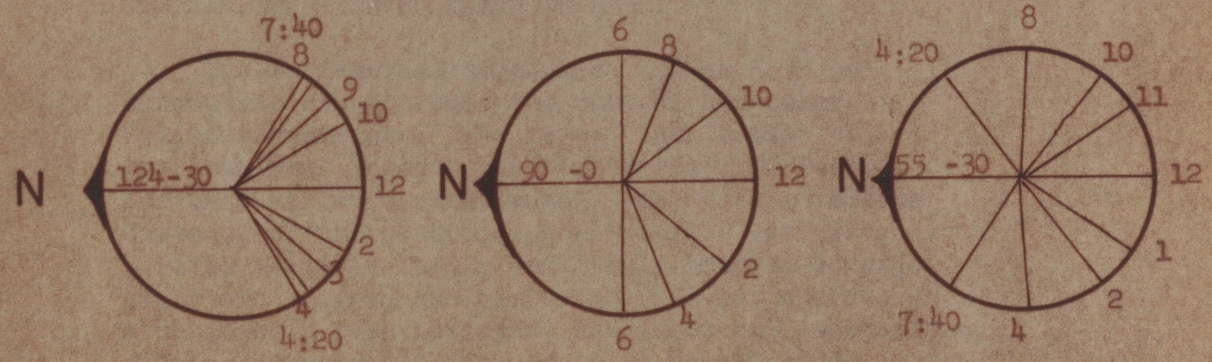
[11] Ibid., p. 14.

SOLAR ANGLES Figure XI

Source: C. E. Wilcox

Angle 'A' - Azimuth
Angle 'B' - Altitude





WINTER DEC. 22 FALL & SPR. SEPT. 23, MARCH 22 SUMMER JUNE 22

A.M.	P.M.	Azimuth	Alt.	A.M.	P.M.	Azimuth	Alt.	A.M.	P.M.	Azimuth	Alt.
Noon		180°-0'	21-30	Noon		180°-0'	45-0	Noon		180°-0'	68-30
10:00	2:00	151°30'	16-0	10:00	2:00	141°-0'	38-0	11:00	1:00	145°-30'	65-30
9:00	3:00	139°-0'	10-0	8:00	4:00	112°-0'	20-30	10:00	2:00	121°-30'	57-30
8:00	4:00	127°-30'	2-30	6:00	6:00	90°-0'	0-0	8:00	4:00	93°-0'	37-30
7:40	4:20							4:20	7:40	55°-30'	0-0

sea level, the sun's rays make an angle of approximately 68° with the earth's surface, on June 22, at 12:00 noon. The angle is 22°. The equinox, equal day and equal night, has an angle of 45°.[12]

Zoning - Residential Areas

Inside the City of Bozeman, a zoning ordinance has been in effect for several years. The present proposal is to bring this ordinance up-to-date, to be adopted by the City of Bozeman. To this is added a recommendation by the Joint City-County Planning Board, providing a zoning resolution for the areas adjoining Bozeman, to be adopted by the County Commission. Both of these are subject to hearings.

THE APARTMENT HOUSE DISTRICT R-3

The residential areas lie more or less as concentric rings around the central and other business districts. The first ring is that of the Apartment House or R-3 District. The reason for this is to furnish rental space within walking distance of the places of employment. The district permits multiple-family dwellings, tourist homes, clubs and lodges, as long as they do not operate as a business. Also colleges, hospitals and sanitariums, if they provide 100 feet of space on all sides. Motels are allowed to have their sleeping rooms in the district but must conduct their business in an adjoining district.

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[12] Ibid., p. 18.

Height and Yards: Building may not be over five stories or sixty feet in height, and require 750 square feet of lot area per family. A front yard of twenty feet, side yards not less than five feet and a rear yard of twenty-five feet required. Automobile storage and parking is permitted.

THE TWO-FAMILY DISTRICT R-2

The two-family or R-2 district allows single and double homes. Lots for duplex dwellings must not be less than 6000 feet in area nor less than fifty feet in width.

This district allows for the building of cheaper homes and covers much of the areas adjoining the business district. Building height is limited to two and one-half stories or thirty-five feet, front yards are twenty-five feet and side yards five feet.

THE SINGLE FAMILY DISTRICT R-1

The single family residential district is the pride and charm of many western cities. To keep it attractive and free from other uses must be the goal of zoning administration.

To protect this district, the provision is made that only single family homes, elementary and high schools, libraries, parks, playgrounds and golf courses shall be permitted. It is not always easy to enforce this rule. Frequently owners will change a large dwelling to a double without asking for a building permit. Others will come in with attractive building designs for a double and triple family dwelling and put up the plea that their building will enhance the neighborhood.

It is important to adhere to the letter of the ordinance. Once a deviation is made, it is extremely difficult to follow the law in other cases. Many beautiful districts have been spoiled by this, the city at large has suffered by this loss.

The lot for this district has been set at 6000 square feet with a lot width of not less than fifty feet and in new subdivisions of sixty feet. Building height is not to exceed thirty-five feet, front yards not less than twenty-five feet and side

yards not less than eight feet.

Provision is made for existing large dwellings which have lost their former use and value to be converted into multiple family dwellings provided they conform to the other regulations for the district.

RESIDENTIAL AGRICULTURAL DISTRICTS A-2 & 3

On the outskirts of the city provision is made for two districts requiring more than the usual city lot area per family. The first one is arranged for half acre areas, the second for one acre per family. Front yards and side yards are increased for each district.

AGRICULTURAL DISTRICT A-1

This district includes farming areas in the outlying sections. The purpose of this district is to protect farming and gardening uses on land which may later be divided into residential blocks. It is meant to prevent the breaking up of good agricultural land. The area per family or per farm should not be less than two and one-half acres. Other restrictions would be the same as for R-1, except that there are none in regard to farming.

Flood protection districts are special areas subject to flood damage. Since the public pays for most of the damage caused by floods, it is essential that these areas by kept open and free from buildings. For this reason it is recommended that only recreational structures are encouraged here, and that families may live only on tracts of two and one-half acres or more.

This type of land is often good park land and it should be purchased by the public for this purpose. Tree and shrub planting can frequently be used for protection against floods and natural park land is not materially damaged if it runs under water.

EXCEPTIONS AND SUPPLEMENTARY

OFF STREET PARKING

The ordinance provides that all new or altered buildings shall provide off-street parking, space for one car per family in the residential districts, space commensurate to floor space for stores and offices and to number of seats for auditoriums, etc.

NON-CONFORMING USES

The ordinances provides that uses of land and buildings which exist at the time of passage of this ordinance and which do not conform to the district, may be continued. In other words, the ordinance is not retroactive. It does provide, however, that if the use of a building is changed, or if it is destroyed by fire to a high percentage, the use of the property shall conform to the ordinance. Wrecking yards or junk yards involving only minor improvements may be ordered to conform or be abandoned after three years.

NEW SUBDIVISIONS

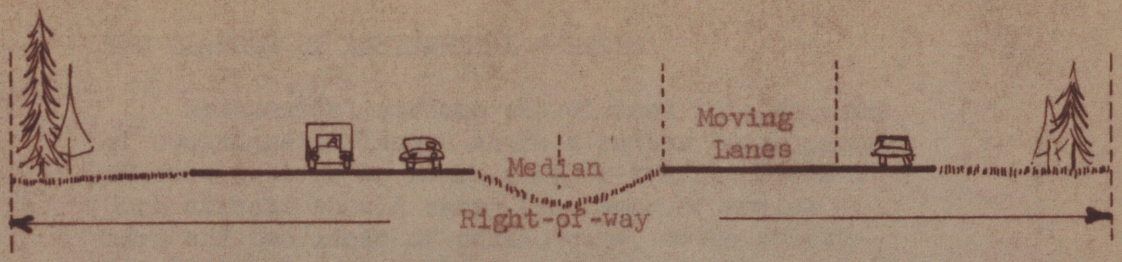
The ordinance provides that all newly subdivided plats shall provide streets of not less than sixty feet width with property line walks if their direct length exceeds 1500 feet. For short streets, less than 1500 feet direct length, the street width may be reduced by fifty feet and curb walks installed.

All new subdivisions shall be checked against the city's master street plan which is on record. Subdividers must provide for the land needed for major streets as shown on the Master Plan. They will also be required to set aside one-ninth of the area for park, playground and school ground purposes. This item shall be paid in cash value if these park, play and school grounds are not located on the property.

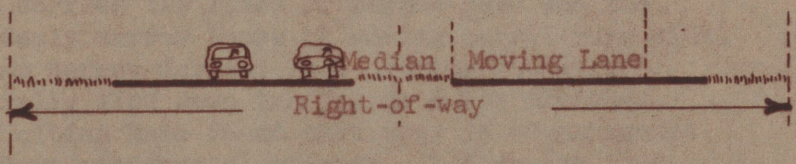
In laying out subdivisions plats, developers should be guided by the street plan shown on the Master Plan for major streets and zoning provisions, but they may submit plans of their own for secondary streets.

RIGHT - OF - WAY ILLUSTRATIONS Figure XII

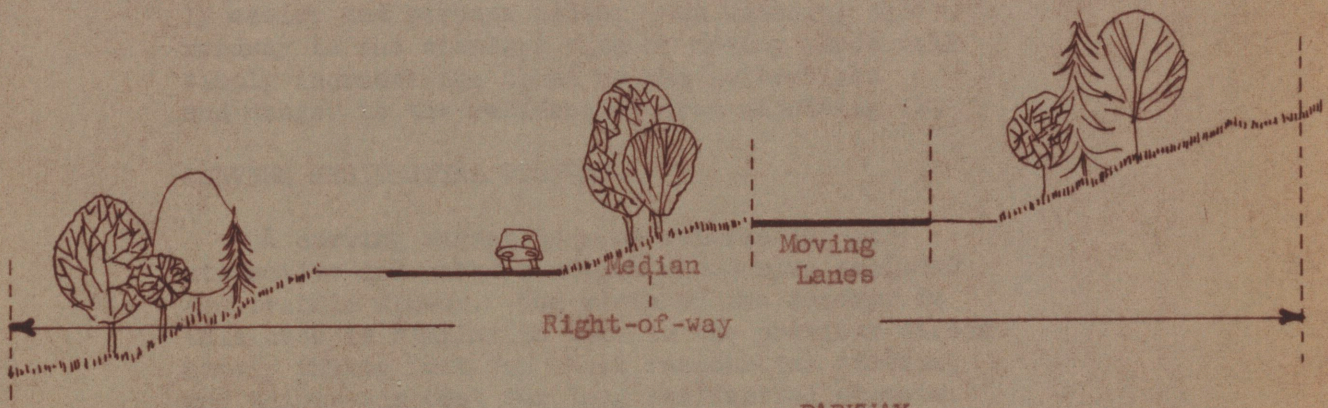
Source: T. J. Wirth and Associates



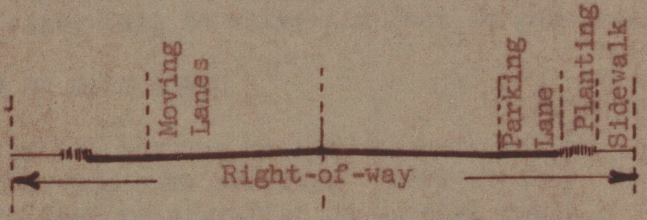
FREEWAY



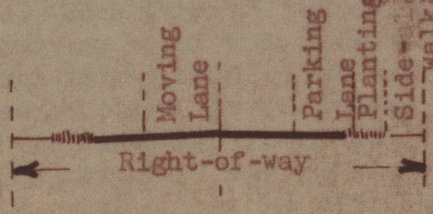
PRIMARY ARTERIAL



PARKWAY



COMMUNITY ARTERIAL



COLLECTOR

TWO CLASSES OF RESIDENTIAL STREETS

Residential streets are divided into streets of considerable length where a rather large amount of cars must go to reach a major traffic street. Such streets should carry two lanes of moving cars and two lanes of parked cars, or be thirty-six feet between curblines. These are the streets of 1500 feet or more in length. The other streets are shorter and the roadway may be narrowed to thirty feet or thirty-two feet. A thirty foot road carries two lanes of parked cars and two extremely narrow lanes of moving cars. This width is too narrow for any fast driving and will naturally slow down traffic to a low minimum. Many cities have found that this is advantageous in short residential streets. Adding two feet to the width of this road makes the traffic slightly easier and perhaps better, but widening the roadway to the standard size of moving lanes will simply increase the speed of the automobiles and danger to the residential area adjoining it.

CURVING RESIDENTIAL STREETS

A curving street is more interesting and attractive and makes a neighborhood more secluded and traffic slower. The width of the roadway in this case is similar to that in the previous street namely thirty feet for short residential streets, and thirty-six feet for long residential streets. Sidewalks should not be on the curb and a right-of-way of sixty feet to sixty-six feet is required.

RECREATION OR PARK ROADS

Much of the driving on city streets can be classified as pleasure driving. Where it is possible to lead this traffic on special roads through parks, or along streams the city gains much in livability and relieves its main business arteries. Such streets, therefore, should have two one-way roads with a center strip not less than thirty feet. Frequently a creek bottom can be placed on the center strip of a major traffic line, also, and quite often advantageously. Running water and a tree-planted creek bottom are attractive

features in the city. This is the cheapest parkland the city can get, and also, the cheapest surface water drainage.[13]

[13] Ibid., pp. 75, 78, 112-116.

FUNCTION

I would like to start this section by defining "function" as in Webster:

> Function: The action for which a person or thing is specially fitted, used, or responsible or for what a thing exists: the activity appropriate to the nature or position of a person or thing.

THE FUNCTION OF HILLSIDE HOUSING

Despite the rising costs of building construction and growing difficulties in obtaining suitable plots of land, the single-family house has not yet lost any of its attractions. The advantages of the single-family house are numerous. A well planned house that is occupied by its owner can provide an environment adapted to the owner's personal way of life, unrestricted by considerations for other people living in the building or in the immediate neighborhood. A home can offer the maximum of freedom and the possibility of the garden, which in itself can provide an exterior of the living space. Just how important this living within and with the landscape has become is evident in present and past examples.

Building sites are scarce and expensive especially in larger cities and in reasonably accessible districts. For this reason sites are being developed which would have been considered

unsuitable for construction twenty years ago. Steeply sloping ground, rock or marshy subsoil all give rise to numerous handicaps, but even these conditions that are said to be inadvisable often are turned into advantages. A steep slope does not always have to warrant costly excavation. By stepping the building down the slope, both upper and lower floors can have an approach at ground level and the raised living room will offer a wider view. Where the water table is high, the house can be set on stilts. The open ground floor could be made use of by a garage, car port, or as a covered play area for children. The difficulties of rocky ground could be met by, besides expensive blasting, the imaginative use of stanchions*. The difficulty of access to hillside sites can be counter-balanced by the advantages obtained from fine views and complete privacy.

The following information is quoted from Contemporary Houses by Thomas H. Creghter and Katherine M. Ford. In obtaining information for their book, the authors visited several selected

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*Stanchion: an upright prop or support; a puncheon.

homes in which the owners were asked the same questions and in addition, invited to make any comments, critical or favorable.

Lighting:

Outdoor lighting is something that is normally overlooked in the planning stages. More and larger skylights are generally preferred by most occupants.

Budget:

The importance of the preplanned budget is being able to arrive at the price that was originally allotted for construction. This eliminates disappointments that the client would otherwise have.

Storage:

Normally most residences have plenty of inside storage but not enough outside storage. Outside storage is used for sports equipment, garden tools, and many other items that are used outside. Corridor storage has proven to be quite an asset. Storage is lacking for the number of books that the average family possesses.

Sun Control:

Keeping direct sun out during the summer months but allowing sun on the floor in winter

is most advantageous to home owners.

Kitchen:

The kitchen is the all-purpose room for the family. The reason for this is because of the amount of time spent for cooking, eating, and children playing.

Adaption:

Houses have to adapt themselves through changes in the lives of the owners. There is an obvious need for a house that would still be useful as the owner grew older and as the children grew and finally left home. An extra bedroom could be converted into a sewing room or office. Playrooms could be changed into a shop.

The Site:

Normally people choose a site before they choose an architect but the opposite has proven itself to be more successful. Landscaping of the site, in most cases, is not an integral part of the architectural plans. The reason for this is the landscaping is left for a later time or left up to the owner's leisure. By planting fast-growing ground cover, erosion can be prevented on hillside sites.

The Filtering Concept:

The so-called "filtering concept" is a theory by which housing is said to pass down the ladder, over a period of time, to families of lower incomes. There are several reasons for the moving down of housing. 1.) The deterioration resulting from age, 2.) changing styles causing some housing to become out of date, 3.) the declining character of some neighborhoods. These reasons and many more, in my opinion, cause housing to become less desirable for families at the income levels it has been serving, and as new and better housing comes on the market, the used housing declines to the level of the next lower income group of families. For the families of the lower income, it is accepted as better housing than they previously had, and therefore finds a ready market. This process is a constant sequence that eventually arrives at vacant housing, slums, and a final delapidated state. This theory is questioned by many individuals by the frequency and amount of actual situations. The one point that seems negligible but is of most concern is trees. New housing developments usually have to plant new trees. This means that when the homes are the newest,

they also usually lack the mature trees the most. In essence, that valuableness of the mature trees in the older housing districts is in one sense of the word an investment. Thus some owners retain their homes for this simple reason.[14]

Housing Standards:

"Standards" should be the housing goals toward which a nation strives. The Housing Act of 1949, established the goal of "a decent home and a suitable living environment for every American family . . ." This statement from the Act's preamble also has one other significant aspect in that it stressed both homes and environment.

No definition of "a decent home" or a "suitable living environment" have yet been organized or recognized by the people as a whole.

It would be very difficult for the United States to establish an over-all housing standard because different population groups have different needs.

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[14] Glenn H. Beyer, Housing and Society (New York: MacMillan Co., 1965), pp. 344-345.

Privacy:

Historically, privacy has always been a luxury few could afford. One need not go far back to a time when whole families lived together in one room. Nobody had privacy then. In colonial days, even among affluent groups, a family had to be quite well off to afford separate bedrooms, one for the parents and one for all the children. Today our ideal seems to be for each child to have his own room and own bathroom. But the middle class children raised on this spacious isolation are those now most likely to crowd together into one tiny room.

Bruno Bettelheim writes that

> "the first radical change, which was to alter the form of the Medieval house, was the development of a sense of privacy. This meant, in effect, withdrawal at will from the common life and the common interest of one's fellows. Privacy in sleep, privacy in eating, privacy in religious and social rituals, finally privacy in thought. In the castles of the 13th Century, one notes the existence of a private bedroom for the noble owners; and one also finds, not far from it, perched over the moat, a private toilet. Privacy in bed came first in Italy among the upper classes."[15]

It appears that as long as all the bodily functions, including sex and elimination, were more

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[15] Bruno Bettelheim, The Saturday Evening Post, "The Right to Privacy is a Myth," No. 15, July 27, 1968.

or less public; no great shame was attached. Only as one became more and more regulated to a private room, which became the privy, did he learn to feel shame at his body and bodily functions. The tragedy is that alienation from one's own body leads to alienation from others. And once we no longer feel comfortable with others, we crave still more privacy.

The more class-structured a society becomes, the more privacy its privileged members demand. How understandable, then, that a society which tries to do away with class structure should also try to do away with privacy, and demand that even larger areas of life should be public.

Among the unresolved problems of modern city life is the prevalence of fear in our streets. Perhaps here the solution has nothing to do with reconstructing our cities, or an endless enlarging of the police forces within them. What we need, in my opinion, is a return to much smaller, more self-contained communities where a great deal of what is now private can become public; where we would share more and know much more about each other.

The less we are kept back by shame from what is reasonably ours to enjoy, the less curious we

are about what others may be "getting away with" in private. The more secure we are in our private sphere, the more prepared we are to respect the privacy of others and resist its invasion. What would then remain private would be kept that way not because it was shameful, but because it was so valuable.

What we must strive for, as is true of most important human questions, is the right balance between what should be respected as private in our lives and what belongs to our more-or-less public and communal life. Then our lives will be neither fortified castles nor public places.[16]

CONCLUSIONS

> "What is housing? Basically, it is a product. It has a fixed location, being used only in the place where it is built. Once it is built, it remains in existence for many years, long after it has served its usefulness. It becomes almost a part of the land.
>
> Housing, unlike many other industrial products, is not highly standardized. Many types of materials are used in both the structure and in the furnishings. Different kinds of parts and facilities are incorporated. The structure possesses a network of pipes, ducts, wiring, and plumbing. There are single-family houses, duplexes, apartments, row-houses, and many other types. There is no "bluebook" that supplies regular price quotations in the used housing market.

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[16] Ibid.

Housing is more than a complex product. It is both an economic and a social process. It plays a tremendous role in the economy of this country. Approximately one fourth of our national wealth is in the form of city and village dwellings. Almost one fourth of the personal consumption expenditure of our population is represented in housing expenditures.

Housing is also important for other economic reasons. For a high proportion of the 100,000 builders it represents their livelihood. For the banker it represents an outlet for his funds. It has a close relationship to public utilities. A vigorous housing program opens up vast opportunities for employment.

There are certain idiosyncratic economic aspects that must also be recognized. Housing is not only sold but also rented. The purchase of new housing, in contrast to the need for food and clothing, is postponable. Higher income is likely to mean a new automobile and many other consumer goods before it means a new house. this makes the establishment of effecitve demand at any one time a complicated task.

Finally, and probably most important of all, housing has highly significant social implications because it provides the shelter for our basic unit - the family. Almost every person is affected in his day-to-day living by the kind of house in which he lives. Housing, therefore, is also urban planning.

There are many evidences of this. Those families who are forced, of necessity, to live in our slums are not given social opportunities equal to those who are able to live in decent, safe, and desirable housing. Unfortunately, houses are socially (but not so readily physically) expansible. This means that widespread doubling-up takes place as a result of economic necessity and under pressure of acute housing shortages.

Since each family is different from every other family, the use of housing remains ruggedly individualistic. Yet, there are some common requirements of housing: it should provide comfort, contentment, health, and aesthetic satisfactions. The idea that "a man's house is his castle" is more than a 350 year-old adage.

In short, housing is deeply involved in our social order."[17]

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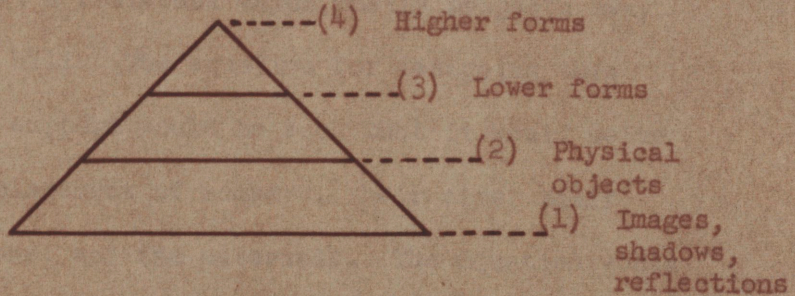
[17] Beyer, op. cit., pp. 3-4.

AESTHETICS

Aesthetics is a very hard subject to define. Dr. Parker at Montana State University, after lengthy exposure to the subject, says that he does not know what aesthetics is.

Plato defined aesthetics once by his "pyramid of knowledge." The pyramid consisted of four categories: higher forms, lower forms, physical objects, and images, shadows and reflections.



1.) Imaginary; assumptions

2.) Belief: it is really there

3.) Thinking: special sciences, facts and relationships

4.) Intelligence: knowledge of the truth has no assumptions, form of the truth

Plato felt that physics and mathematics were works of art, in other words, a new equation was beautifully and aesthetically pleasing. This type of situation was placed in the higher forms category which is intelligence. An artist who painted a beautiful scenery picture was placed in the category of images, shadows, and reflections. The

apex of the pyramid was the ultimate in aesthetics.[18]

I would imagine that most artists would take issue with Plato's thinking in placing them in the lowest category, but I personally feel that this definition of aesthetics has real value. For example, in this thesis, Hillside Housing, a support or truss system might have to be designed in order to support a residence which mostly projects away from the hill. The equation for designing this truss or support would be such that it would solve for the placement of members, their size, their connections, and the materials. The equation would take into consideration, in having the most efficient system possible, that the members would be placed so that they were capable of handling the maximum shear, the maximum bending, and the maximum compression. Thus the equation previously described, would achieve a system that does not take into consideration any of the principles used in art such as symmetry, contrast, unity, harmony, rhythm, and variety. However, I feel that this system is just as aesthetically pleasing and beautiful as any system consciously contribed using

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[18]Morris Weitz, Problems in Aesthetics, (New York: The Macmillan Company, 1959) pp. 5-190.

these principles of art instead of pure mathematics.

Webster's Third New International Dictionary lists two meanings for aesthetics.

The first illustrates what is wrong with much contemporary feelings about the subject. Webster says that aesthetics is "relating to the beautiful as distinguished from merely pleasing, the moral, and especially the utilitarian."

In the second definition, Webster says that aesthetics is "involving pure feelings or sensation, especially in contrast to ratiocination or reasoning."

When we think of something being beautiful, we "feel" its beauty as a sensuous experience. Afterwards we can examine the situation and sometimes discover why it impressed us in such a manner, but the reaction to beauty is first of all an emotion.

When a person looks at a building or experiences its interior spaces, he has feelings and we hope to make these feelings positive.

ECONOMICS

The economic considerations of this thesis are very flexible. The reason for this is the actual designing of the complex has not been started as of this time. Therefore the actual number of units has not been determined nor even the amount of floor space within the units. Taking this into account, a hypothetical situation has evolved in which we will assume at this time that the average amount of floor space is 700 square feet per unit and that there will be ten units in a group. The following has been devised for just one group of ten units; for each additional group the final cost can be multiplied by that number in order to get the entire cost of the development.

The design stage of the thesis which immediately follows this written portion will bring out many considerations that cannot be dictated at this time. I am most seriously considering a type of module construction for the development. This module could even be prefabricated if the design stages also agree. If it is prefabricated the following cost estimate could be reduced by as

much as twenty-five percent.[19] The reason for the twenty-five percent reduction factor for construction is of discipline by standard materials and components, and an adherence to dimensions which would minimize cutting and fitting. Structural systems and building methods can be used and developed to take into account the average trade skills which could be constructed with minimum effort and material.

As an example of a general price range for this project, the Marshall Valuation Service was consulted. No development such as Hillside Housing was given extensive consideration. Therefore Apartment Housing was substituted in order to give a fair idea of possible costs for costs of construction.

The amount of carpet, tile, stone work, and hardwood floors was averaged into one figure rather than trying to specify actual amounts.

TWO BEDROOM APARTMENT

1 - bedroom	120 Sq. feet
1 - bedroom	120 Sq. feet
1 - bath	54 Sq. feet

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[19] Norman Chermer, Fabricating Houses from Compact Parts (New York: Reinhold Publishing Corp., 1957), p. 15.

Living room	168 Sq. ft.
Storage	100 Sq. ft.
Kitchen	120 Sq. ft.
Halls	18 Sq. ft.
	700 Sq. ft.

SEGREGATED COSTS OF APARTMENTS

	Amount per sq. foot of floor space
Excavation & site preparation	$ .12
Foundation	.63
Frame	1.63
Floor structure	1.56
Floor cover	1.10
Ceiling	.52
Interior partitions	3.35
Heating, cooling, ventilating	2.45
Electrical and lighting	.77
Exterior wall & insulation	4.50
Roof structure	.85
Roof cover	.40
	$ 17.68
Elevators	.74
	$ 18.42

Miscellaneous built-in construction

Diswasher	$ 265.00
Exhaust fan	40.00
Garbage disposal	90.00
Range & oven	360.00

Refrigerator	325.00
	$1080.00
Total (700 sq. ft.) ($18.42 per sq. ft.) =	$12,894.00
Cost of built-ins	1,080.00
	$13,974.00
Five story building multiplier . .	1.105
(1.015) ($13,974.00)	$14,183.00 per unit

COMPLETION OF BUILDING VALUATION

Contractor's overhead and profit, normal taxes, permit fees and insurance during construction are included in the above costs; however, financing costs and broker's commission are not included.

Architect's fee multiplier . . .	1.07
(1.07) ($14,183.00)	$15,175.00
Current cost multiplier	1.04
(1.04) (15,175.00)	$15,782.00
Local multiplier	1.03
(1.03) ($15,782.00)	$16,255.00
Total	$16,255.00 per unit

25 percent reduction for prefabrication

(75%) ($16,255.00) = $12,291.00

Final estimated cost per unit . . $12,291.00
(for prefabrication)

A group of ten units would cost $12,291.00. The number of groups that are to be built can be distributed over a period of years. Thus the finished development would be the product of several stages of construction.

The financing of the Hillside Housing development could be the success or the failure of the entire project. If it is to be a success, short term loans have to be avoided along with interest rates in excess of ten percent. My reasoning for this is derived from Joppatowne which is "The story of a market success and a financial failure." This project, "Joppatowne," was started with $2 million in front money. They built more than 1600 units on 1400 acres in Baltimore during the past five years. By April of this year they were down to $5000.00 in cash and under siege by their many creditors. Ahead was $6.1 million in short-term loans, most at interest rates of eleven percent and twelve percent. The basic problem was that they could not strike a balance between heavy debt costs and cash flow. This is the same problem that has plagued a lot of new developments.

Most big subdivisions look good on paper, so it is relatively easy to borrow the sizable

amounts that are needed to start developing them. For as long as these projects live up to their optimistic cash flow projections, everything is fine. But what happens if sales drop off unexpectedly, as they did in Joppatowne? The developer has three choices:

1. He can sell some land. But that reduces his potential profit and plays havoc with his long-term plans.
2. He can get a money partner. But they are hard to find in times of trouble.
3. Or he can borrow more on the land, as Joppatowne did.[20]

The financing of this development can be handled in several ways. Gallatin Trust and Savings Bank interest rates vary between 6 3/4 percent to 7 1/4 percent. This takes into consideration the financial statement of the borrower. An FHA Loan has an interest rate of 6 1/2 percent. One other loan, Small Business Loan, is also applicable to this project. Its interest rate is comparable

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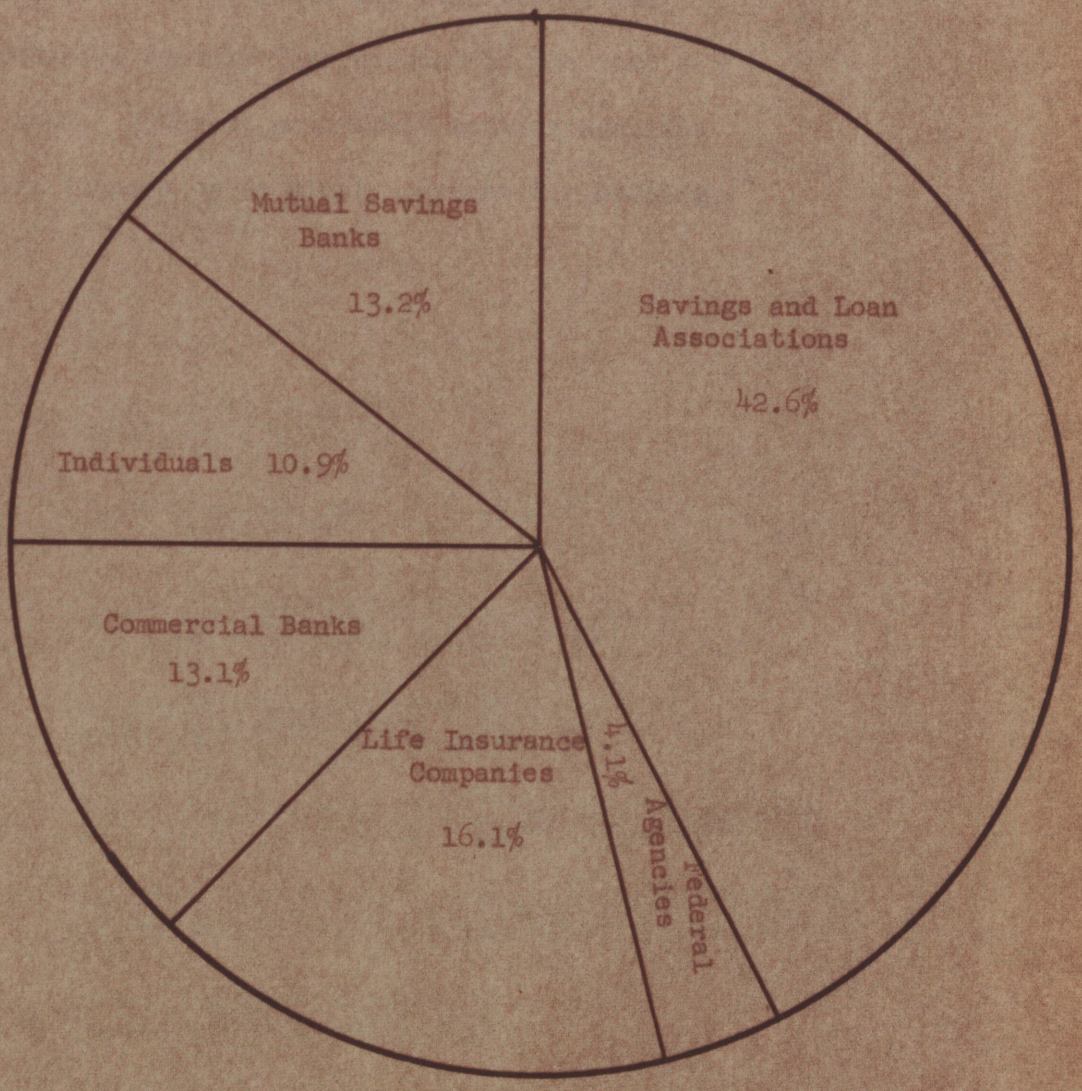
[20] "The Story of a Market Success and a Financial Failure," House and Home (McGraw-Hill Publications, Vol. 32, No. 2, August 1967), p. 57.

MORTGAGES ON ONE-TO FOUR-FAMILY HOMES

Figure XIII

Source: Housing and Society



The dollar amount of mortgages held by the principal types of lending institutions is shown above.

with the other loan programs. Most of the banks and other private loan associations require approximately twenty-five percent working capital from the borrower and will supply the remaining seventy-five percent in the form of a loan. However, government loaning agencies will finance up to ninety percent for housing.[21]

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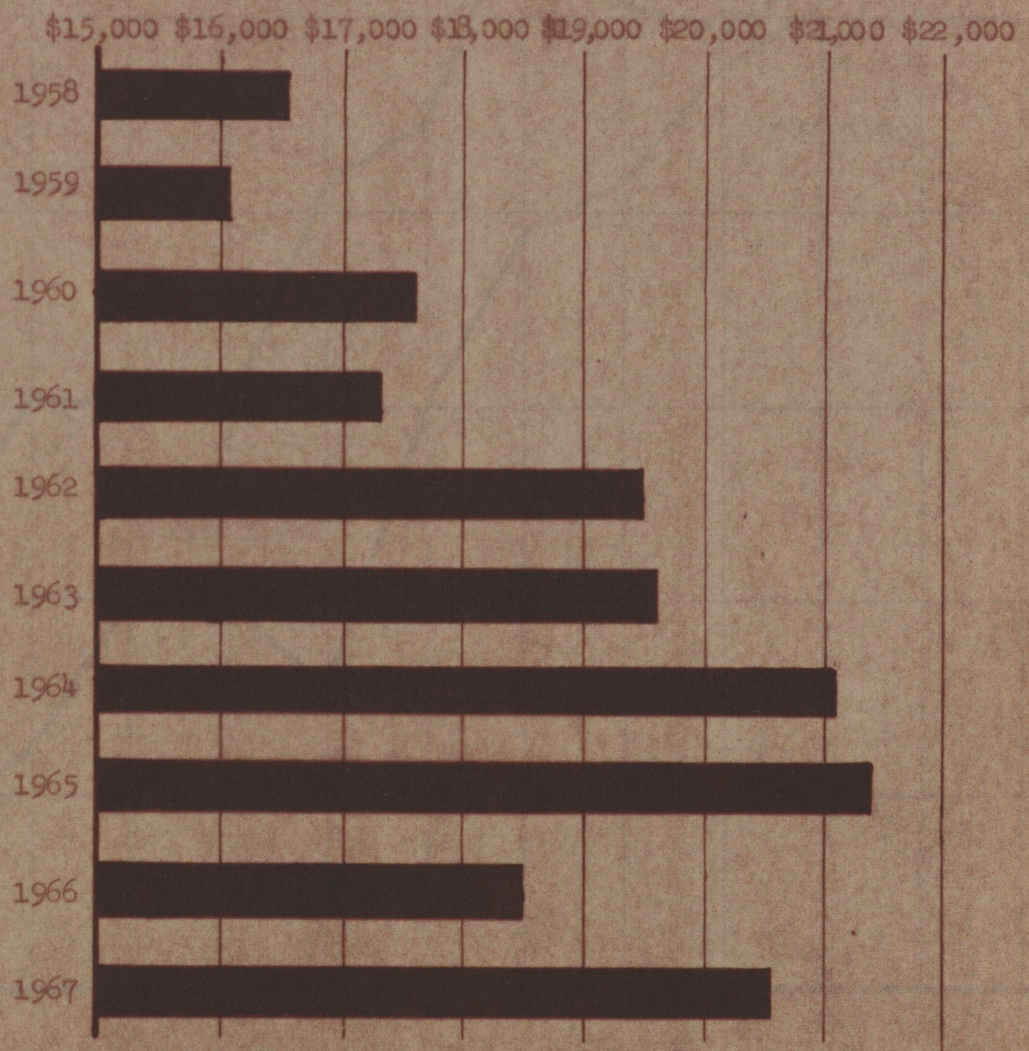
[21] An interview with James P. McGuire, employed at Gallatin Trust and Savings Bank, Bozeman, Montana, August 6, 1968 at 1:30 p.m.

COST OF SINGLE FAMILY RESIDENCE IN BOZEMAN Figure XIV

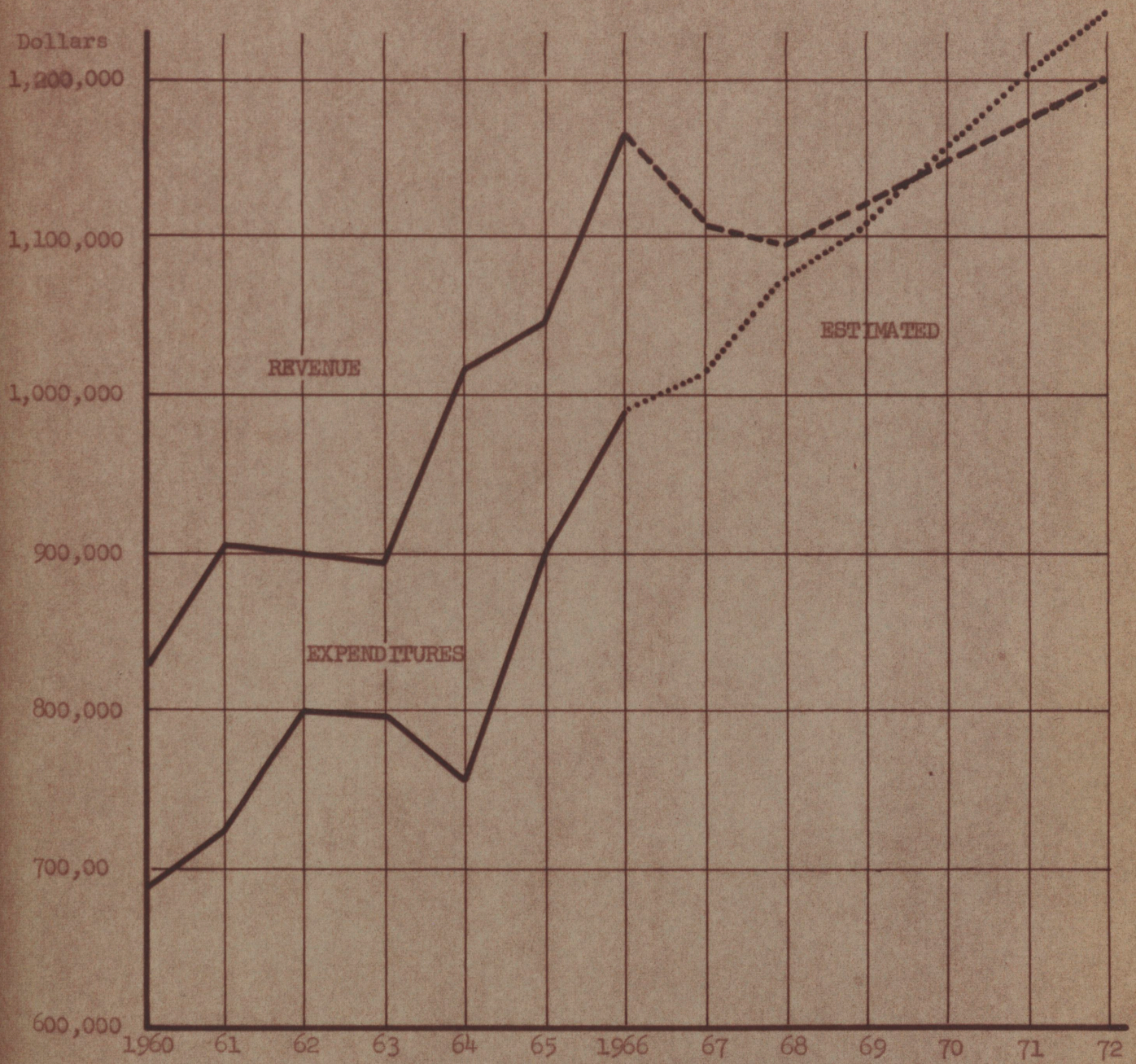
Without Respect to Size

Source: Don Barrack, City Inspector



BOZEMAN'S REVENUE & EXPENDITURES Figure XV

Source: T. J. Wirth and Associates



Revenues
Property Taxes
Rights & Privileges
Services & Sales
Fines & Forfeitures
Investments & Property Sales
State-shared Revenues
Miscellaneous (sundry)

Operating Expenditures
Departments of:
Law, Finance, Safety,
Service, Welfare
Bond Service on issues of 1948,
1963 & 1965 only included
in projections.

BUILDING PROGRAM

"One of the most fundamental requirements of a successful building program is effective communication between the owner and the architect. This is necessary not only to provide the architect with the detailed requirements of the building, but also to make him aware of the philosophy of the owner, and to help him to identify himself as a part of the group whose responsibility it is to create a building. The more thoroughly the architect understands the role the building will play in accomplishing the objectives of the client, and the more he feels a part of the group responsible for successfully fulfilling this role, the better and more effectively will he be able to create and oversee the execution of a design.

The establishment of such communication is primarily the responsibility of the owner. No matter how adept the architect is at asking questions, no matter how much time he spends in research, and no matter how great his general knowledge of the type of building he has been commissioned to design, without an owner who can successfully make his needs and wishes known, he cannot perform his function as well as he should.

The architect, by training and experience, is able to transform environmental needs into space. To do this he uses sketches, drawings and specifications and when he prepares these he considers all of the facets of a building and hence produces a unified and coordinated scheme.

Therefore, what he requires is a concept of the space to be provided and <u>not</u> sketches and floor plans and this concept must be obtained from a written program. He is not a consultant on how the space is to be used but rather an expert at arranging space and its attributes to provide the proper physical environment which is to house a specific activity or a group of activities."[22]

22

I have prepared the following building program. This program outlines the essential aspects of a Hillside Housing Development which will be solved in the design portion of this thesis.

The development of the entire project will be devided into two parts. The first stage includes living units, a north-south arterial, and access to utilities. The second stage proposes a finished park and additional living units. The designer must prepare a complete concept for the living units and a comprehensive plan to portray the entire development in its finished stage.

Living Units:

The units will be sold on a condominium basis. Construction costs should not vary more than ten percent of $12,000.00 per average unit. This figure includes all common areas, parking areas, and circulation areas. It does not include money to be spent by the city for the north-south arterial, the city park, or the extension of utilities and sewer. The number of bedrooms per unit should fall within the following requirements. One-fifth of the units must be one bedroom units. Three-fifths of the units must be two bedroom

units, and one-fifth are to be three bedroom units.

The total number of units in the first stage should be within ten percent of 75 units. The second stage of construction should start developing from eight to ten years after the first stage has been completed. In accordance with facts previously discussed in this thesis, Bozeman can absorb seven to ten units per year in this particular development.

Each unit should have access to a type of plaza or individual balcony. If individual balconies are decided upon, they should be designed so they cannot be viewed from adjacent balconies. The units should also have individual outside storage areas that can be accessible by automobils.

Parking:

Ample space for parking is a must. The base requirements call for, at minimum, a covered parking stall for each unit. There must also be enough extra parking spaces for .5 X the number of units. These spaces need not be covered.

Elevators:

The aspect of elevators should be considered.

The cost of elevators, if decided upon, must be deducted from the $12,000.00 per unit.

Sound Transmission:

Sound transmission between units cannot exceed 30 decibels.

Garbage:

A convenient means of disposing of refuge is an important factor. The distance between the individual units and recepticles should be minimum. A clean, sanitary system for the refuge is mandatory. Such aspects as hindrence of refuge deposits by wind, children, and domesticated animals should be considered. The distance between disposal recepticals and service by refuge trucks is also a factor.

View:

Full advantage should be taken of the natural view which the site possess. As many units as possible should be exposed to this view. Provisions to impede vision from one unit into another are desirable.

Telephones:

An empty telephone outlet must be incorporated into each unit. Pay telephones should also

be available on a community basis.

Alarm System:

A presignal fire alarm system is also mandatory.

Storage:

Besides the outside storage areas and normal storage for linen, clothes, etc., there must also be provisions for book storage.

Laundry Facilities:

A common laundry area should be considered. This will take the place of each unit having to have its own individual washer and dryer.

Cleaning:

The possibility of a central vacuum system for mops and/or vacuum cleaners should be investigated.

Mail Delivery:

A central system for mail delivery would be more desirous than door-to-door delivery.

Common Recreation Area:

This area should be covered and heated. It also must have toilets for each sex.

Men

One water closet, one urinal, two lavatories.

Women

Two water closets, two lavatories.

Air Conditioning:

Air conditioning (central system) should be incorporated. This could provide possibly a service that could be less expensive than that of having an air conditioner in each unit.

Drinking Fountains:

Public drinking fountains should be positioned in convenient locations.

Outside Electrical Outlets:

There should be at least one outside outlet for each unit. The feasibility of head bolt heaters in parking areas should also be studied.

Custodial:

There should be adequate custodian areas to maintain the common areas. Provisions for maintenance of outside grounds are also necessary.

Public Services:

It is mandatory for all public services to be underground. Services include sewer, water, electrical, and telephone.

Floor Drains:

In areas which require floor drains, the floor should be sloped to the drain.

Park:

Due to Bozeman's present park needs, there must be an area with the development that may be used as a public park. The park should contain the usual recreation facilities such as playfields, playground equipment, and picnicing areas. Covered areas should be considered along with development of Sourdough Creek. Based upon the National Recreation Park Association, the standards of 10 acres per 1000 population shall be minimum. It should also be considered that the deficiency in parks may be curtailed by having additional park area than the minimum. Refer to page eight.

Erosion:

Because of the site's inclination, erosion can play a disasterous role. Therefore, when the natural ground cover is hindered by construction, special provisions have to be made. Additional planning so as to restore ground cover and add to it must be included. Special drains and gutters may also have to be incorporated in order to prevent erosion. Provisions for runoff during heavy rains must also be studied.

APPENDIX

Existing Houses:

All of the existing houses in the area of the site are mostly tract houses. None of the houses are on the actual hillside. The existing houses are mostly secondary in that they are older homes and most are small. The major proportion of the houses are in a dilapidated state. All of the houses are located on the flat land near the Sourdough Creek. This flat land is very poorly drained. The possibility of the creek flooding is a constant threat to the houses in this area. What I am proposing to do is to phase these houses out on a long-range basis ultimately achieving a well-developed city park. Presently the land value of the undeveloped acreages is approximately, at minimum, $1000.00 per acre.

Contour Map:

On page 33 of this thesis a contour map of the Bozeman area, in 40 foot intervals, is located. After extensive searching, I have found no other contour maps of this area. I feel that from the 40 foot contour intervals and the close accessibility to the site I can build a contour model that will be very helpful in the following de-

sign stages.

Utilities:

The area that the site is located within is able to apply for a special improvement district. Special improvement districts can be paid off in up to twenty years. The present interest of a special improvement district is 5½ to 6 percent. The current premiums for the normal utilities are the following. Paving costs $40.00 a lineal foot for a 37 foot wide street. This also includes curbs. A six inch water main costs approximately seven to eight dollars per foot. Street lights are assessed by the Montana Power Company. 175 watts which is about 7000 lumens, costs $3.70 per unit per month. The storm sewer would cost about $5.50 a foot for a 15 inch main. Storm drain inlets costs $350.00 each. Sidewalks are normally bid at 65 cents a square foot for a four inch walk. A six inch deep sidewalk is normally 70 cents a square foot. The sanitary sewer is next to impossible to estimate at this stage. An eight inch trunk line for the sewer is usually $8.00 a lineal foot. Manholes cost between $500.00 and $580.00 for ten to twelve foot depths. A rough

estimate for the number of manholes needed would be about twenty-four. This number is for both stages or approximately 150 units.[23]

Aesthetics:

On page 73 of this thesis I have discussed my philosophy on aesthetics. I have also indicated the origin and source of my beliefs. In this section I have tried to reveal the misconceptions that people in general seem to have about aesthetics. I feel that most people do not realize that physics and mathematics, etc. are art, beautiful, and aesthetically pleasing. Some of the ancient Greek philosophers have stated that equations in physics and mathematics are discovered and not invented. What I am trying to say is that an equation can be discovered or composed for a structure. And if this structure follows the mathematical equations which would determine the exact size of members, the exact amount of stresses, the most efficient position for each individual member that we could arrive with a system which would be in my beliefs the

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[23] From an interview with the City Engineer, R.C. Fargo, October 9, 1968 in Bozeman, Montana.

aesthetically pleasing structure that could be designed under these circumstances.

Economics:

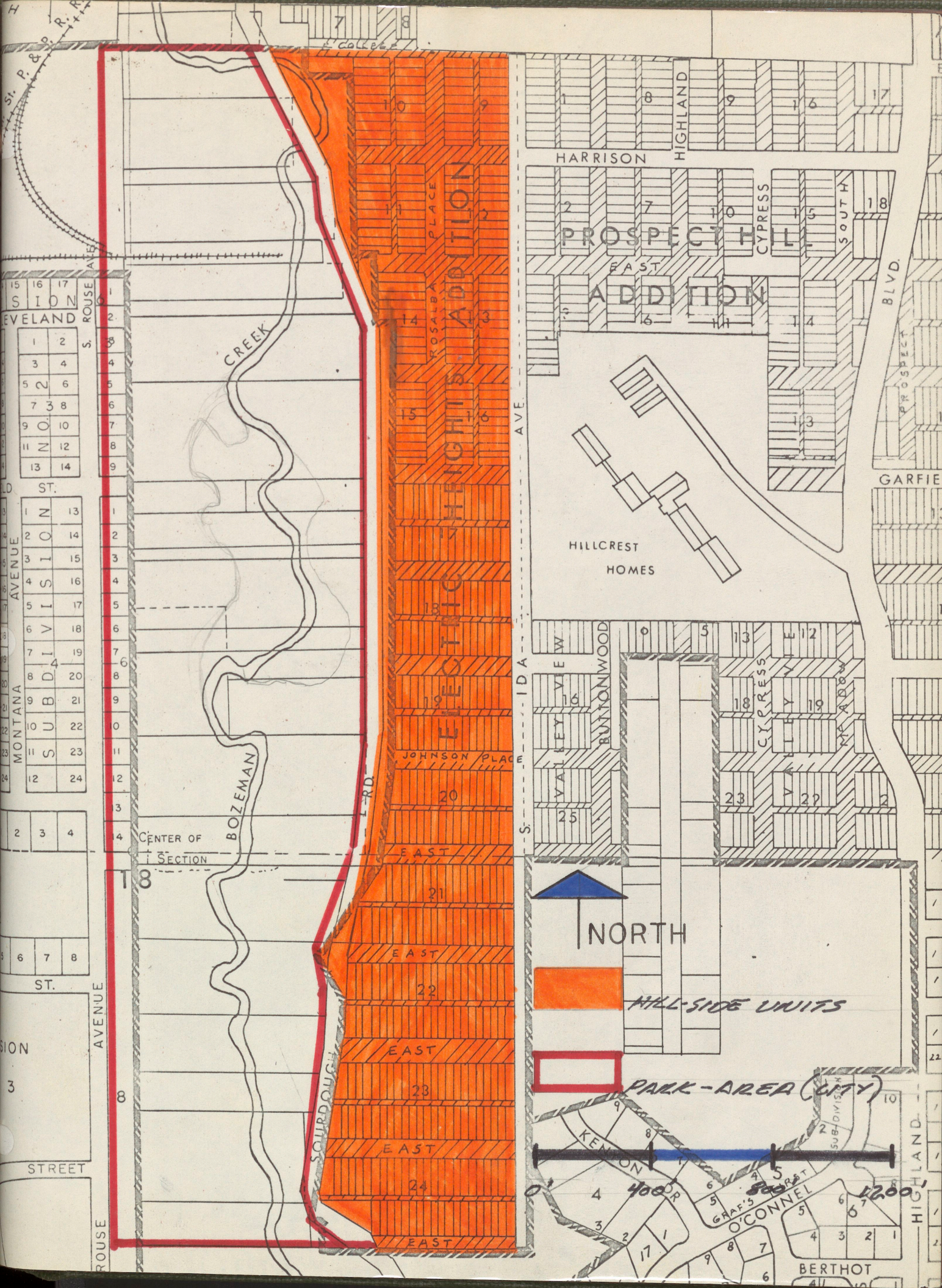
I had anticipated that the individual units could be sold on a condominium basis in such a way that the incoming money from sales could help to reinforce the original investment until the entire development has been completed. In essence units already completed could be sold to pay for units not yet built. Thus a happy medium could be obtained between the acceleration of building construction and sales of units which would be a direct relationship to the demand. I also feel that the city would be responsible for providing the north-south arterial and the city park. I would also like to mention that the north-south arterial and the city park are the features of this development which would require the sites of the present buildings already mentioned. The actual hillside units do not require the removal of any structures.

Seasons:

Spring is from March 21 to June 22, summer is from June 22 to September 23, winter is from

December 22 to March 21, and autumn is from September 23 to December 22. The more technical definitions for the seasons for the Northern Hemisphere, 1967, at eastern standard time is March 21, 2:37 A.M. Sun enters sign of Aries; spring begins; June 21, 9:23 P.M. Sun enters sign of Cancer; summer begins; Sept. 23, 12:38 P.M. Sun enters sign of Libra; autumn begins; Dec. 22, 8:17 A.M. Sun enters sign of Capricornus; winter begins.





PROSPECT HILL ADDITION
ELECTRIC HEIGHTS ADDITION
HARRISON
HIGHLAND
CYPRESS
SOUTH
BLVD.
PROSPECT
EAST
ROSALBA PLACE
HILLCREST HOMES
IDA AVE.
S.
VALLEY VIEW
BUTTONWOOD
CYPRESS
VALLEY VIE
McADOW
JOHNSON PLACE
CREEK
BOZEMAN
L RD.
CENTER OF SECTION
EAST
SOURDOUGH
KENTON DR
GRAF'S FIRST
O'CONNEL
SUB-DIVISION
BERTHOT
HIGHLAND
GARFIE
EVELAND
S. ROUSE AVE
MONTANA AVENUE
SUBDIVISION NO. 2
ST.
AVENUE
STREET
ROUSE
NORTH
HILL-SIDE UNITS
PARK-AREA (CITY)
0'
400'
800'
1200'

SUMMARY

At this point, with only one week to go, I can honestly say that I have put forth my most enduring efforts thus far in my education. I am glad in only one respect, which is that I chose housing on a 100 percent grade as my thesis topic. For I feel that the last six months have been an investigation into a subject that can become more extending in my endeavors in the future.

I am not totally satisfied in what has been accomplished to date. By this I mean that what has been finished is only a tool to use to search further. For if I were completely convinced at this stage, I would have terminated my desires to continue efforts in this area.

I would like to say that my design solution is the product of my research, the product of six months of work; it is myself; it is the way I think and feel. It is the most honest project that I have ever been associated with. The reason that I can say this is because I originated the problem and attempted a preliminary solution as the answer to the problem.

I am most grateful to the faculty and my

critics for their time and knowledge. For they are directly responsible for the manner in which I have performed. They should also be accredited with their challengings of my premises of thought which were untried until their tests were applied.

Urban structures are nothing new. As early as 1939, Mr. E.A. Koch proposed hillside apartments. The newness that I have discovered may be new only to myself. The new uses are standardized components, the use of idle sloping sites for the reduced land costs, and the elimination of heavy foundation work, as foundations are to be notched or dowelled into the embankment. Another very important factor is exploiting industrialization in such urban structures.

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HEREFORD

MASON

LINCOLN

AVENUE

MONTANA

AVENUE

ROUSE

GARFIELD

CLEVELAND

CM ST

P&P RR

SCALE - 1"=50-0"
CONTOUR INTERVAL - 5'0"
OCTOBER, 1968

NORTH

TO BOZEMAN

SOURDOUGH ROAD

TO COLLEGE ST

IDA AVENUE

LINCOLN

GRANT

CLEVELAND

HARRISON

BUTTONWOOD

HIGHLAND

MAR 5 1970

MAR 9 1971

MONTANA STATE UNIVERSITY LIBRARIES
stks 720.6.M76C622 CA
Hillside housing development /
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LIB USE ONLY

