DOUGLAS OSWOOD

ANACONDA SMELTER

P378
.Os9

LIBRARY
Montana State University
BOZEMAN

ANACONDA SMELTER

Great Falls, Montana

By

Douglas Oswood

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

June 1973

Q378
.059

[redacted]
TA9.6
M179
059A

TABLE OF CONTENTS

	Page
CHAPTER I--THESIS PROPOSAL	1
CHAPTER II--HISTORY OF A C M	5
CHAPTER III--INTRODUCTION OF THE A C M PLAN	7
CHAPTER IV--HISTORY OF THE AREA	10
CHAPTER V--INTRODUCTION OF A C M DEVELOPMENT PLAN	15
CHAPTER VI--LAND USE SUMMARY	17
CHAPTER VII--COPPER OPERATIONS	19
CHAPTER VIII--WIRE AND CABLE CO.	21
CHAPTER IX--EMPLOYEE INFORMATION	24
CHAPTER X--TRANSPORTATION	25
CHAPTER XI--TRANSPORTATION PLANNING	30
CHAPTER XII--RESIDENTIAL DEVELOPMENT	32
CHAPTER XIII--LAND USE INVENTORY	37
CHAPTER XIV--SELECTED TRAVEL INFORMATION	39
CHAPTER XV--OBJECTIVES AND GOALS OF THE HOUSING PROGRAM	40
CHAPTER XVI--SURVEY FINDINGS	42
CHAPTER XVII--GREAT FALLS HOUSING SURVEY	46

CHAPTER I

THESIS PROPOSAL

THESIS PROPOSAL

The Anaconda Smelter in Great Falls, Montana, is the subject of my proposed thesis project. Its scope deals with a combined area between forty to fifty acres. Within this area is a housing complex, production facilities for zinc, a 620 foot smoke stack and a golf course.

Some five months ago, all zinc production was discontinued leaving the majority of the smelter complex unused. Anaconda Company officials say that within a period of time the complex, and specifically the stack, will have to be torn down because the upkeep will be too great and the physical aspect of the plant will undoubtedly be condemned.

My thesis proposal deals with an architecture solution of what to do with this area. It also will help me as an architect deal with the shape of things already constructed, possibly the solution to many "growing pains" is not to dismantle and discard but rather to evaluate the area and provide workable solutions. Further research through contacts with the City Council of the City of Great Falls and the Anaconda Company will aid me in my architecture solution.

My thesis presentation will consist of a complete slide presentation of my drawings and models.

I. SUBJECT OF THE PROJECT

A. The area under study is the Anaconda Smelter in Great Falls, Montana.

B. It has been abandoned since July 1, 1972.

II. DISCUSSION OF THE THESIS

A. It has happened in the past that when an institution is abandoned, it usually becomes condemned and ends up being torn down.

B. The program of this thesis is to introduce the problem of certain existing institutions which have been abandoned; this being an industrial institution surrounded by a residential type of environment.

C. The object of this thesis will be to study this type of institution and arrive at an architectural solution to this problem.

III. STUDENT ADVISOR

A. Professor William Carver

IV. RESOURCE PEOPLE

A. The City Council of Great Falls, Montana.

1. Their views on this proposal.

2. Their personal feelings about this proposal.

B. The City Planner of Great Falls, Montana.

1. His short and long range program.

C. Employees of the plant.

1. Information concerning the building facilities.

D. Head of the Department at the Anaconda Smelter in Great Falls, Montana.

E. County Court House

1. Land use studies

V. METHOD EMPLOYED IN REACHING A SOLUTION

A. Survey

1. The city in the regional setting of Montana.

2. The city of Great Falls, Montana.

3. The area surrounding the Anaconda Smelter in Great Falls, Montana.

B. Area Study

1. Existing land use map

2. Soil limitation

3. Water analysis, surface water and water tables

4. Conditions of the buildings

5. Layout and environment

6. Scenic values

7. Recreation values

8. Residential values

9. Historic values

10. Institutional values

11. Hydrology

12. Surface drainage

13. Soil drainage

14. Geology

15. Slope

16. Economical factors

17. Vegetation

18. Climate

19. Physiography

20. Transportation

C. Sorting and organizing information gathered.

D. Plotting information in graphic chart form.

E. Land use map.

VI. MEETING SCHEDULE

A. Advisor

1. Once a week

B. Thesis Committee

1. Once a week

C. Resource People

1. When possible

VII. REQUIREMENT FOR PRESENTATION AND LIBRARY DOCUMENTATION

A. Research booklet in form

1. Maps

2. Pictures

3. Graphs

CHAPTER II

HISTORY OF A C M

HISTORY OF THE A. C. M.

Early in 1891 the Boston and Montana Consolidated Copper and Silver Mining Company broke ground for a copper reduction works on the north bank of the Missouri River across the river from the east end of the City of Great Falls, and about two and one-half miles from the business district of that city. Black Eagle Falls is at this point in the Missouri River. These works were built to treat ore from the company's mines in Butte yielding copper and relatively small amounts of silver and gold.

In March, 1892, the concentrator, roasting furnaces, reverberatory smelting furnaces, and converters were ready to begin operations. A blast furnace for the retreatment of converter slag was completed in 1893, thus completing the plant construction necessary for a chain of operations for the production of blister copper.

An electrolytic copper refinery and a furnace refinery were built in 1892 and put into operations in 1893, making it possible at that time to carry the treatment from ore to commercial shapes of refined copper. These plants were rebuilt in 1915 and enlarged in 1925. The electrolytic copper refinery is now being rebuilt, enlarged and modernized. A billet plant was started in 1953 to produce a shape that is used for the production of copper pipe and tubing.

During 1910, the properties of the Boston and Montana Consolidated Copper and Silver Mining Company were taken over by the Anaconda Copper Mining Company, and since then, the metallurgical plants at Great Falls Reduction Department of The Anaconda Copper Mining Company. In 1955 the name was again changed from the Anaconda Copper Company to The Anaconda Company.

In 1916 a plant was completed for the production of electrolytic zinc. The plant was enlarged in 1925 and again in 1942.

In 1918 a mill was finished for the manufacture of copper rods, wire and cable, which are made from the refined copper produced by the furnace refinery. The completion of the mill brought the copper industry in Great Falls to the point of producing a product ready for the consumer. This mill was transferred from the Anaconda and Cable Company. A new mill was built in 1954 for the manufacturing of aluminum rods, wire and cable which are made from refined aluminum produced at the Anaconda Aluminium Company plant at Columbia Falls, Montana.

Prior to 1918, the work of copper concentrating and smelting, for which the original works were built, was gradually reduced entirely, so that now the operation changed from the copper concentrating and smelting to that of copper refining, copper and aluminum rod, wire and cable manufacture and electrolytic zinc and cadmium production.

CHAPTER III

INTRODUCTION OF THE A C M PLAN

INTRODUCTION OF THE A C M PLAN

A C cutback at Great Falls plant part of company reorganization.

Viewed in the perspective of Anaconda Co.'s total operation, setbacks in Great Falls and other Montana locations would have to be viewed as "a step back in the right direction."

While damaging to the local economy and drastic terms of unemployment, closure of the local zinc plant and cutbacks in other Montana A C endeavors have helped to put the company back on its feet financially--a fact that could in the long run mean much to the state.

When zinc smelting and refining operations at the Great Falls plant were axed, about 800 workers lost their jobs. Marin K. Hannefan, general manager of Montana operations at the time, blamed the closure on diminishing returns from the zinc operation due to competition in Japan and West Germany, to skyrocketing costs of operation and to what he felt were unreasonable and costly demands to meet environmental standards that would cost a lot of money.

At the same time, Anaconda announced sales of extensive timber lands in Montana and cuts in work forces at several sites.

All of these moves were part of drastic action taken by the huge corporation to pull itself out of a dire situation

brought about by the loss of company holdings in Chile and mounting losses in some of its operations.

Credit for saving the firm is given to Anaconda's chief executive, John B. M. Place. An article in Forbes Magazine for December, 1972, says that Place has accomlished "one of the most efficient turnarounds of a giant company in corporate history."

He accomplished this by closing the zinc smelter and wire mill in Great Falls, a lead smelter in Utah, a new mine in Canada, four brass mills, nickel and aluminum ventures in Australia. "If something is not profitable," Place is quoted as saying, "we are not going to hang on to it."

Money from the sale of Montana timberland, $117,000,000 in cash, which Anaconda has no know-how for developing, was applied to a bank debt of nearly $196,000,000 reducing maturities problems to manageable proportions.

What this means to Montana is that Anaconda, revitalized and stable once more, may eventually find methods to make its zinc and aluminum operations in the state feasible again, or expand into other areas of industry.

The company announced early in January, for instance, construction of a $22,000,000 smelter in Anaconda, creating 120 new jobs with an annual payroll of 1.2 millon. About 450 men will be employed at peak of construction, scheduled

to begin this spring. The plant will be operational by late 1974, according to the present schedule. Copper ore concentrates from Butte, Nevada and Brittannia Beach, B. C., will be processed at the smelter.

Plans to invest $200,000,000 in Montana over the next five years were announced by Place in the summer of 1972.

"We have made a commitment to Montana and we're backing it with money."

CHAPTER IV

HISTORY OF THE AREA

History of the Area

The Great Falls area was originally part of the territory claimed by France. It was ceded to Spain in 1762, but was recovered by France 40 years later. It was sold to the United States as part of the Louisiana Purchase of 1803. Successively, it had been part of the Territory of Louisiana, Territory of Nebraska, Territory of Dakota, Territory of Idaho, Territory of Montana and State of Montana when statehood was achieved in 1889.

Following the Louisiana Purchase, President Jefferson appointed Captains Meriwether Lewis and William Clark as leaders of an expedition to explore the newly acquired land. At the time of the Lewis and Clark Expedition, the Blackfeet Indians were in possession of the area. Trapping and trading with the Indians followed the expedition. However, the Blackfeet maintained a hostile attitude toward trappers and traders. The establishment of a permanent post of the American Fur Trading Company at Fort Benton, about 25 miles below the lower falls, eased the tension and trouble declined.

In 1881 Paris Gibson, an engineer, visited the locality. The following May he began surveys of the Town of Great Falls, and with the backing of James J. Hill, the Great Falls Water, Power and Townsite Company was incorporated. The town was incorporated in 1888 and Paris Gibson was elected mayor, a position he held for several years. Because of this man,

Great Falls grew as a planned community with wide streets and ample parks.

Early industrial development included a dam and hydroelectric plant at Black Eagle Falls, smelting plant, a meat packing plant and a flour mill built by Paris Gibson in 1885. Much of the growth of the city can be attributed to the construction and operation of several hydroelectric dams at the various falls of the Missouri River where power of the falling river has been put to productive use.

The importance of agriculture to the growth of the area is reflected today in the large number of business houses and related facilities that are associated with agriculture and livestock raising.

From the age of the buildings, it is evident that the early development of the city was located in the area to the east of the river and in close proximity to the business district. Early residential construction occurred in this general vicinity where employment centered in the commercial and industrial establishments. The later construction of railroad yards on the west side of the river and the smelter and mill in the vicinity of Black Eagle contributed to the expansion of these areas.

Malmstrom Air Force Base, just east of Great Falls, which was established as a bomber training base during World War II, has also played an important part in the development

of the area. This air base currently serves as a control center for a vast missile complex located throughout Northern and Central Montana.

Growth of the Area

To plan for the long-range physical development of an area requires a look at past trends in population and projections of these trends based on known future influences.

The following table and chart present a comparison of past population growth within the Great Falls corporate limits, Cascade County, Montana, and the United States as determined by the U. S. Bureau of Census.

Year	Corporate Limits Great Falls	Cascade County	Montana	United States
1890	3,979	8,755	142,924	62,947,714
1900	14,390	25,777	243,329	75,994,575
1910	13,948	28,833	376,053	91,972,266
1920	24,121	38,836	548,899	105,710,620
1930	28,822	41,146	537,606	122,775,046
1940	29,928	41,999	559,456	131,669,275
1950	39,214	53,027	591,024	150,697,361
1960	55,357	73,418	674,767	178,464,236
1970	60,091	81,804	694,409	205,022,000

The demand for schools, parks, roadways, residential, commercial and other land by 1990 will be dependent upon the amount of growth that can be expected between now and 1990. For this reason, extensive population studies have been recently accomplished as a part of the Great Falls Transportation Study.

Population data projected for this study indicated that the Great Falls metropolitan area will grow to over 83,000 persons by 1975 and to over 120,000 persons by 1990. The following table shows Transportation Study area data for 1968 and projected Study Area data for the years 1975 and 1990.

	1968	1975	1990
Persons	78,884	83,542	120,179
Students	23,585	25,134	37,758
Employed	31,008	33,200	47,220
Dwelling Units	23,354	24,678	35,883

Economic Trends

The economic studies prepared as part of the Great Falls Transportation Plan indicate that the Great Falls area can expect steady economic growth based on its importance as a major trade and service area of Central Montana and Southern Alberta. Manufacturing, although not rapidly growing will continue to be important as a source of export income, as will trade, services, agriculture and the military.

Steady growth has also been reflected in building within the area. The value of new construction in the City of Great Falls reached an all-time high in 1969, totaling over 13 million dollars, up over 151 per cent from the previous year. Eighty-five per cent of this total valuation has been nonresidential construction, indicating confidence in the future commercial growth of Great Falls.

The following table shows comparative building statistics in Great Falls since 1959:

GREAT FALLS BUILDING STATISTICS

Year	Total Permits	Total Valuation	Residential Units	Residential Valuation
1959	1,202	10,901,799	702 units	6,610,121
1960	1,143	13,140,752	740 units	6,551,099
1961	999	8,779,429	594 units	5,440,384
1962	852	8,683,233	471 units	4,432,044
1963	817	12,380,808	505 units	5,056,206
1964	765	7,436,753	330 units	3,692,315
1965	808	8,622,921	324 units	3,429,890
1966	849	7,434,066	171 units	1,997.127
1967	767	7,352,716	140 units	1,851,799
1968	831	5,259,932	161 units	1,914,342
1969	755	13,215,435	187 units	1,991,077

CHAPTER V

INTRODUCTION OF A C M DEVELOPMENT PLAN

INTRODUCTION: THE A C M DEVELOPMENT PLAN

The idea was conceded of A C M developmental plan when John B. M. Place, chief executive for the A C M plant made the decision to cutback 60 per cent of the plant's operation. This cutback was the zinc operation, leaving the copper refinery and wire mill remaining. This physical decline was due to loss of zinc operations to competition in Japan and West Germany.

FUNCTIONS OF THE GENERAL PLAN FOR A C M

The main function of the 1972 general plan for the A C M of Great Falls, with accompanying tables, charts, maps and other graphic illustration is to provide an equally general, ambitious, but realizable statement of development and objectives for the A C M renewal.

DISTINGUISHING CHARACTERISTICS OF THE PLAN

The plan is an outgrowth of industrial institutions within the city which have become extinct and by certain decision making have been abandoned, leaving to a great extent the question of what to do with this area.

SPECIAL EMPHASIS

Certain highlights of the development program are underlined in the plan:

1. This development plan cannot be carried out without the approval and support of the A C M Company.

2. Guidelines for any accomplishment on the plant must meet certain code standards.

CHAPTER VI

LAND USE SUMMARY

LAND USE SUMMARY

Major changes in Anaconda Copper plant land use:

1. Residential; Change in plant region from 5.0 per cent to 20.0 increase in per cent. The plan proposes a modest growth in residential acreage, an improved and added distribution of diverse housing types, and a moderate increase in housing densities in many parts of the plant's region.

2. Commercial; The change in residential increase of 15.0 per cent leaves the expected increase in commercial land use of the plant's region from 0.0 per cent to 5.0 per cent. The commercial land use is limited only to within the plant's region.

3. Light Industrial; Change in what you might call a very minor per cent (if you categorize the maintenance shops as part of the light industrial use). An increase in 27.0 per cent land use for industry. An increase in various types of industry with a varied pattern of industrial land uses and distribution along a greater utilization of the existing industrial buildings and very little new buildings being constructed.

4. Heavy industry; The copper refinery is 40.0 per cent of the plant's operation. The plan proposes a modest growth along the lines of heavy industry in connection with the southeast region of the plant being its projected growth direction. This made possible by a plan for industrial land reorganization.

5. Open space; There will be changes in open spaces along the lines of improving the existing areas which will include,

    1. clean up
    2. landscaping
    3. parks

    } also open spaces occur throughout all areas of the plant.

6. Recreation; Change in recreational facilities will be along the lines of greater utilization of the existing facilities which is created by improving the existing recreational areas. Also there will be improvements capitalizing on the undevised river front areas, along the lines of parks and open spaces amounting to 10 per cent land use.

CHAPTER VII

COPPER OPERATIONS

COPPER OPERATIONS

Impure copper in the form of (1) anodes is shipped from Anaconda to Great Falls and is placed in (2) refining tanks to be electrolytically refined. The refined copper in the form (3) cathodes goes to a (4) reverberatory type furnace to be melted down and (5) cast into (6) shapes for market.

A part of the shapes so produced goes to the Anaconda Wire and Cable Company Wire and Rod Mill in Great Falls where it is (7) rolled hot into rods, (8) drawn cold into wire and a part of the wire is (9) stranded into cable. The remainder of the rods are shipped to other wire mills to be drawn into wire. The remainder of the wire is used as single strand line wire.

Copper has the highest electrical conductivity of any of the common metals, hence it finds its greatest use as an electrical conductor. It is used in transmission lines, substation wiring, house wiring, transformers, motors and generators, radio and radar equipment, television equipment, and for many other electrical jobs. It is combined with zinc to make brass and with tin to make bronze. It is used in such products as automobile radiators and copper flashing and roofing. It is also pierced and drawn into seamless copper pipe and tubing.

The Anaconda Company mines zinc, manganese and copper ores in Butte and ships these ores to Anaconda, where they are crushed and milled to separate the minerals from the waste rock. The mineral is collected in a product called a concentrate.

Copper concentrate is smelted to produce matte, the matte is converted to produce blister copper and the blister copper is partially refined to produce an impure copper anode for shipment to the Copper Refinery at Great Falls.

Manganese concentrate is burned in a long kiln to produce manganese modules, a part of the manganese modules are smelted in electric furnaces to become ferromanganese. The remainder of the modules and the ferromanganese is shipped to steel mills to be used in the manufacture of steel.

CHAPTER VIII

WIRE AND CABLE CO.

WIRE AND CABLE CO.

The mills of the Anaconda Wire and Cable Company located at the Great Falls process two metals, copper and aluminum.

Copper for manufacture into wire or cable is cast from the furnaces of the Reduction Department into wire bars 62 inches long and weighing about 310 pounds. The wire bars are moved by flat cars to the copper rolling mill.

Here the bar is heated to 1,650° F. in a gas fired furnace, and then rolled back and forth through 16 passes, which reduce it to a rod 5/16 inch in diameter and approximately 1,000 feet long. The rod is coiled, dropped automatically into water bath for cooling, carried past an end cropper, an inspector and tied. Fourteen rods are accumulated in a load which is moved by means of an overhead crane.

This is the most spectacular of the two mills in that the copper bar is cherry red while passing through the mill. Its color gradually turns black as it cools due to oxidation. This copper oxide must be removed before the rod can be sent to the wire drawing machines as copper oxide would cut the dies and produce an inferior wire. To remove the oxide scale, the rods go through a pickling solution of 10 per cent sulfuric acid. The rods are then rinsed with water before going through a boiling soap solution.

When the rod is scheduled tobe made into magnet wire, the red oxide must be removed as well as the black oxide.

This is accomplished by the patented oxoff process before going through the normal cleaning operation described above. After cleaning, the rod is ready for the wire drawing machines to complete the cycle "From mine to consumer."

Most of the rods rolled in our mill here are shipped by rail to the six other wire mills of the Anaconda Wire and Cable Company. These mills are located in California, Indiana, Illinois, Michigan, New York and an eighth mill is being built in Georgia.

Anaconda's new aluminum mill located in a building adjacent to the copper mill is one of the most modern in the industry. Aluminum bar ingots produced at the Anaconda Aluminum plant at Columbia Falls, Montana, are shipped to Great Falls and are processed in much the same manner as copper. The bar ingots are six inches square, six feet long and weigh about 230 pounds. The bars are sent to the furnaces where they are heated to a rolling temperature of about 750° F. The heated bars go to the completely automatic rolling mill. No manual attention is required from the time the bar enters the furnace until the rolling process is completed. A completed rod is about 1,800 feet long and 3/8 inch in diameter. From the catwalk over the rolling mill the visitor can see this marvelous equipment in full operation.

As the rod leaves the rolling mill, it is coiled, tied and taken to a bundling press where 12 coils are banded into

a bundle to afford greater ease of handling for shipment or storage. The rod is now ready for use in the wire mill or shipment to the other mills of the Anaconda Wire and Cable Co. for final processing. The wire drawing machines reduce the rod to the required diameter wire. The wire leaves the drawing machine at speeds up to 5,200 feet per minute and is run onto a spool. The spooled wire is taken to the stranders where it is stranded into cable. Cable stranding equipment in this mill can produce a cable with as many as 127 wires. Anaconda's famous A C S R--Aluminum Cable Steel Reinforced--is known around the world where long overhead spans require high-tension cable of great strength. Smaller strandings equipment in the mill can make seven strand aluminum cable or steel core for reinforcing the larger transmission cables.

Wound onto reels and ready for shipment, the finished products of the aluminum and copper mills move off to our customers.

These products are tangible evidence of the skill and cooperation of the Anaconda people. Processed on the finest equipment available in the industry, these products are ready to compete for the business that is required to maintain our operation and provide the new plants and equipment we'll need tomorrow. The work is dependent on the skill and know-how of many people, and because of these people, Anaconda products are known throughout the industry for their superior qualities.

CHAPTER IX

EMPLOYEE INFORMATION

CHAPTER X

TRANSPORTATION

TRANSPORTATION

Background; Existing Facilities:

Having committed itself to an industrial area within the city region, we find a heavy emphasis placed on the railroads to handle most of the imports and exports which the industry partakes in. When the plant was in full swing, all the rails were used, but since the cutback of 1972, 60 per cent of the rails are abandoned, leaving 40 per cent in operation which handles the copper refinery.

The basic system of the rails is it formed a loop within the core of the plant with secondary rails branching off of the primary line. Because of the great cutback, this primary line becomes less efficient.

Transportation facilities between buildings within the plant's own area are handled by truck. The truck hauls parts, supplies and is the main line of transportation of maintenance parts between buildings. Also the truck is the main transportation of smaller industrial needs within the city.

The auto is the main use of the worker to and from work, 80 per cent coming into the plant from outside the plant area and 20 per cent staying within the plant.

Parking facilities are handled on the site. Each building for the most part handles its own parking.

Transportation:

In speaking of roads, it can be categorized as 90 per cent service roads and 10 per cent private roads. Also 30 per cent makeup the paved roads; 70 per cent make up gravel and dirt roads.

Road Conditions:

Type	Condition	Maintenance
Paved	good	poor
Gravel	poor	poor

Traffic Patterns:

1. Heavy	7:30 A. M. to	8:00 A. M.
	4:00 P. M. to	5:00 P. M.
2. Moderate	12:00 P. M. to	1:00 P. M.
	12:00 to	12:00 A. M.

Road Service:

Roads to copper plant used heavily.

Roads to office heavy.

Roads to maintenance shop heavy.

Parking Facilities:

1. Main parking for copper refinery 250 total
2. Wire mill 250 total
3. Shop 150 total
4. Zinc refinery 350 total

There is adequate parking for the existing facility; but if the plant was to expand there would be a need for more parking facilities.

Objectives of the plan for transportation:

The basic objectives of the plan for transportation are to insure adequate transportation for the services of industry, for the region's residential increases, and to maintain the services of these routes. All of the following objectives stem from these goals:

1. To increase the capacity of the entire transportation system for carrying traffic and imports and exports to and from the plant.

2. To improve the plant's street system.

3. To improve the plant's original transportation; to increase the capacity of easy access within the plant's own area.

4. To provide adequate parking spaces, predominantly in short-term parking garages for employees and adequate parking garages for residents.

First Priority:

A. Utilization of the old company railroad lines in greater degree, do away with unused.

B. Create new transportation to and from the plant's industrial needs.

C. Create new transportation of the new additional facilities, such as residential.

D. Improvement on the existing roads.

Roadway Improvements:

A. The kinds of streets that should be constructed or improved and the functions they must perform fall into these four categories:

1. Existing paved roads (primary) which lead directly to and from industrialized areas, and administration buildings.

2. Existing gravel roads which are primary roads need to be paved.

3. Existing paved roads which lead to residential district need repair.

4. Existing gravel roads which are service roads between plant activity.

Improvements into plant core:

A. Plan to bring transportation systems into the plant core from outside areas.

1. Airport; with direct transportation to plant.

2. Improved highways into the plant.

3. Improved rail line system to and from the plant.

Parking Improvements:

If the plant's activities to increase in residential, in light industry and heavy industry, an increase in auto parking will have to occur.

An increase in two spaces for every additional resident.

Adequate parking for 500 spaces for the copper refinery.

Adequate parking for 100 spaces for personnel.

Adequate parking for 200 spaces for the maintenance shops.

Adequate parking for traffic coming to the plant in form of visitors.

Type, size and location of proposed parking:

The plan recommends that the type of parking space provided to be predominantly parking garages, since sites will be available and garages taking up less space.

Location of garages will be at key points within the industrial park and adequate walking distance to the building. Also parking furnished for garage type parking for recreation, residential and commercial use.

Auto Traffic Patterns:

The automobile is the main use of transportation for the worker to the plant.

Traffic Report:

Heaviest traffic period for copper refinery

5:00 A. M. to 8:00 A. M.

2:00 P. M. to 4:30 P. M.

Heaviest traffic period for maintenance shop

7:30 A. M. to 8:00 A. M.

4:30 P. M. to 4:30 P. M.

CHAPTER XI

TRANSPORTATION PLANNING

Transportation Planning:

With growing traffic volumes have come the problems of congestion, regulating existing traffic, and the need to provide facilities which will carry tomorrow's increased number of vehicles. Planning must be accomplished today so that tomorrow's streets, bridges, and other facilities will provide the most efficient response to increased demands, and this planning must be accomplished in such a way as to enhance the physical quality of the Great Falls area. It has been with this goal in mind that the Montana Highway Commission, Planning Survey Division, in cooperation with the U. S. Department of Transportation, Bureau of Public Roads, and the Great Falls City-County Planning Board established in 1961 a continuing process of transportation planning as part of a total planning program within the Great Falls area.

As a continuing process, a system of on-going review has been incorporated into this plan. It is for this reason that an in-depth update of the 1961 Urban Transportation Study was recently conducted, beginning in July, 1967.

In this Update Study, ten separate areas were researched:

1. Economic factors affecting community development;
2. Population;
3. Land Use;
4. Transportation facilities;
5. Travel patterns;

6. Terminal facilities for parking;

7. Traffic control features;

8. Zoning ordinances, subdivision regulations;

9. Financial resources; and

10. Social and community-value factors such as parks and recreational facilities - preservation of historical sites and aesthetics.

In consideration of these ten items, the transportation process recognizes the fundamental association with other elements of comprehensive community planning. Transportation facilities in the Great Falls area cannot be divorced from other inter-related elements such as housing, commercial development, industrial development, open spaces and utilities.

Emphasis was placed upon the close relationship between roadways and land use in the Great Falls Transportation Plan. Socio-economic studies, land use and population projections, and the future overall plan for the community were all prepared by the City-County Planning Board. These plans formed the basis for projected traffic demands for 1975 and 1990. Close coordination was maintained between the Consultant and the Planning Board Staff during the preparation of both the future land use plans and the future roadway plans.

CHAPTER XII

RESIDENTIAL DEVELOPMENT

Residential Development

Residential growth within the planning area has developed in the past at an average density of 5.6 dwelling units per acre, ranging from 19.6 dwelling units per acre in and around the Central Business District to 3.0 dwelling units per acre in the western portion of Great Falls.

Past building trends for the area show steady residential growth to the late 1950's. The period from about 1958 to 1965 was marked by increased construction of single-family units. From 1965 to 1970 new residential construction consisted mainly of apartment-type or multiple-family residential units. A sharp upswing in the construction of single-family homes has occurred in 1970.

Construction is increasing within the multiple-family zoned areas in the community, which reflects a national trend toward apartment and condominium-type living. This trend in higher densities is expected to continue through the year 1990.

Commercial Development

Commercial facilities, including stores, shopping and service centers, hotels, office buildings and theaters, account for about five per cent of all developed land in the Great Falls Area today. By 1990 a 70 per cent increase in commercial acres can be expected. This commercial expansion

should be guided by standards established as part of the Comprehensive Plan to insure that all of these areas are served by properly designed arterial roadways, that optimum convenience to neighborhoods be considered and that these areas not adversely affect adjoining properties.

Since the early 1950's, commercial patterns in the area have changed considerably. Many types of stores have joined together into multi-purpose shopping centers. These centers have been located along major roadways away from the high land costs and parking problems of the Central Business District. While this type of retail shopping center will continue its major role in newly developing parts of the area, much commercial development will continue to take place in downtown Great Falls, which has been emerging as a vital growing center of commercial activity.

Parks, Recreation and Open Space

There are 916 acres of park and recreation land within the planning area today. Standards as established by the National Recreation Association recommend that approximately 10 acres of park land should be available for each 1,000 residents. In the Great Falls Area there are nearly 12 acres of park land for each 1,000 residents.

Based on projected population, recreational land must increase by 284 acres to keep pace with minimum standards.

More important, however, this recreational land must be located and developed in such a way so as to be within a reasonable walking distance of all neighborhood residents, and it must be varied enough to satisfy all age groups and recreational interests.

There exists a need for more than just sites for active recreation. There is also a need for open space serving, along with developed parks, as a unifying element separating and complementing various uses of land. In a "Goals" survey conducted by the Planning Board, relative to future open space and recreational development, area residents indicated a desire to take full advantage of the recreational and open space potential of the Missouri River, including the full development of the Giant Springs Area, the aesthetic improvement of the west bank of the Missouri and the designation of a parkway along the east shore.

Industrial Development

Industrial acreage within the study area is expected to increase 4,624 acres by 1990. This is an increase of 607 acres over industrially zoned property in 1970. This does not indicate a vast growth in industrial development for the Great Falls Area, but rather a continuation of the moderate growth experienced in recent years.

Most industrial growth should occur in the northeast corner of the study area. This area is adequately served by good rail and highway facilities and is located in an area where prevailing winds will minimize any adverse effects of industry.

Some additional industrial acreage, primarily in the form of warehousing and other light industrial uses, will be experienced in the northwest portion of the study area. At Great Falls International Airport, it is expected that some light industrial areas will be designated for anticipated air freight activities.

Community Facilities

In 1990 the 120,000 people living in the Great Falls Area will require 42 public schools, 1,200 acres of developed park land, 5 fire stations, a new airport terminal, a new police and jail complex and numerous other public facilities. The Community Facilities Section of the Comprehensive Plan establishes a means through which these needs can be identified and eventually met. Its purpose is to establish policy for the maintenance of those existing community facilities which serve their purpose adequately; for the improvement or expansion of those facilities which are of inadequate size or quality to meet needs; for the development of new facilities

where deficiencies in service exist and for the abandonment of facilities which are no longer needed. It is also a means through which community facilities can be provided in the entire metropolitan area on an equitable basis, complement land development and assure accessibility to the transportation system.

The projected community facilities and their locations are shown on the other side of this report.

Transportation Facilities

By 1990 the pattern of development of the Great Falls Area is expected to generate over one million vehicle miles of travel per day on area streets. Transportation facilities have a greater influence on the way an area develops than any other single factor. With growing traffic volumes have come problems of congestion, regulating existing traffic and the need to provide facilities which will carry tomorrow's increased number of vehicles. For this reason, a continuing process of transportation planning has been established in the form of the Great Falls Urban Transportation Study.

The recommended street network, determined by this study as it influences area development, is shown on the reverse side of this report.

CHAPTER XIII

LAND USE INVENTORY

LAND USE INVENTORY

SUMMARY BY DIVISION
(1969)

Div.	Population	Single Family Acres	Multi-Family Acres	Commercial Acres	Public and Semi Public Acres	Park and Recreation Acres	Industrial Acres
1	8,083	131	85	120	22	118	78
2	26,113	908	171	64	89	245	170
3	8,338	389	59	49	123	31	401
4	6,676		Malmstrom Air Base				
5	8,455	740	24	166	302	117	295
6	2,292	220	3	18	1,760	86	458
7	7,427	695	27	106	37	276	258
8	9,632	460	29	110	229	43	745
9	163	124	-	-	-	-	1,612
Total	77,179	3,667	398	633	2,562	916	4,017

LAND USE PROJECTIONS

SUMMARY BY DIVISION
(1990)

iv.	Popu-lation	Single Family Acres	Multi-Family Acres	Commer-cial Acres	Public and Semi Public Acres	Park and Recrea-tion Acres	Indus-trial Acres
1	9,651	74	110	182	22	120	80
2	29,360	808	281	74	89	255	197
3	8,896	448	94	215	171	256	723
4	7,049			Malmstrom Air Base			
5	24,563	1,252	317	241	410	137	295
6	13,646	814	132	77	3,416	96	483
7	9,209	831	56	117	45	286	382
8	17,820	746	174	170	245	63	852
9	163	124	-	-	-	-	1,612
Total	120,357	5,097	1,164	1,076	4,398	1,213	4,624

CHAPTER XIV

SELECTED TRAVEL INFORMATION

1961 TO 1968 COMPARISONS OF SELECTED TRAVEL INFORMATION
(Average Daily Traffic)

Description	1961	1968	Per Cent Change from 1961
Total Internal Auto Driver Trips	109,689	170,645	+55.6%
Internal Auto Driver Trips Attracted to Central Business District	18,687	30,890	+65.3%
% of Auto Driver Trips Attracted to Central Business District	17.0%	18.1%	+ 1.1%
Bridge Traffic			
Warden Bridge	11,400	13,800	+21.1%
Central Avenue West Bridge	18,900	19,700	+ 4.2%
10th Street Bridge	10,400	7,000	-32.7%
15th Street Bridge	-	9,700	-
Total 10th and 15th Corridor	10,400	16,700	+60.6%
Total Crossings	40,700	50,200	+23.3%
External Traffic			
All stations - all vehicles	20,716	19,184*	- 7.4%
Through Traffic	932	1,138	+22.1%
Through Traffic Per cent of External	4.5%	5.9%	+ 1.4%

* Decrease because of cordon relocation

CHAPTER XV

OBJECTIVES AND GOALS OF THE HOUSING PROGRAM

OBJECTIVES AND GOALS OF THE HOUSING PROGRAM

Circumstances surrounding today's environment make it necessary for the Great Falls City-County Planning Board to have and maintain a housing program. This program will be a stepping stone to insure all the people in the community a decent, safe and sanitary dwelling in which to live. In the past, these responsibilities have been left up to the private sectors of the housing market. Alleviating the shortages and shortcomings that we are presently experiencing will require the combined effort of builders, developers, financiers, volunteer organizations, local government agencies, private citizens, architects and planners. Each and everyone has a role to play in the housing process.

This report and the activities of the continuing housing program of which it is a part are necessary to identify the objectives and goals toward which our efforts are directed.

Objectives: - Survey the data needs for study of our housing problem (accomplished in Housing Report No. 1).

- To provide a housing market study for the Great Falls Area (Housing Report No. 2).

- To provide a mobile home study for the Great Falls area (Housing Report No. 3).

- To provide a Black Eagle housing and development study (Housing Report No. 3).

- To provide a housing data study and finance and building industry trend study (Housing Report No. 4).

- Relocation study and establishing a continuing program (Housing Report No. 5).

Goals: In meeting these requirements, it is hoped two ultimate goals can be reached. These are:

- To adequately house all the area's people.

- To create and maintain good healthy neighborhoods in the process of housing all the people.

CHAPTER XVI

SURVEY FINDINGS

SURVEY FINDINGS

During the past four years, several surveys have been conducted in the Great Falls area in an attempt to analyze the housing problems. The following reports, surveys and data have been used in analyzing the housing situation.

(1) Analysis of the Great Falls, Montana Housing Market (Dec. 1, 1971, Dept. of Housing & Urban Development).

(2) Great Falls Housing Survey (April, 1971, State Department of Planning & Economic Development).

(3) 1970 Census - 1st Count Summary Tape Report. 1970 Census Report - General Housing Characteristics.

(4) Great Falls Metropolitan Area Housing Report No. 1.

(5) Research by the Office of Economic Opportunity and the Great Falls City-County Planning Board.

(6) Great Falls Comprehensive Plan Population Projections.

Briefly, we will endeavor to summarize these reports in an effort to equate the Great Falls Housing Problem in its proper perspective.

The Great Falls Housing Market Analysis defines their housing market area (HMA) as Cascade County which also conforms to the Great Falls Standard Metropolitan Statistical Area as defined by the Bureau of the Budget. We have generally accepted this area although our immediate concern is the Great

Falls Metropolitan Area and Planning Jurisdictional Area which extends approximately four and one-half (4½) miles outside the City of Great Falls.

The period for which the F.H.A.Housing Market Analysis is forecasting demands is from December 1, 1970, to December 1, 1972. The F.H.A. report estimates the demand for permanent, non-subsidized housing in the Great Falls area will be an increase of 700 permanent non-military connected civilian households, or about 350 housing units per year. A breakdown of types of units is illustrated in Table No. 1 taken from the F.H.A. Housing report.

TABLE 1

Estimated Annual Demand for Non-subsidized Housing
Great Falls, Montana, Housing Market Area
December 1, 1970 to December 1, 1972

A. Single-family houses:

Sales Price	Number of Units	Percent of Total
Under $20,000	10	5
$20,000 - 22,499	20	10
22,500 - 24,999	40	20
25,000 - 29,999	60	30
30,000 - 34,999	40	20
35,000 and over	30	15
Total	200	100

B. Multi-family units:

Gross monthly rental	Efficiency	One bedroom	Two bedroom	Three or more bedrooms
$130 - 149	15	-	-	-
150 - 169	-	20	-	-
170 - 189	-	20	-	-
190 - 209	-	10	35	-
210 - 229	-	-	25	-
230 and over	-	-	15	10
Total	15	50	75	10

Note: Gross monthly rental is shelter rent plus the cost of utilities.

Source: F.H.A.Housing Market Analysis

Subsidized Housing:

Federal assistance in financing costs for new housing for low or moderate income families may be provided through a number of different programs administered by the F.H.A.

(1) 221 (D) (3) Monthly Rent Supplement.

(2) 235 - Partial payment of interest on home mortgages.

(3) 236 - Partial interest payment on project mortgages.

(4) Federal assistance to local housing authorities for low-rent public housing.

TABLE II

Estimated Annual Occupancy Potential For Subsidized Rental Housing From December 1, 1970 to December 1, 1972

	Sec. 236a/ Exclusively	Families 1 Eligible for Both Programs	Public Housing Exclusively	Total for Both Programs
Families				
1 - bedroom	10	0	15	25
2 - bedrooms	60	0	45	105
3 - bedrooms	40	0	25	65
4+ - bedrooms	15	0	15	30
Total	125	0	100b/	225
Elderly				
Efficiency	30	15	60	105
1 - bedroom	20	10	10	40
Total	50c/	25	70d/	145

a/ Estimates are based upon regular income limits.
b/ Approximately 60 per cent of these families also are eligible under the rent supplement program.
c/ Applications and commitments under Section 202 are being converted to Section 236.
d/ All of the elderly couples and individuals also are eligible for rent supplement payments.

Source: F.H.A. Housing Market Analysis

CHAPTER XVII

GREAT FALLS HOUSING SURVEY

GREAT FALLS HOUSING SURVEY

This survey was conducted by the State of Montana, Department of Economic Development, in April of 1971, and the findings were published in June of 1971. Due to budgetary limitations, local assistance was necessary in order to conduct the survey. Organizations rendering assistance were: The Great Falls City-County Planning Board, the City-County Health Department, the Great Falls Housing Authority and Opportunities, Incorporated. The basic objectives of this survey were: 1) To determine the outside or structural appearance or quality of housing units, and as a corollary, the extent of deteriorating and substandard housing; and 2) To determine select economic characteristics of households (residents).

A unit's total structural score determined where it would fit in the five classifications. These classifications and their corresponding scores are outlined below. Units falling into the lower two classes, deteriorated and dilapidated, are considered as substandard homes.

Structural Scoring Classification

Unit Score	Unit Classification
0 - 2	Very good or new unit, no apparent maintenance problem
3 - 5	Average, only routine maintenance needed
6 - 9	Deteriorating
10 - 12	Deteriorated
13 - 15	Dilapidated

The primary information sought on the economic interview dealt with income, rent, or mortgage payments, number of rooms in the unit, respondents general age group, and number of persons living in the unit.

Summary Highlights

The survey started with over 900 housing units rated in the structural phase. After interview rejections, incompletness, and mistakes, there were 814 units included in the final analysis for this report. This is 3.4 per cent of the 23,885 housing units reported by the Census for the Great Falls, Black Eagle and a few surrounding units. Approximately 70 to 75 per cent of the jurisdictional area of the City-County Planning Board was covered by the survey. Some highlights of the survey are itemized below to provide a brief summary.

1.	Mean household income	$9,440
2.	Mean monthly rent	$ 109
3.	Mean monthly mortgage	$ 138
4.	Mean income, homeowners	$8,340
5.	Per cent of sample having less than $3,000 annual income	7.1
6.	Per cent of sample with incomes of $10,000 or more	41.3
7.	Per cent of sample with more than one income per household or unit	25.7
8.	Average structural score (rounded)	3
9.	Per cent of sample classed as sub-standard units	4.7
10.	Persons per room sample average	.5

Structural Scores:

The total score of the sample was 2,302, giving a sample mean (average) of 2.83. The following table summarizes the structural scores and units in each classification.

TABLE I

Housing Units Structural Scores and Classification

Classification/Score		No. of Units	Per Cent
Very Good	0 - 2	466	57.2
Average	3 - 5	191	23.5
Deteriorating	6 - 9	119	14.6
Deteriorated	10 - 12	33	4.1
Dilapidated	13 - 15	5	.6
		814	100.0

Table I shows that only 4.7 per cent of the units sampled can be classified as substandard units. Adding those to the units which are deteriorating results in a total of 19.3 per cent of the units which showed signs of deterioration or worse. On the other hand, 80.7 per cent of the sample were average or better. This was due to the fact that several clusters were in recent additions to the City and consisted of new or recently new single family dwelling units.

Table II compares structural scores and classification of units by ownership status.

TABLE II

Structural Scores, Classification, and Ownership Status

Classification/Score		Total Units	Percentages Rentals	Buying	Owners
Very Good	0 - 2	385	22.9%	53.8%	23.4%
Average	3 - 5	116	31.0%	31.0%	38.0%
Deteriorating	6 - 9	61	55.7%	18.0%	26.3%
Deteriorated	10 - 12	11	63.6%	9.1%	27.3%
Dilapidated	13 - 15	1	100.0%		
		574			

The average unit size (average rooms per unit) for the sample was 7.1 per unit. The average persons per room was .5 or two rooms per person. It should be noted, however, that basements and utility rooms were counted. Because of this, Census reports on persons per room and results from this report cannot directly be compared. Findings in this report indicate crowding is not a problem in Great Falls.

Household Income:

Mean gross household income from the sample was determined to be $9,440.50 annually. This compares favorably with 1970 estimates by Sales Management magazine which placed Great Falls at $9,350.00. The same organization reported the comparable State figure to be $8,500.00 in 1970. Census income data is not yet available. However, efforts by two private firms have resulted in a model using what census data is available to estimate median family income. For

Great Falls, the median has been estimated to be $8,524.00. The distinction between a mean and a median must be kept in mind when comparing results of the sample with census data.

Table III shows the frequency distribution for income ranges reported in the sample.

TABLE III

Household Income Frequency Distribution

Income Range	Number Reporting	Per cent
$ 0 - $2,999	39	7.1%
$3,000 - 3,999	40	7.3%
$4,000 - 4,999	27	4.9%
$5,000 - 5,999	29	5.3%
$6,000 - 6,999	30	5.5%
$7,000 - 7,999	53	9.7%
$8,000 - 8,999	55	10.0%
$9,000 - 9,999	49	8.9%
$10,000+	227	41.3%
	549	100.0%

Noting the heavy upward trend of the distribution in Table III, one would suspect some bias in the sample. This was due, as previously stated, to the fact several cluster points fell in the newer sections of the city. Another factor to consider is that during the sampling, the response rate was considerably higher for households with the lower structural scores, the better or average units. There were, for example, 157 units scored six or more (signs of deterioration, deteriorated, or dilapidated) and over half of them refused or would answer only part of the economic interview. Of those

units classified as deteriorated or dilapidated (that is substandard units), 74 per cent refused to answer all or part of the questionnaire.

A comparison between incomes and housing unit classifications is made in Table IV.

TABLE IV

Relative Distribution of Household Income by Unit Classification

Income Range	Very Good 0 - 2	Average 3 - 5	Deteriorating 6 - 9	Deteriorated 10 - 12	Dilapidated 13 - 15
$ 0 - $2,999	38.5%	30.8%	28.2%	2.5%	(a)
$3,000 - 3,999	42.5%	25.0%	30.0%	2.5%	(a)
$4,000 - 4,999	29.6%	33.3%	25.9%	11.1%	(a)
$5,000 - 5,999	44.8%	24.1%	20.7%	10.3%	(a)
$6,000 - 6,999	66.7%	13.3%	20.0%	(a)	(a)
$7,000 - 7,999	65.4%	28.8%	5.8%	(a)	1.9%
$8,000 - 8,999	69.1%	20.0%	10.9%	(a)	(a)
$9,000 - 9,999	79.6%	18.4%	2.0%	(a)	(a)
$10,000+	83.7%	12.3%	3.5%	.5%	(a)

(a) indicates no response to all or part of the questionnaire.

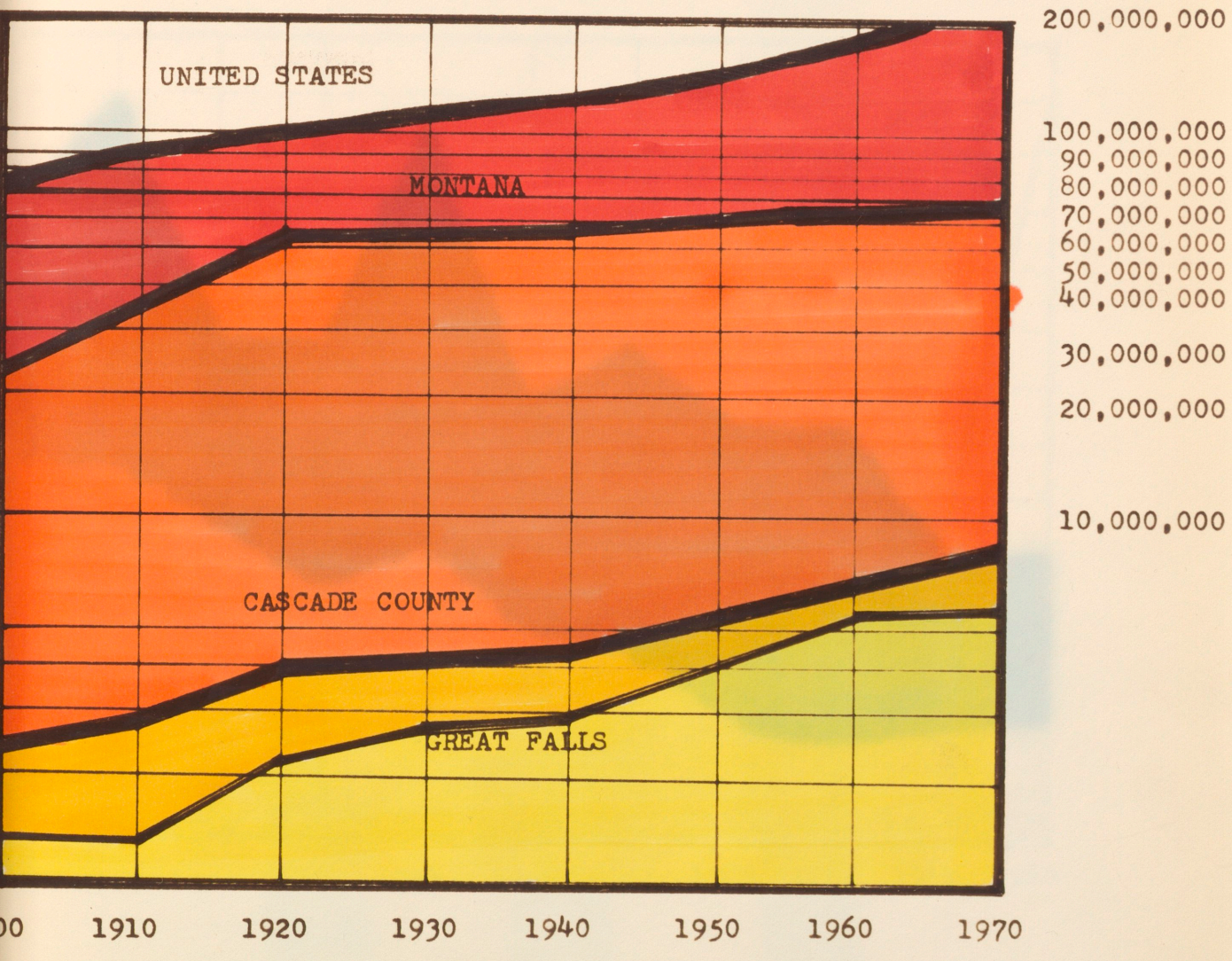
The most striking feature of Table IV is that it reveals low income households do not appear to be heavily concentrated in deteriorating or substandard units. However, the bias discussed earlier must be kept in mind when considering Table IV.

Rents and Mortgages:

The mean monthly rent payment of the sample was $108.72, while the mean mortgage payment was $138.40. Table V shows rent and mortgage payments by structural classes. Despite the response problem, the data clearly shows that lower cost

rentals definitely tend to be concentrated in lower structural classes. In particular, this is true in the $50 to $74 payment range where over half of those paying in that range are in units classed as deteriorating or deteriorated. With respect to the highest payment range, ninety per cent (90%) or more of both rent and mortgage payments are in the highest structural class. Neither of these situations is unexpected or believed to be exceptional.

COMPARATIVE POPULATION TRENDS

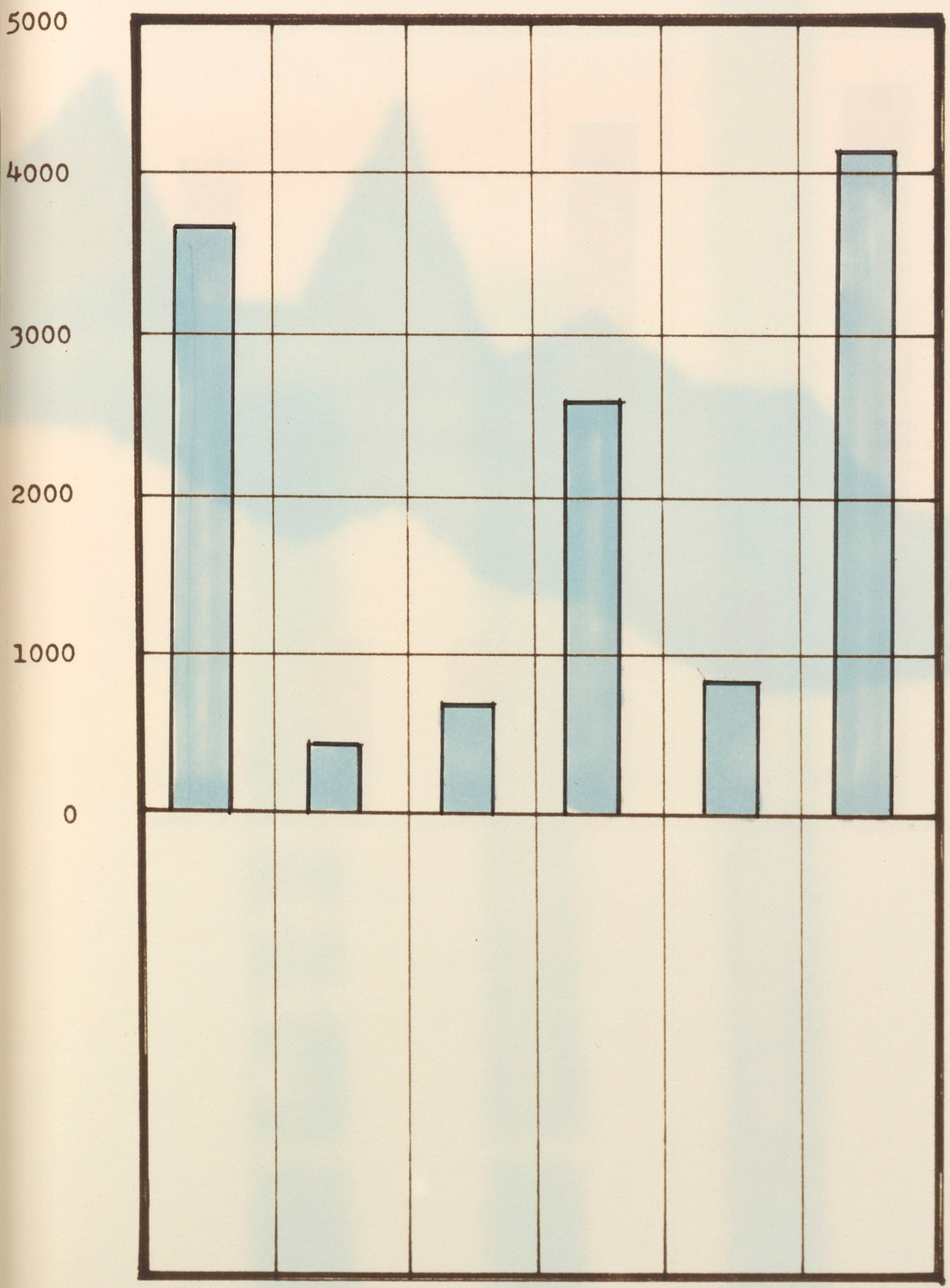


VALUE OF NEW CONSTRUCTION

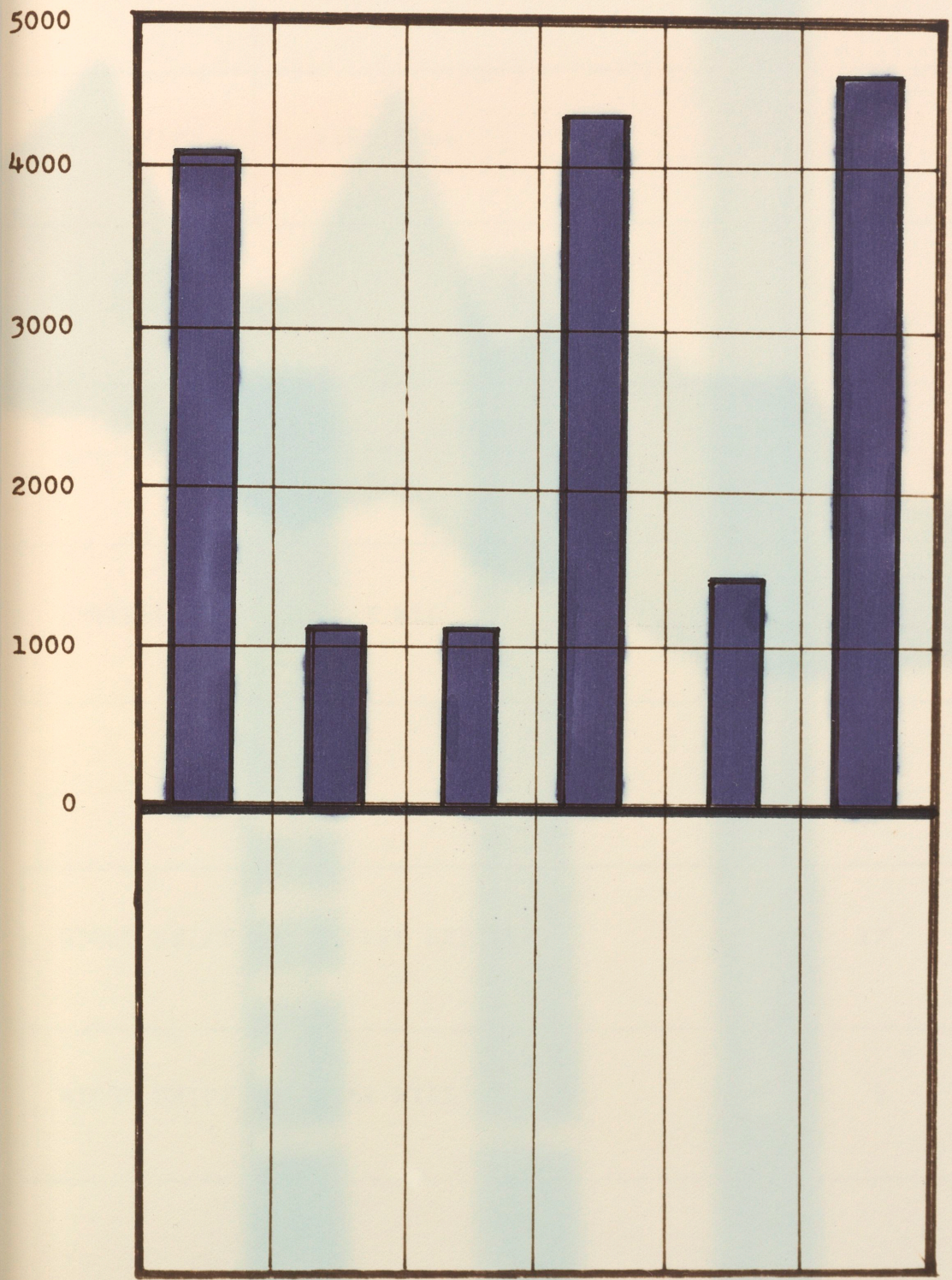


959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969

EXISTING LAND USE, 1972



LAND USE PROJECTIONS, 1990



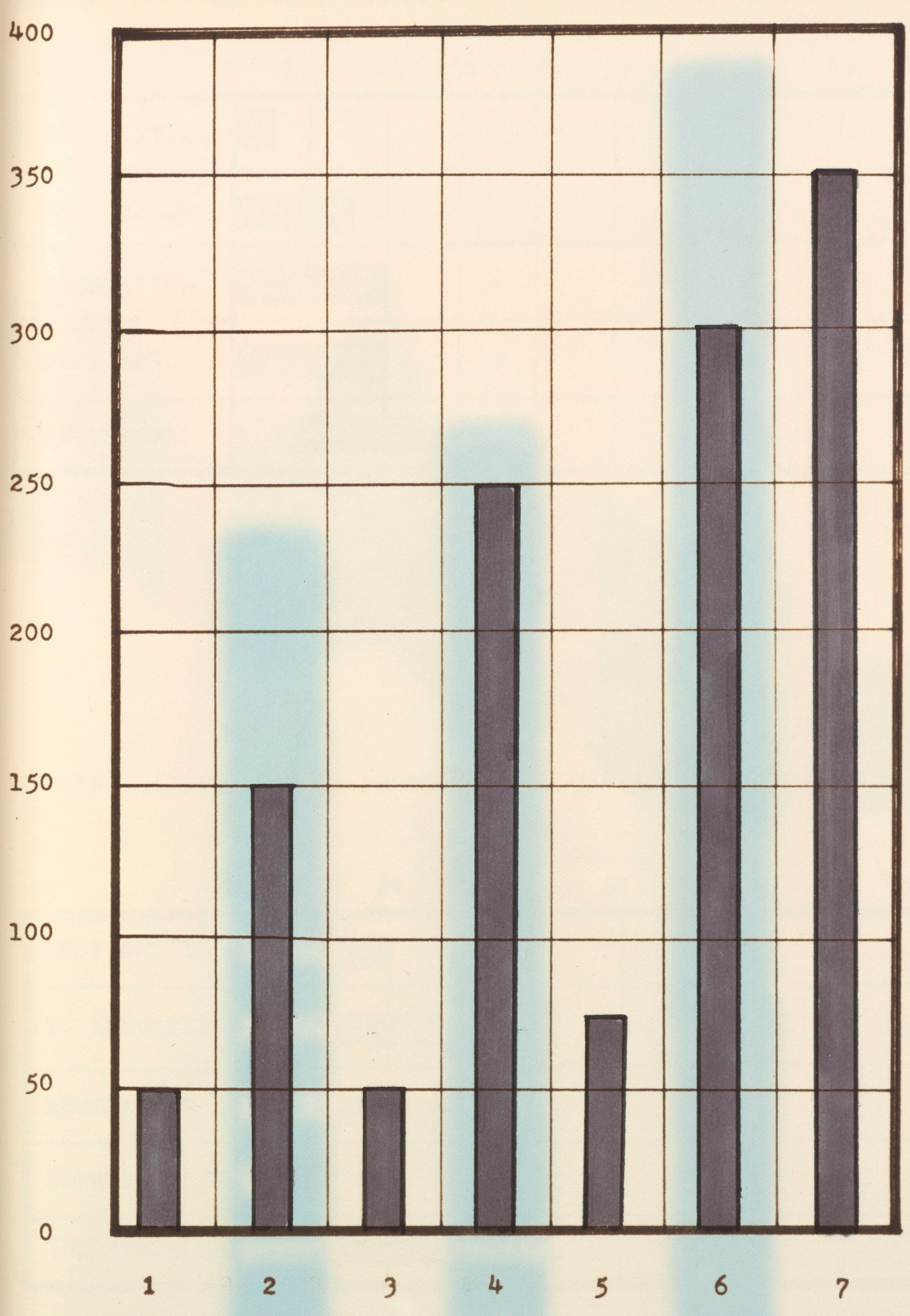
ACM SHIFT SCHEDULE, 1972

DAY SHIFT	COPPER REFINERY	385
DAY SHIFT	WIRE MILL	55

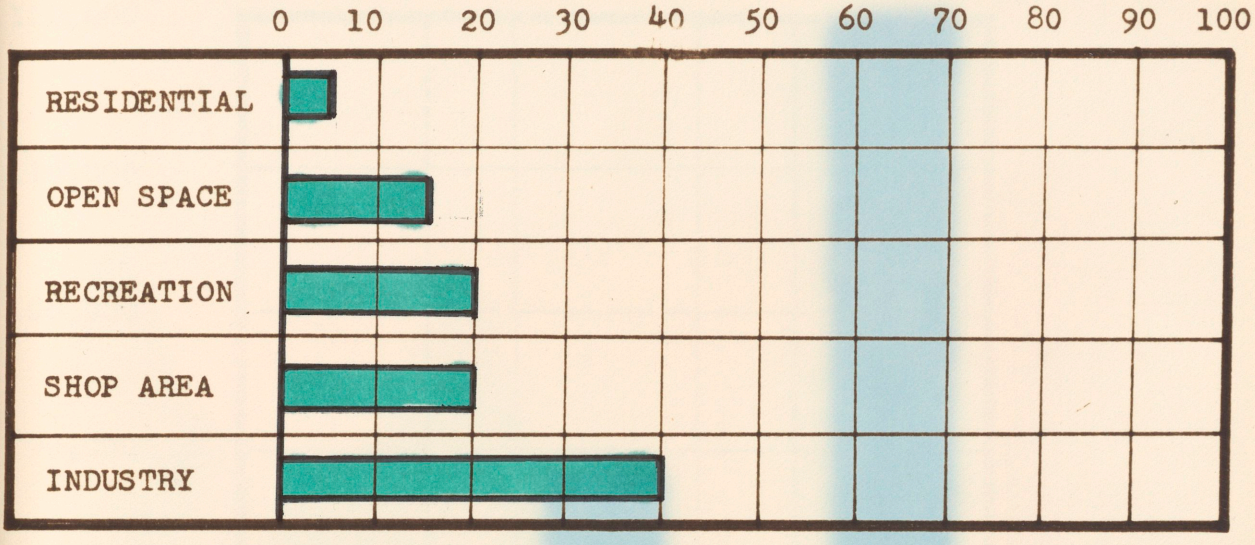
AFTERNOON	COPPER REFINERY	24
AFTERNOON	WIRE MILL	30

NIGHT SHIFT	COPPER REFINERY	12
NIGHT SHIFT	WIRE MILL	4

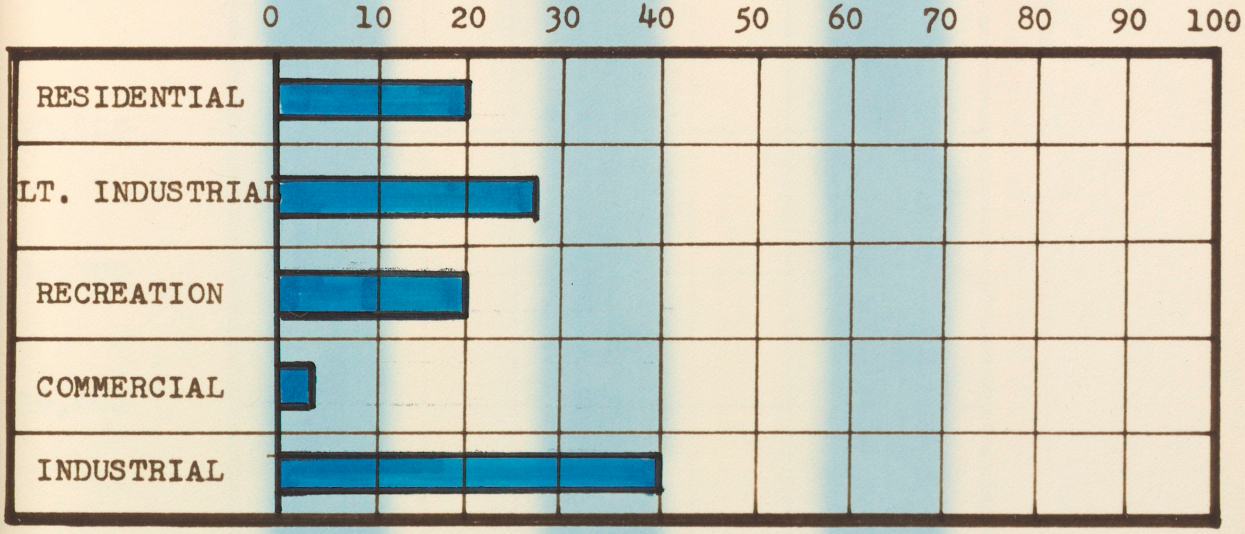
EXISTING PARKING FACILITIES



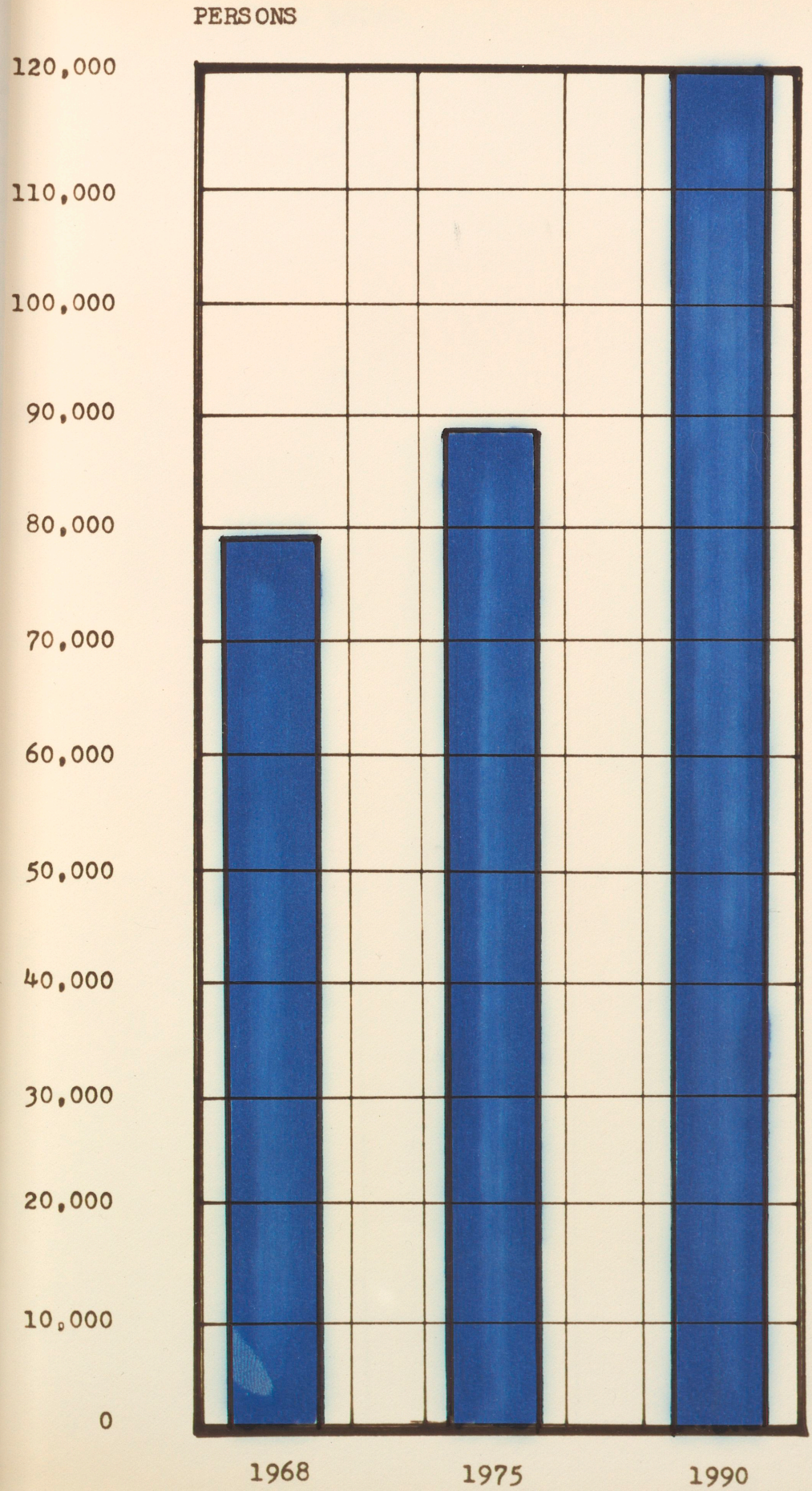
PERCENT DISTIBUTION OF EXISTING LAND USE ACREAGE, ACM PLANT, 1972.



PERCENT DISTIBUTION OF PROPOSED LAND USE ACREAGE, ACM PLANT, 1990

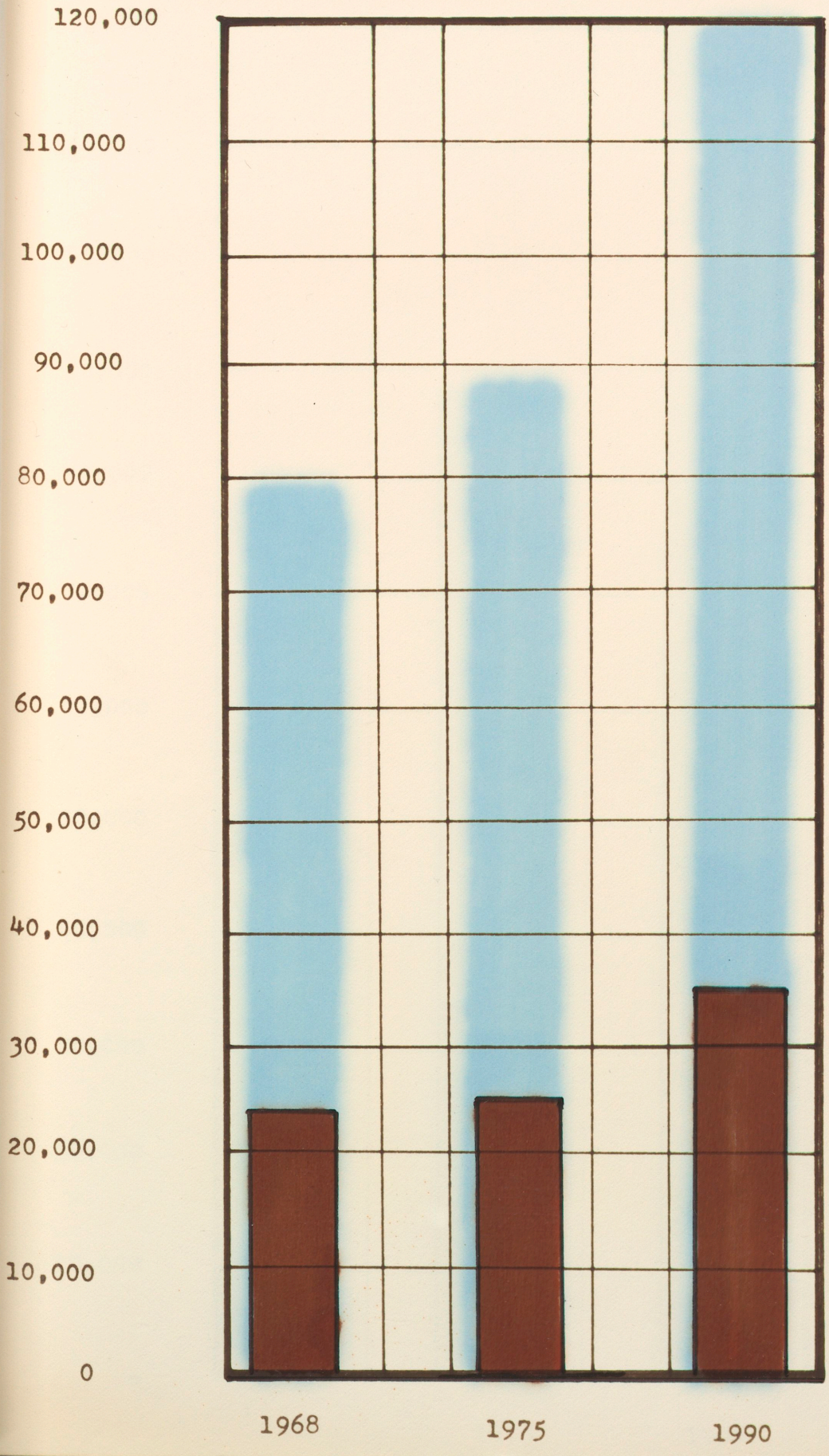


POPULATION PROJECTION

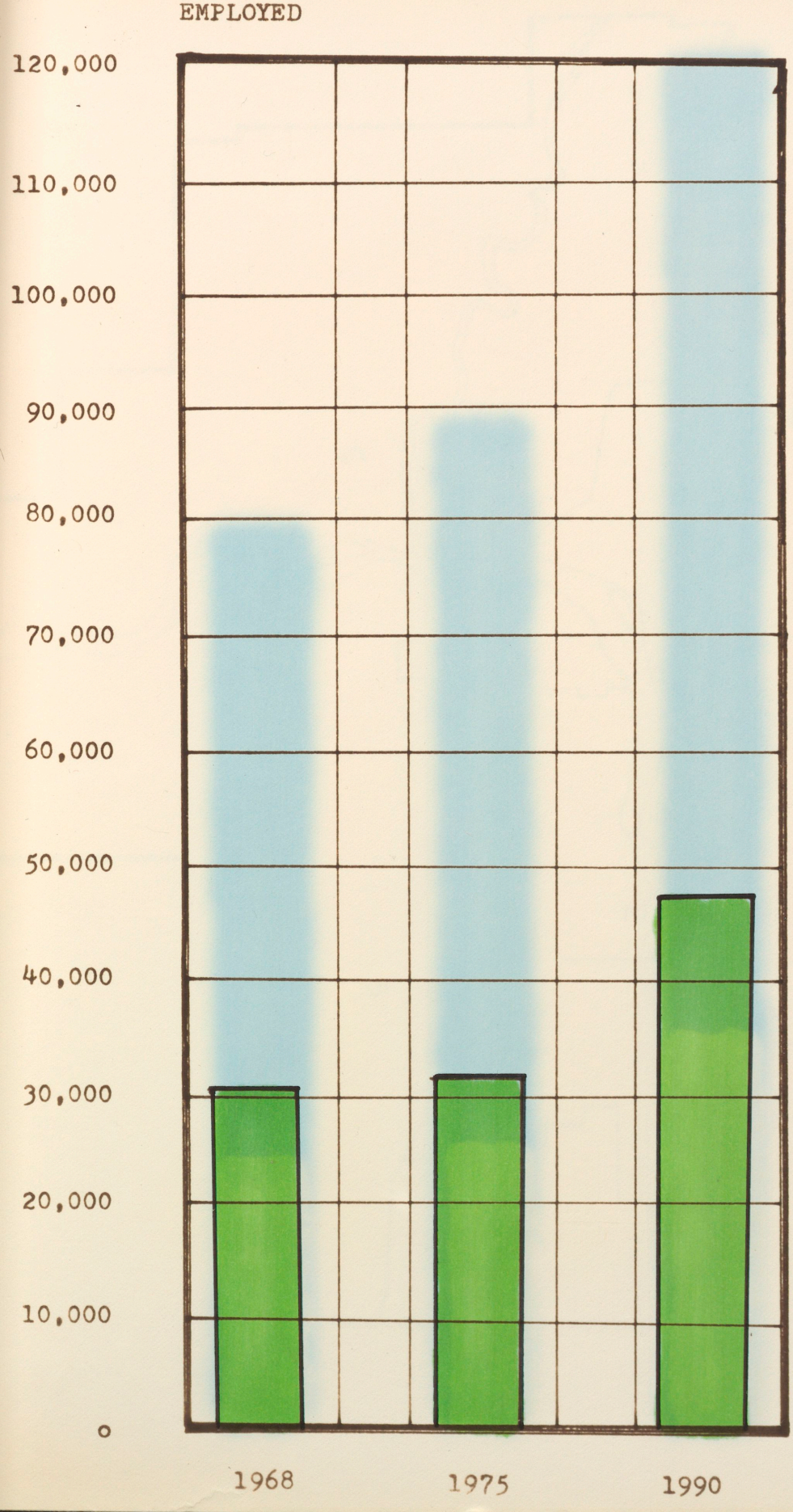


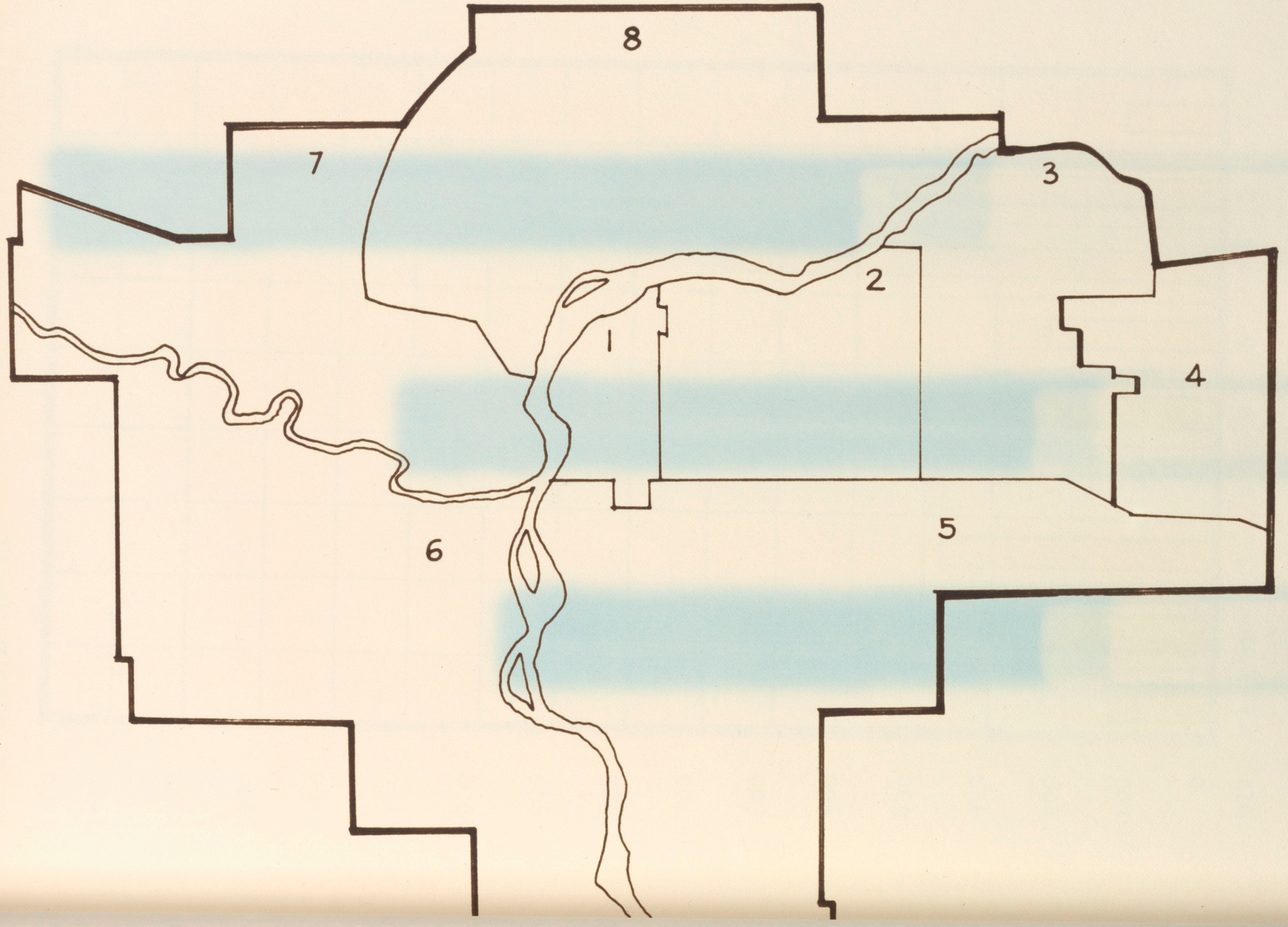
POPULATION PROJECTION

DWELLING UNITS

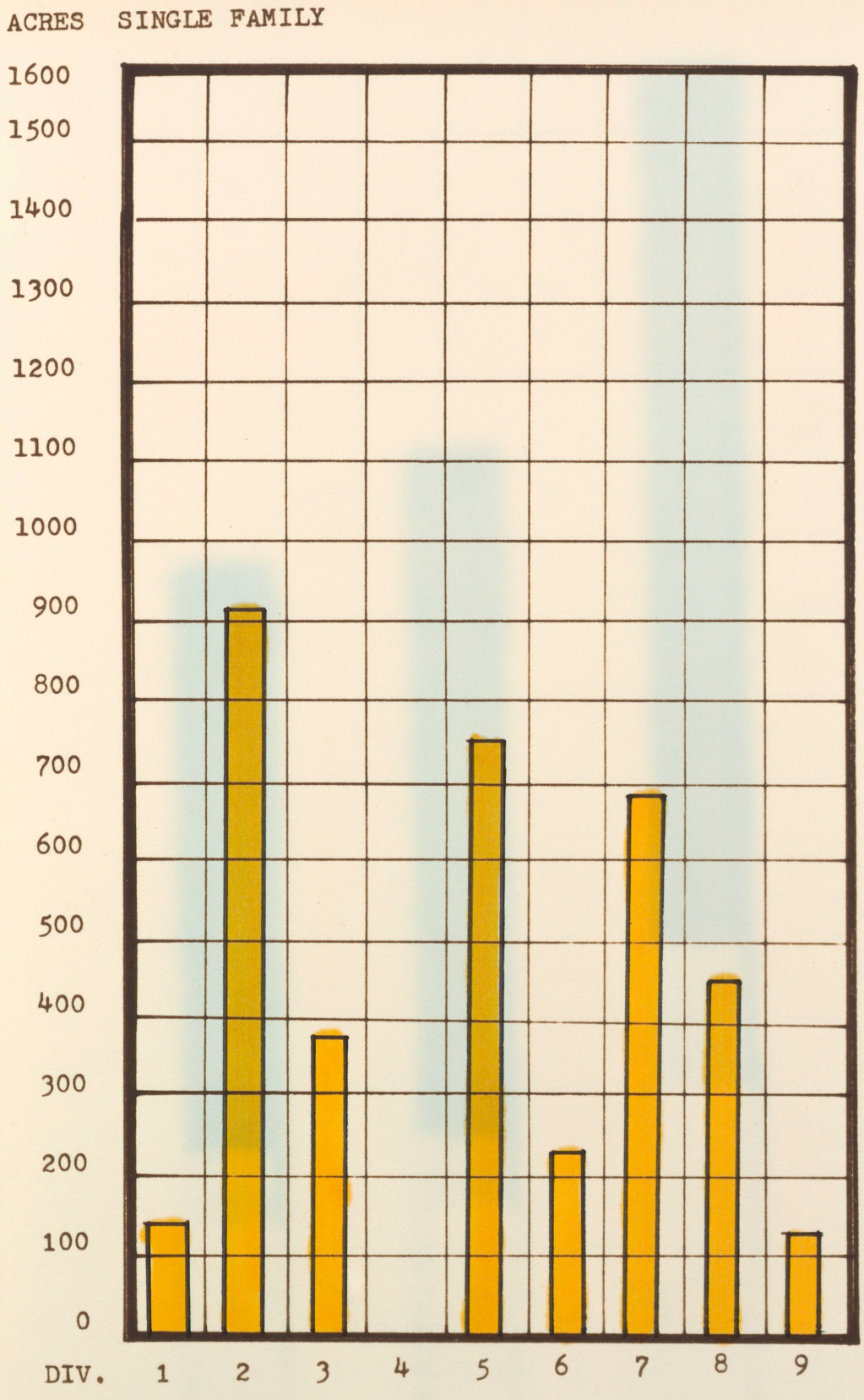


POPULATION PROJECTION

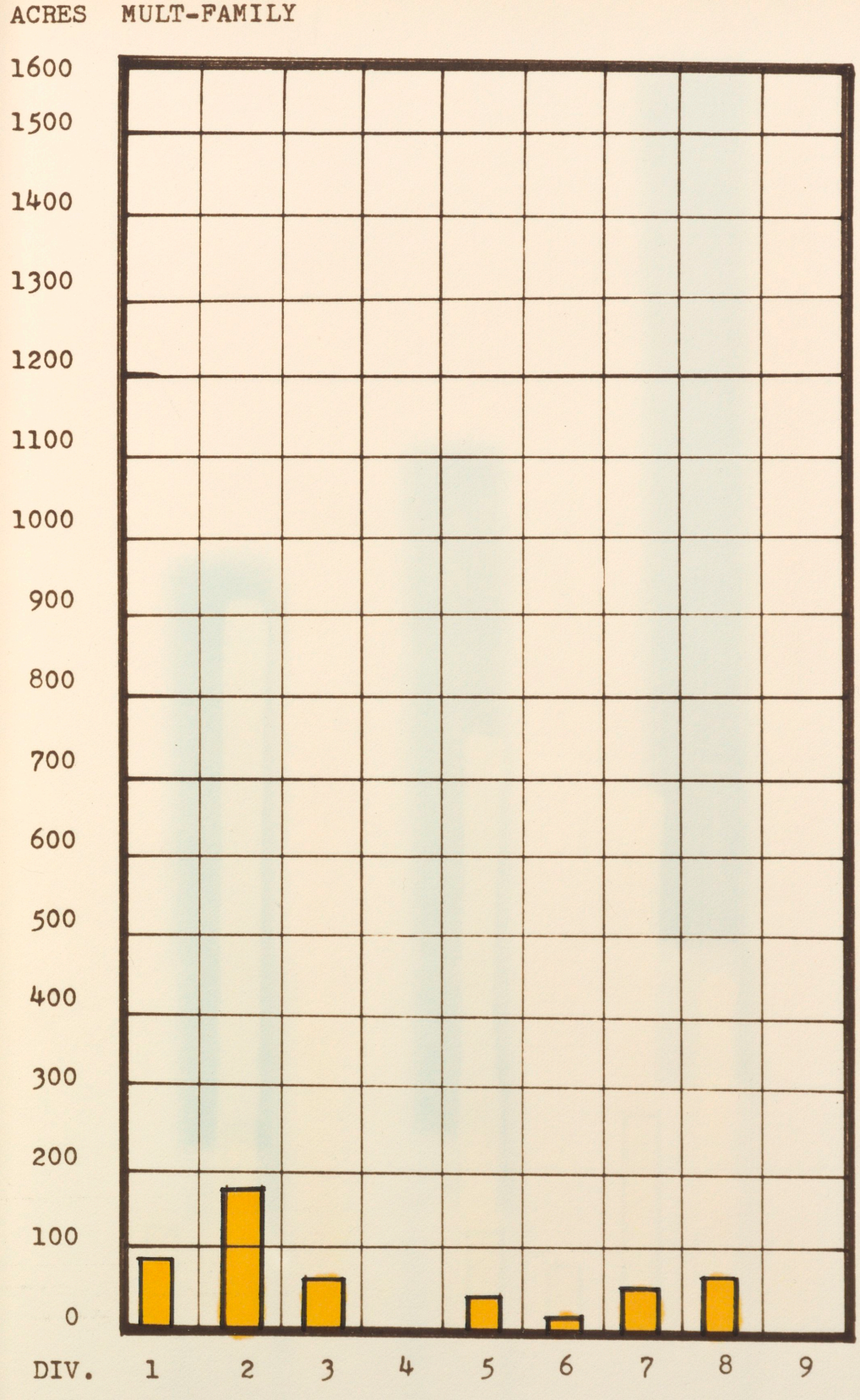



8
7
3
2
1
4
6
5

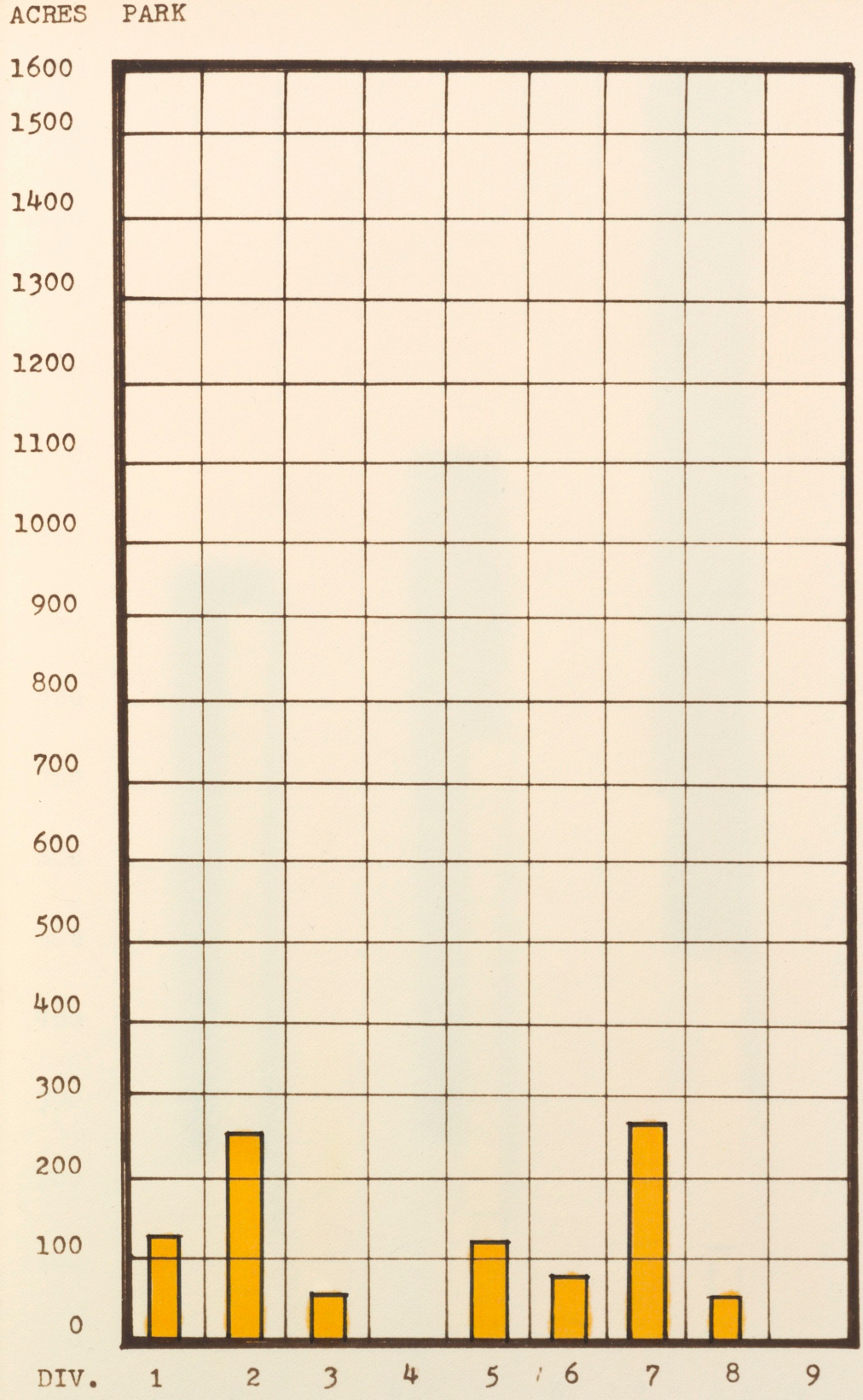
LAND USE INVENTORY, 1969



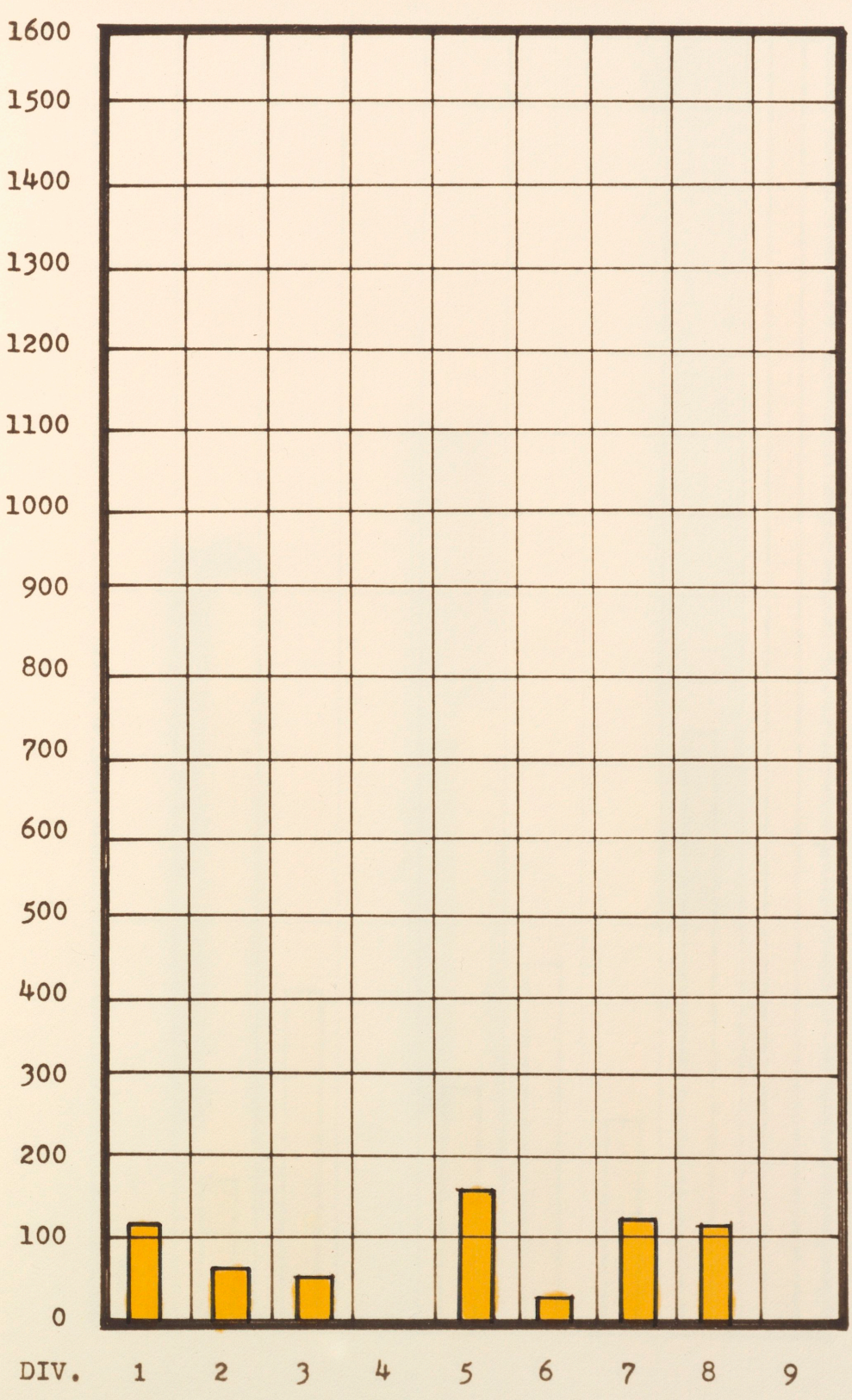
LAND USE INVENTORY, 1969



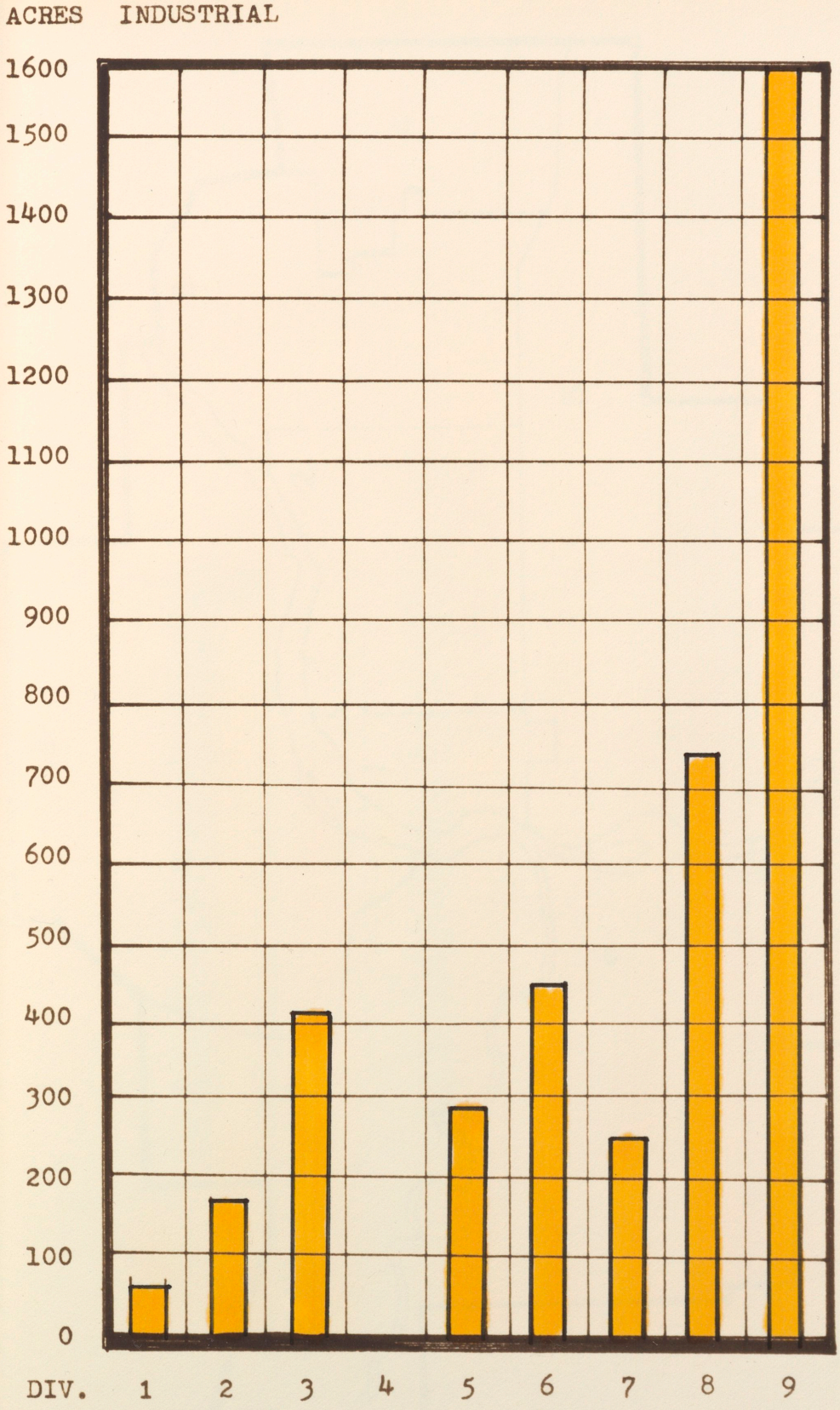
LAND USE INVENTORY, 1969

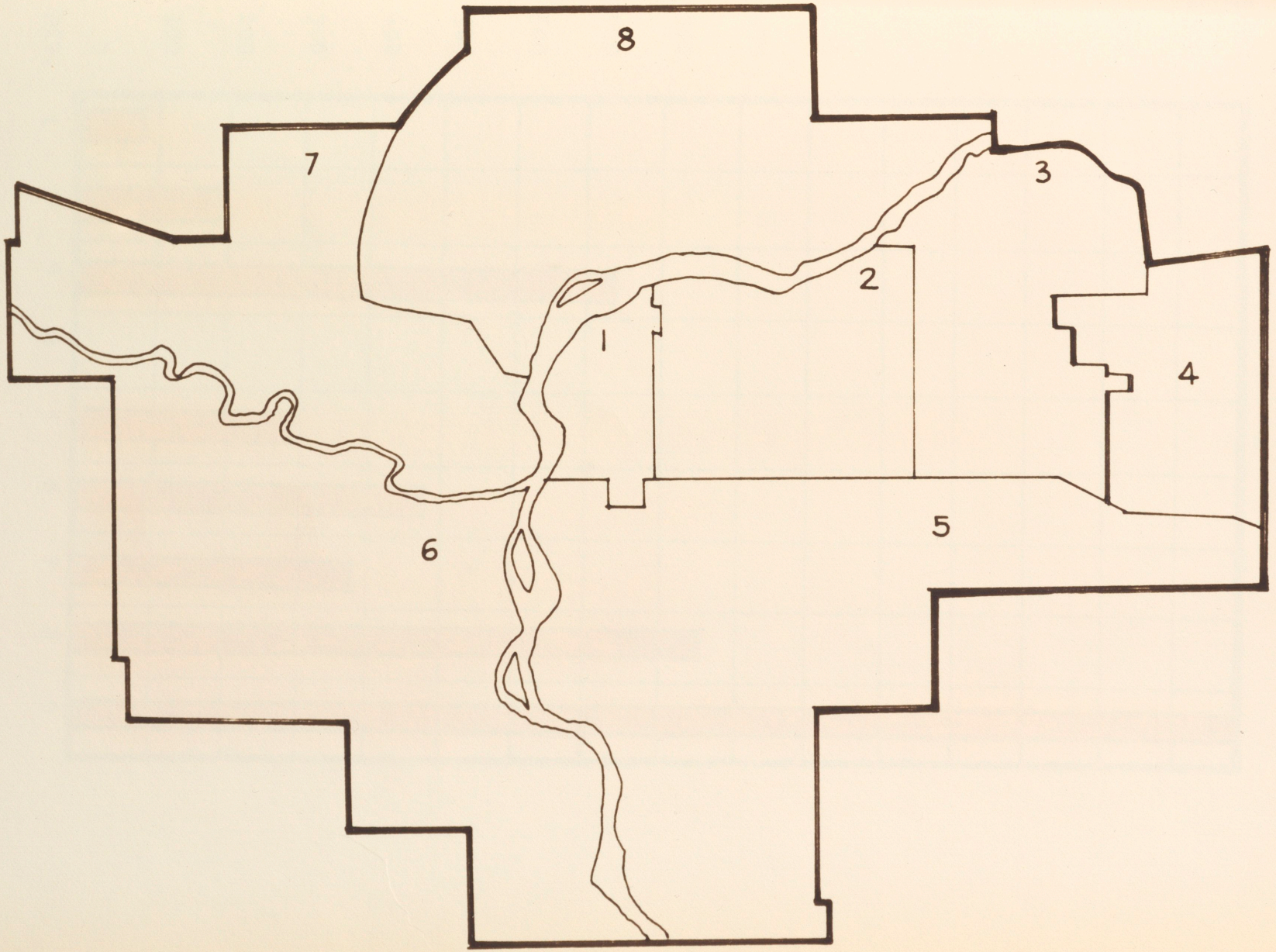


LAND USE INVENTORY, 1969

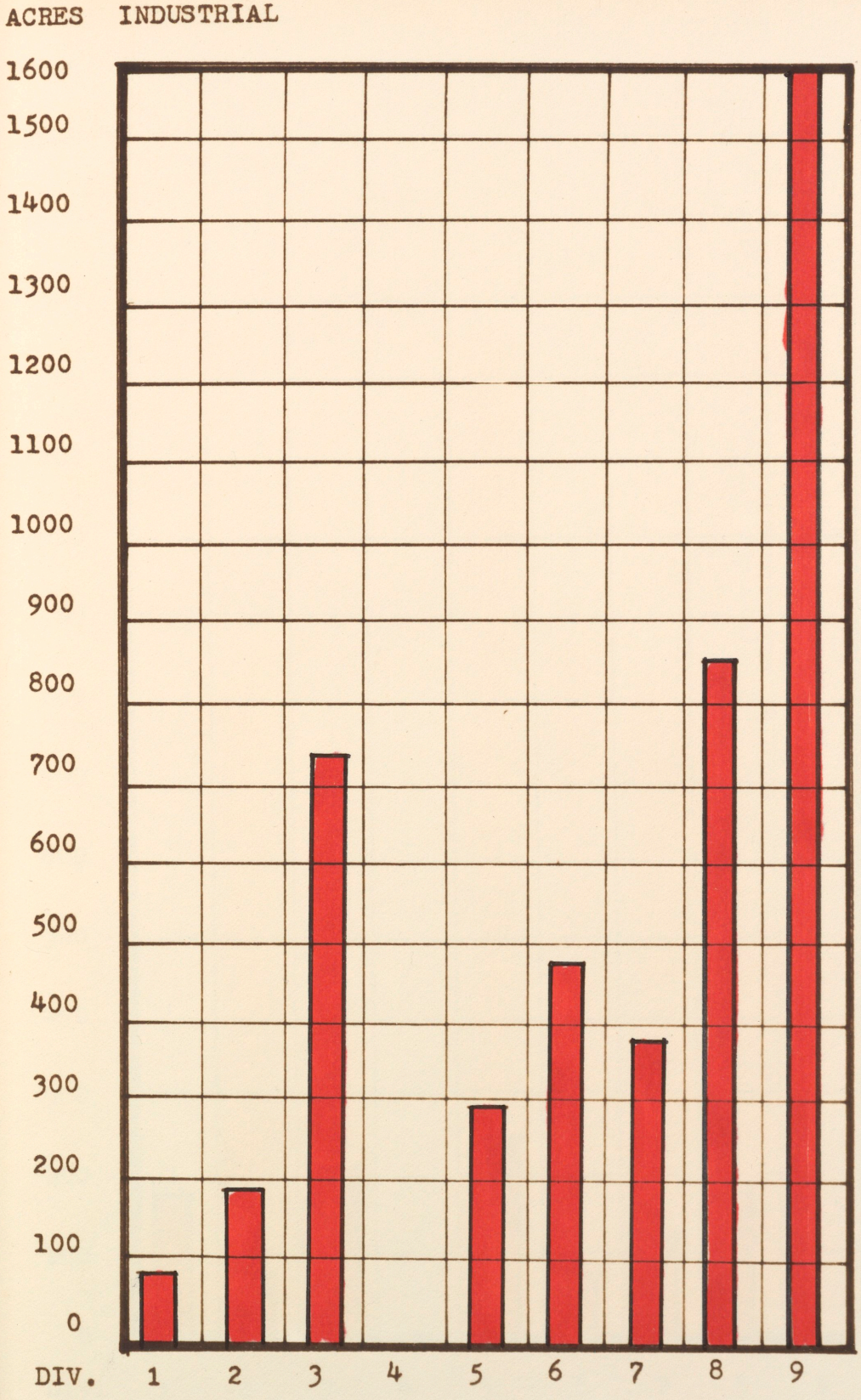


LAND USE INVENTORY, 1969

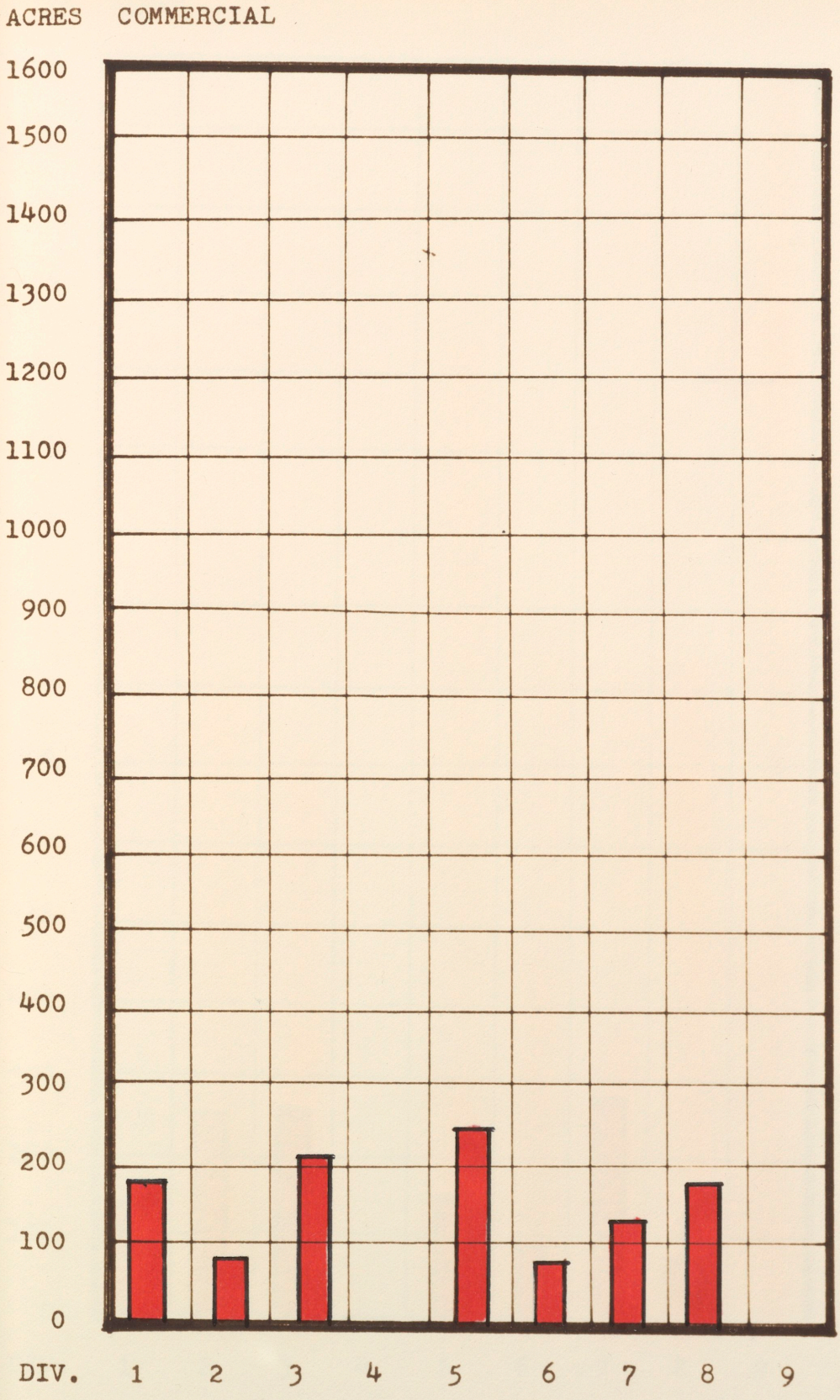



8
7
3
2
1
4
6
5

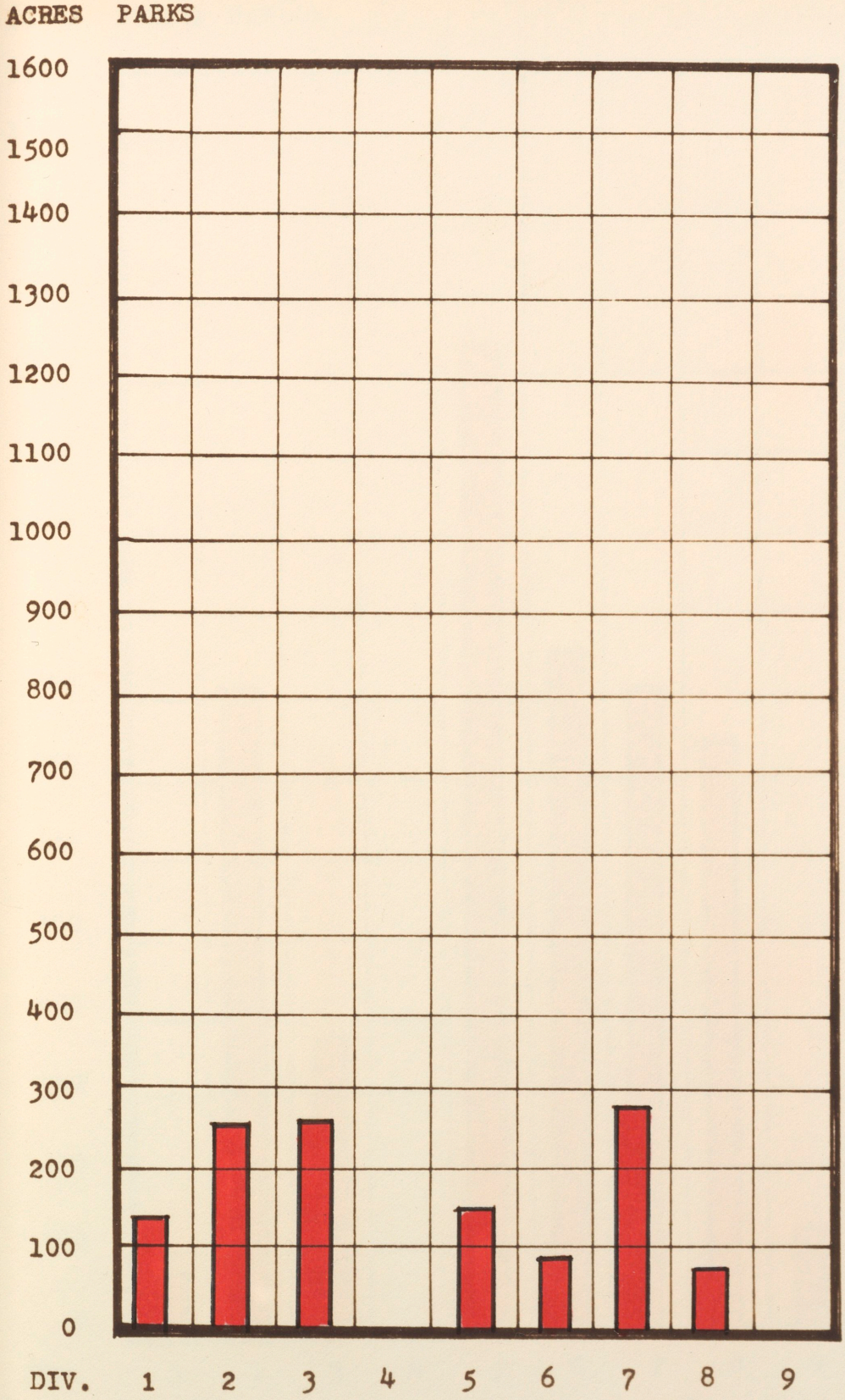
LAND USE INVENTORY, 1990



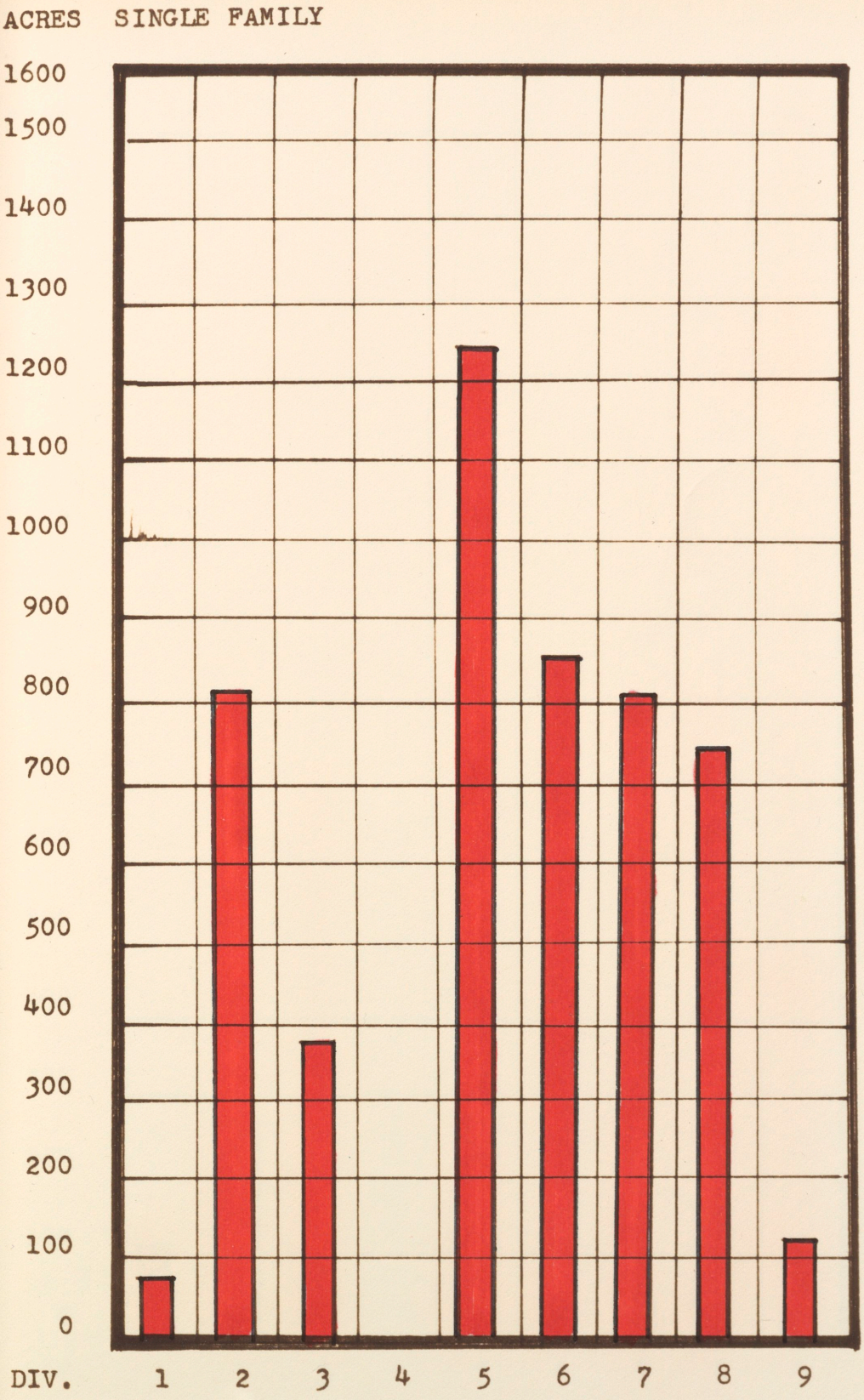
LAND USE INVENTORY, 1990



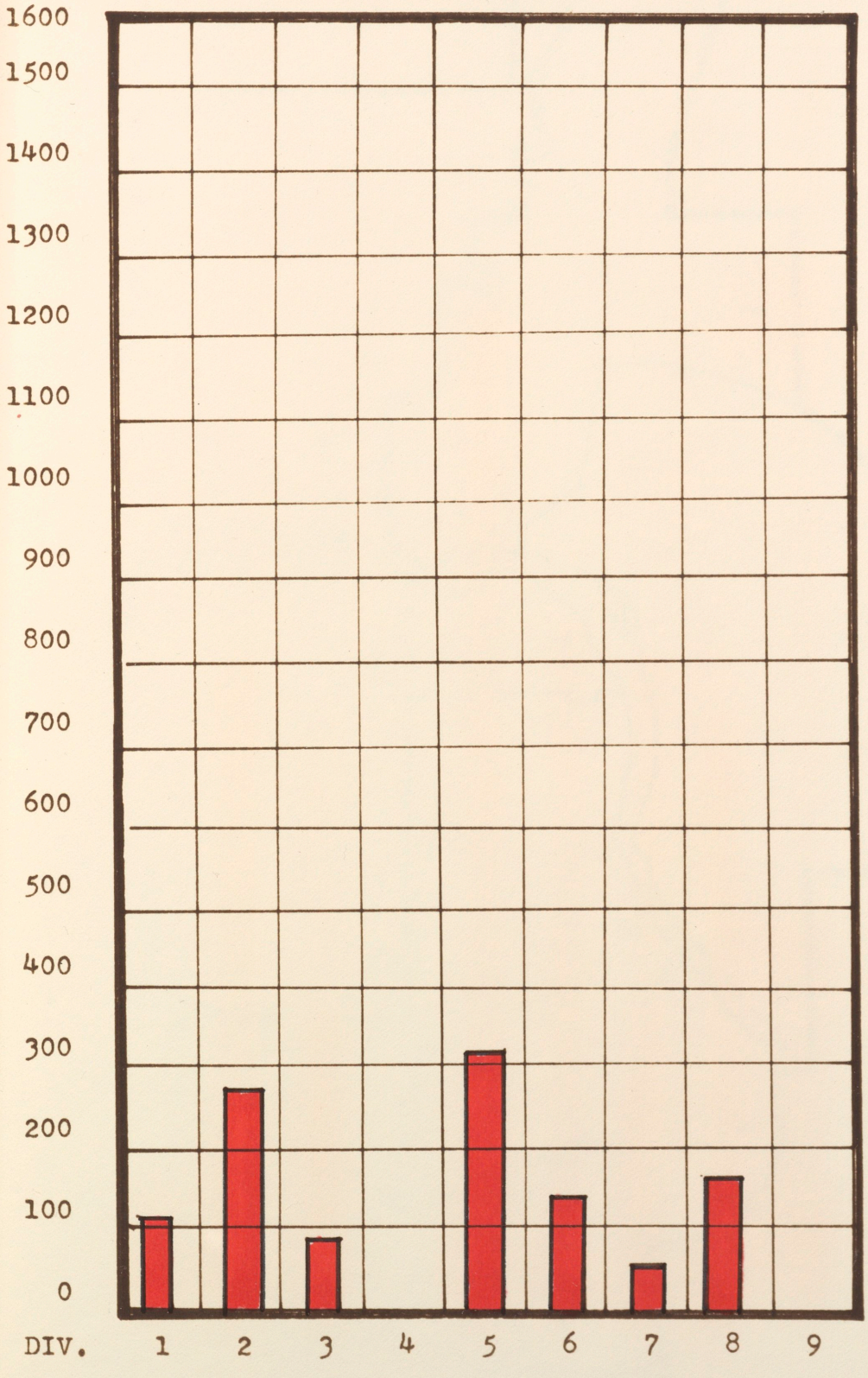
LAND USE INVENTORY, 1990



LAND USE INVENTORY, 1990



LAND USE INVENTORY, 1990

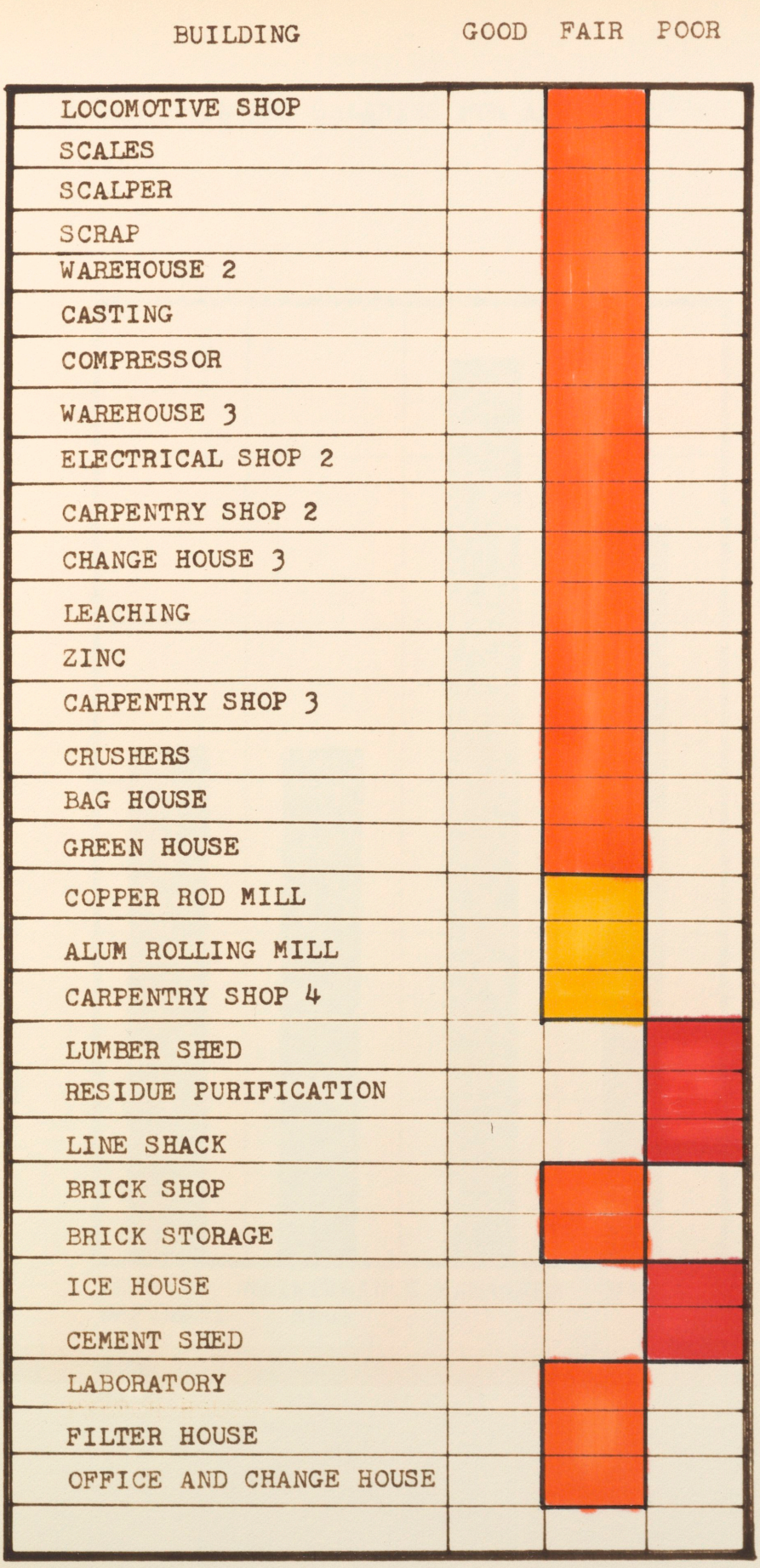



8
7
3
2
1
4
6
5

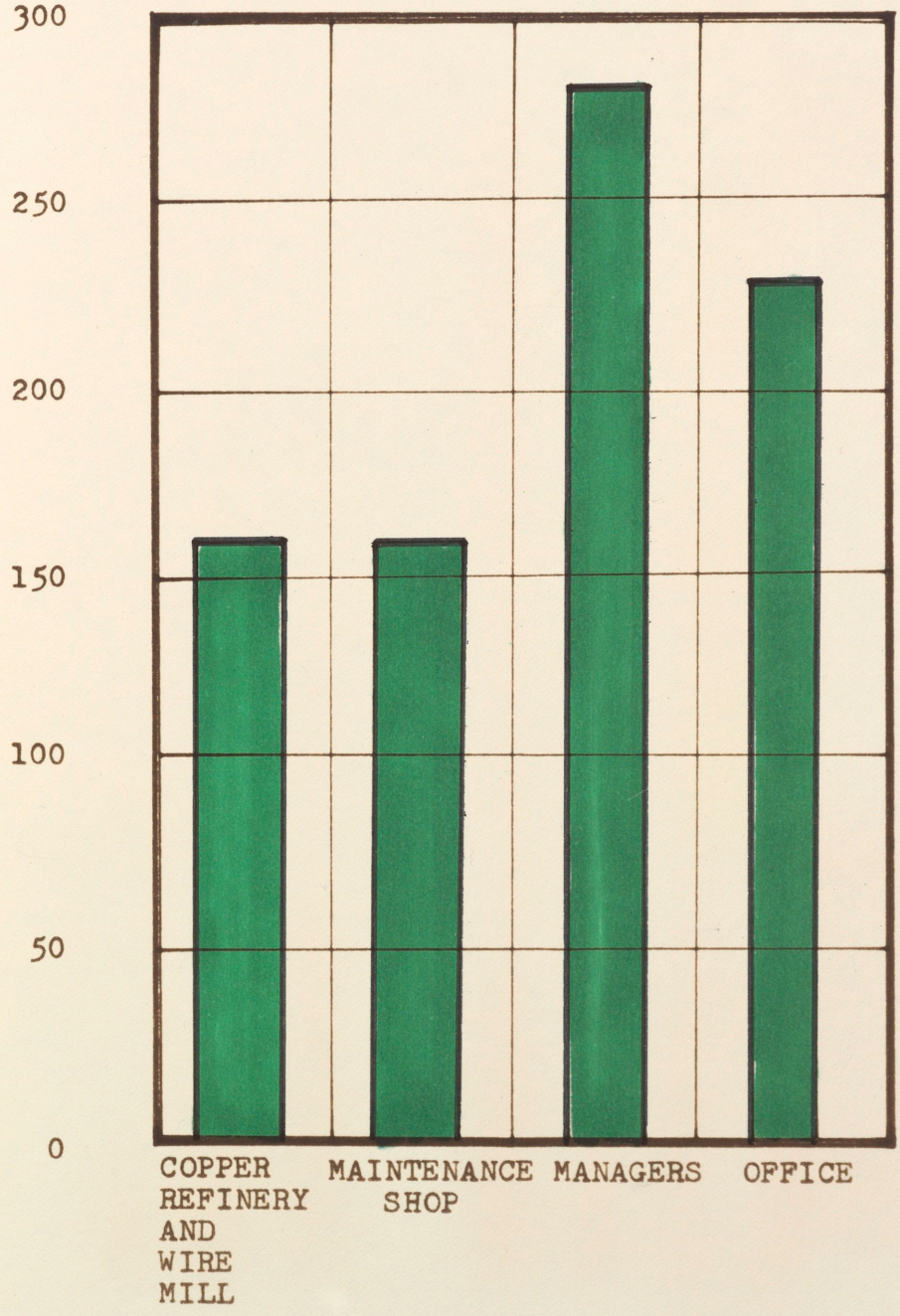
BUILDING CONDITIONS

BUILDING	GOOD	FAIR	POOR
SMELTER			
MACHINE SHOP			
BLACKSMITH SHOP			
GENERAL OFFICE			
STORAGE			
OIL HOUSE			
PATTERN STORAGE			
WAREHOUSE			
SEWAGE TREATMENT			
ELECTRICAL SHOP			
HARDWOOD AND PAINT			
CARPENTRY			
TOILETS			
BOILER HOUSE			
GARAGES			
POOL			
SCALE			
COMPANY HOUSING			
COMPANY GARAGES			
TENNIS COURTS			
CLUB HOUSE			
GOLF COURSE			
STACK			
MAIN FLUE			
TRAIN SHED			
CONCENTRATED STORAGE			
COPPER REFINERY			
COMPRESSOR			
CHANGE HOUSE 2			
COPPER SULPHER			
FURNACE REFINERY			

BUILDING CONDITIONS

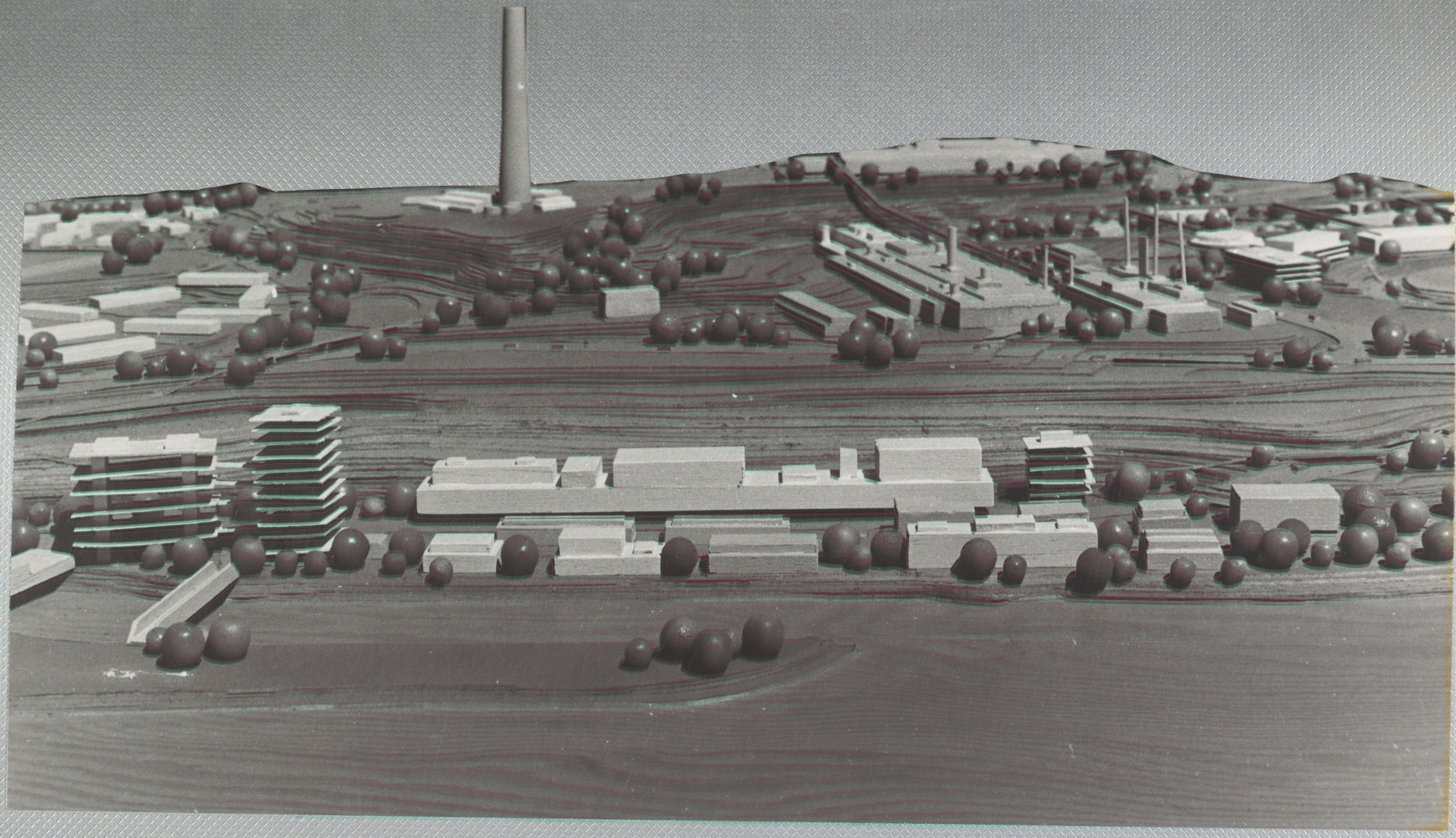


WEEKLY INCOME SALARIES FOR ACM PLANT

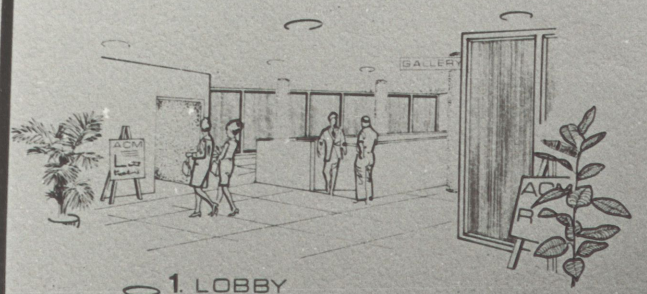




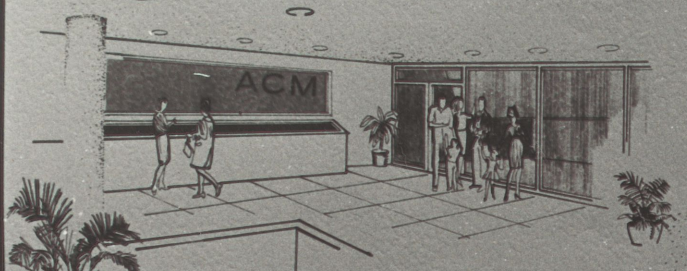




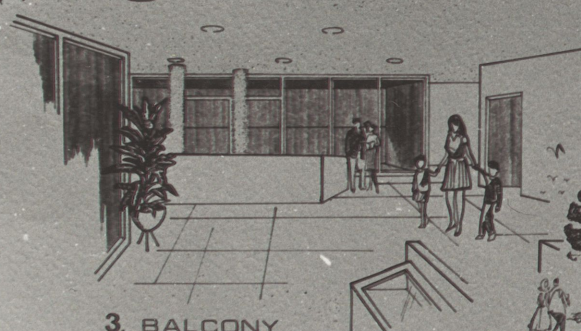




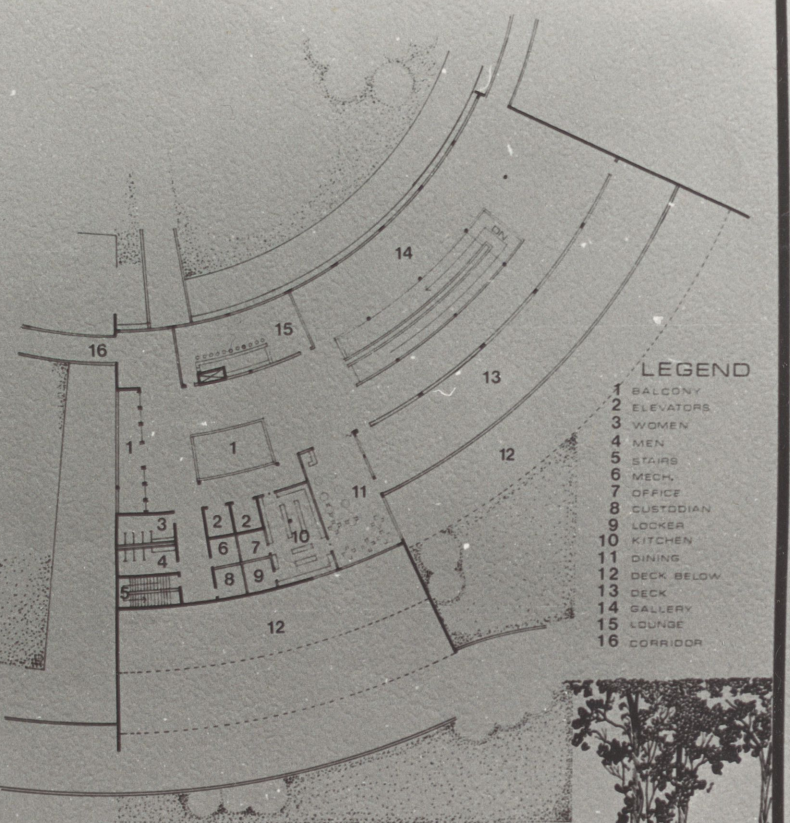
1. LOBBY



2. GALLERY



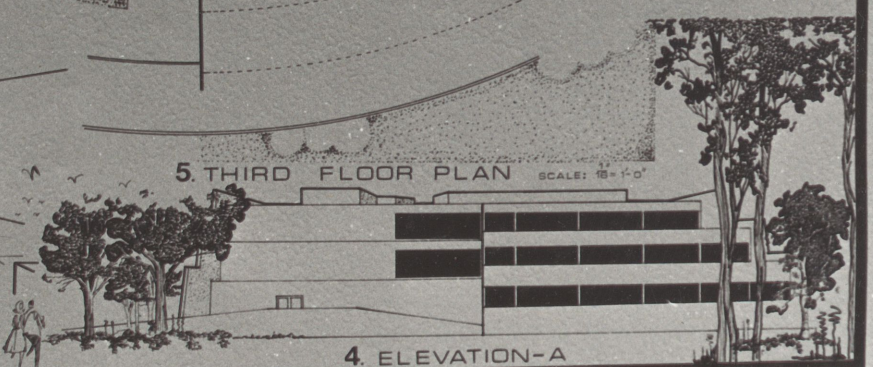
3. BALCONY



LEGEND

1 BALCONY
2 ELEVATORS
3 WOMEN
4 MEN
5 STAIRS
6 MECH.
7 OFFICE
8 CUSTODIAN
9 LOCKER
10 KITCHEN
11 DINING
12 DECK BELOW
13 DECK
14 GALLERY
15 LOUNGE
16 CORRIDOR

5. THIRD FLOOR PLAN SCALE: 1/8" = 1'-0"



4. ELEVATION-A

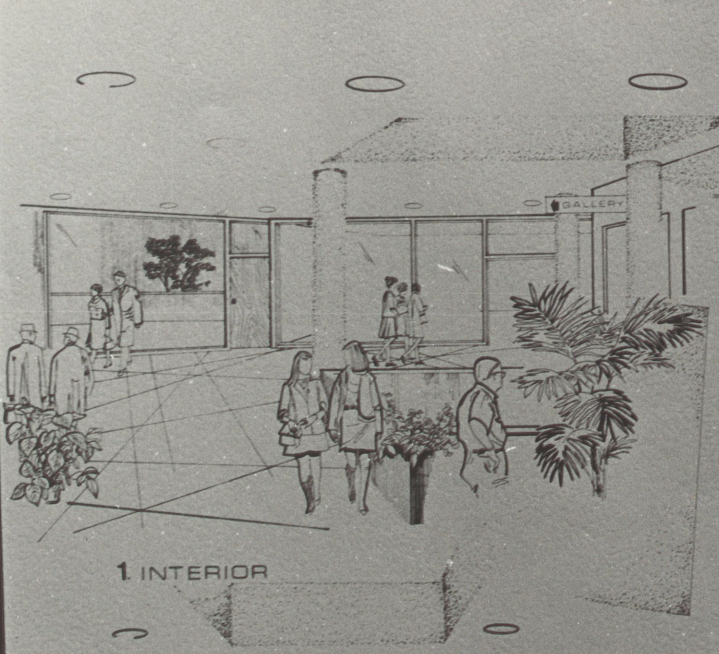
4

FLOOR PLAN - ELEVATION

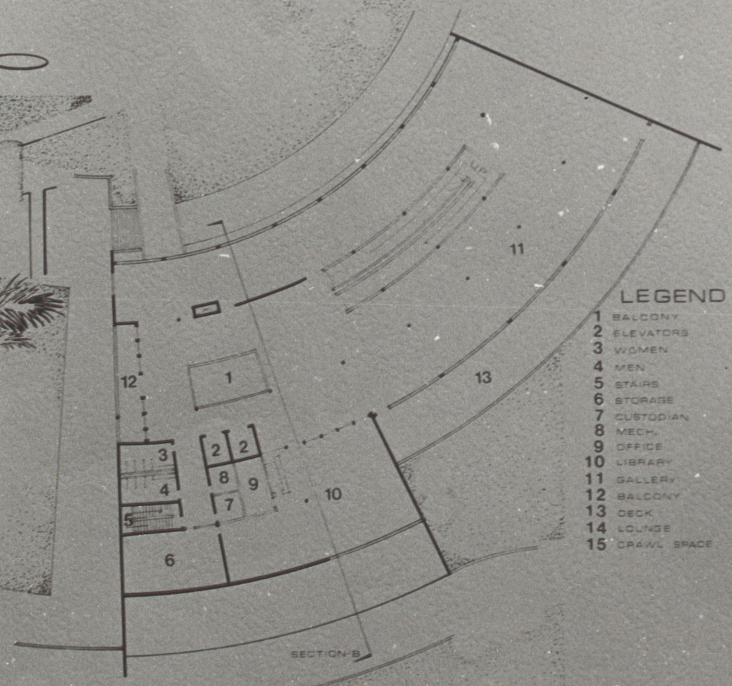
GREAT FALLS, MONTANA

ACM

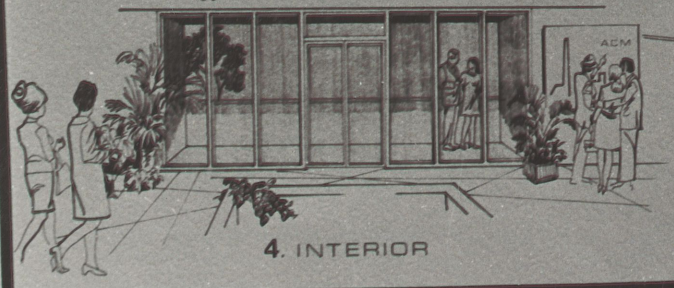
OSWOOD



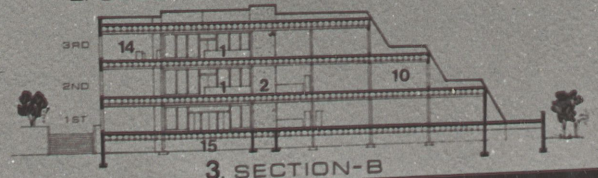
1. INTERIOR



2. SECOND FLOOR PLAN: SCALE: 1/8" = 1'-0"



4. INTERIOR



3. SECTION-B

ACM

3

FLOOR PLAN + SECTION

GREAT FALLS, MONTANA

OSWOOD

MONTANA STATE UNIVERSITY LIBRARIES
stks 720.6.M760s9 CA
Anaconda smelter, Great Falls, Montana /
3 1762 00158372 1

FEB 10 '75
FEB 25 '75
MAR 11 '75
APR 15 '75

NA 2540
720.6
M26
Os9

LIB. USE ONLY