

AN OPEN SPACE COMMUNITY (PUD) DESIGN STUDY

by

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A MASTER'S THESIS

submitted in partial fulfillment of the

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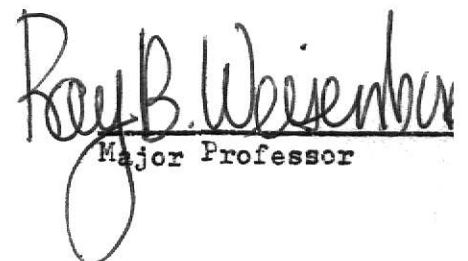
MASTER OF ARCHITECTURE

Department of Architecture

KANSAS STATE UNIVERSITY
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I. STATEMENT OF PURPOSE

Two major purposes are intended for choosing a Planned Unit Development as this study.

1. Academic

Planned Unit Development (PUD) is one of the new concepts in residential land development in the sixties, and is increasing its tempo of replacing the conventional lot development.

It is generally accepted that the motive for one's being in a graduate school is to learn new trends and ideas and contribute new concepts in one's field. The choice of a PUD meets my academic motive.

PUD is "the building block of new towns."¹ The new town concept seems to be an appropriate approach to urban expansion. The American experience with a new town program has failed, however, mainly because of the developer's financial problems.

Today all but six of the projects are virtually bankrupt, and the future of the survivors is precarious.² HUD (Department of Housing and Urban Development), for some time aware of the serious administrative and financial problems with the program, declared a moratorium on new applications in January 1975.

Although the American new town program has been a failure, the "building block of new town" seems at the moment to be a feasible and appropriate answer to urban expansion in the near future.

A design study of a PUD is within the managing ability of a graduate student of architecture.

¹ James Bailey, New Towns in America, The Design and Development Process (N.Y., John Wiley and Sons, 1973), p. 74

² Urban Design (Formerly Design and Environment), Spring 1978, Vol. 9, No. 1, p. 21

In short, a planned unit development study has general and educational significance and it is a size appropriate for a one-man project.

2. Personal

The other purpose of this study is to challenge the personal ability to handle a large scale project independently. Through this study, I intend to familiarize myself with the essence of the whole process of a planned community development so that when faced with a similar situation in the future, I will be able to respond quickly and properly.

II. DELIMITATIONS

This study will be limited to the physical design of a planned community. The planning and design decisions will be made based on personal academic experience and pertinent materials. Because of the nature of the field (urban design) and the study, certain assumptions have to be made in order to make this study possible. Therefore, the following limitations are made:

There is a market for the kind of development at the selected site;

There is no financing difficulty (including FHA-insured financing);

The Manhattan City Planning Department and the Planning Commission will render full support;

The City Council and the public opinion will favor it;
 There is no trouble with the provision of utilities from
 the City and the Kansas Power and Light Company.

III. DEFINITION OF A PUD

PUD -- Planned Unit Development (or "open space community" ¹)
 is a term to cover the kind of innovations and land development
 intended by freedom from the conventional residential lot deve-
 lopment of the past.

It's definition, according to the Urban Land Institute, is:

A project, predominantly of housing, with the follow- ²
 ing elements: dwelling units grouped into clusters, allow-
 ing an appreciable amount of land for open space, much or
 all of its housing in town houses or apartments or both;
 most economical and efficient use of land, making possible
 higher density without overcrowding; where desired, part
 of the land is used for non-residential purposes, such as
 shopping and employment centers.

and the general objectives of planned unit developments are:

1. To achieve flexibility.

3

1 Urban Land Institute, Community Builder's Handbook, p. 105

2 James Bailey, op.cit., p. 74

3 Urban Land Institute, New Approaches to Residential Land Development - Technical Bulletin 40 (Washington, D.C., ULI, 1961)

2. To provide a more desirable living environment than would be possible through the strict application of zoning ordinance requirements.
3. To encourage developers to use a more creative approach in the development of residential, commercial and industrial land.
4. To encourage a more efficient and more desirable use of open land.
5. To encourage variety in the physical development pattern of the city.

The city of Manhattan, Kansas, has included in its zoning ordinance planned unit development guidelines, and the objectives to be achieved are:

- (A) A maximum choice of living environments by allowing a variety of housing and building types or permitting an increased density per acre and a reduction in lot dimensions, yards, building setbacks, and area requirements. ¹
- (B) A more useful pattern of open space and recreation areas and, if permitted as part of the project, more convenience in the location of accessory commercial uses and services.
- (C) A development pattern which preserves and utilizes natural topography and geologic features, scenic vistas, trees and other vegetation, and prevents the disruption of natural drainage patterns.
- (D) A more efficient use of land than is generally achieved through conventional development resulting in substantial savings through shorter utilities and streets.

1 Manhattan Zoning Ordinance (revised June 1978), p. 8-3

- (E) A development pattern in harmony with land use density, transportation facilities, and community facilities objectives of the comprehensive plan.
- (F) An environment which provides safe, clean, convenient and necessary residential, commercial, and industrial facilities which will afford greater opportunities for better housing, recreation, shops and industrial plants for all citizens of the community.

IV. SITE DESCRIPTION

Locating at the north-west corner of the Manhattan City, Kansas, the selected site (132 acres) is right next to, and to the north of, the CICO Park. (see location map on page 19) Being a wheat field, it is bounded on three sides by Highway K-113 on the East, Kimball Avenue on the South, and Hudson Avenue on the West. The north boundary of the site is an imaginative line starts from Gary Avenue to Hudson Avenue. The whole site is roughly a square of 2400' X 2400'.

Located generally at the west portion of the City, K-113 is a major artery running north-south, connecting at a right angle with east-west arteries such as Kimball Avenue, Claflin Road, Anderson Avenue, and Highway K-18. Among these arteries, Anderson Avenue leads to the city downtown area. From the access point of view alone, this is an ideal place for an "open space community."

To the east of the site, across the K-113, is a residential area with single-family, detached houses. The CICO Park

is to the south. The area to the south west, adjoining the CICO Park, is also a low-density residential area. To the west is a tract of undeveloped rolling hills.

On the south tip of the site, within the city limit, there are some single-family houses which have been built recently; construction is still going on. Most of the area to the north is still undeveloped wheat field.

As for the topography of the site, it is a gentle slope (about 5%) with the highest area at west side. Some vegetations are growing along the edges.

V. ALLOCATION OF LAND USE, RESIDENTIAL TYPES

According to the Community Builder's Handbook, it is recommended that in a planned community, the percentage of land allocation to residential use be kept to 60 percent. " ... the land use allocations will be very close to the practical if residential use approximates 60 percent of the area with the other 40 percent assigned to ancillary uses, including streets." ¹

In fact, however, the percentage of land area for residential use as well as other uses varies according to each project.

¹ Urban Land Institute, Community Builder's Handbook, p, 131

Based on the relevant materials reviewed and the site conditions, the following land use percentage are obtained:

Residential	70%
Commercial	5%
Open Space and Recreation	25%

Since the total area of the site is 132 acres, area in acres for land use are:

Residential	92.4
Commercial	6.6
Open Space and Recreation	33

Total number of dwelling units and residential types are:

Single detached	58
Duplex	87
Townhouse	185
Apartment	152
Total	482

VI. INFORMATION RELATED TO DESIGN DECISIONS

A. Design Objectives

- Organize housing to reinforce the open space system and the visual amenities of the site.
- To directly relate dwelling units to open space (Maximize the number of units with immediate access and views to open space.)
- Establish a consistent interior-exterior relationship.
- To provide a variety of active and passive recreation facilities and open space.
- To provide adequate parking within close proximity to dwelling units.
- To locate apartment parking areas with immediate access to the roadway.
- Avoid large parking areas.
- Achieve convenient pedestrian access while minimizing pedestrian-auto conflicts.
- To provide a continuous pedestrian circulation network which links the various residential clusters with community facilities, recreation and open space.

B. Site Analysis

a. Soils

The primary objective of the soil analysis is to evaluate the suitability of each soil type of the site for supporting development.

The soils types on the site, according to the Unified Soil Classification System, are classified as

Cs, Re, Sm, Sc, Tv, and Wn. The capabilities of these soils are noted in the following chart.

	STABILITY AS SOURCE OF				SOIL FEATURES AFFECTING	SOIL PROPERTIES SIGNIFICANT TO ENGINEERING	
	Topsoil	Road Subgrade	Road Fill	Highway Locatio		Depth to Bedrock	Shrink-Swell Potentia
Gs	Fair: limited quantity of suitable material	Fair: moderate shrink-swell potential	Good	Bedrock at depth of 1 1/2 to 2 1/2', irregular top; moderate plasticity, possible seepage	Foundations for low bldg. moderate to low shear strength bedrock at 1 1/2' to 3 1/2' moderate shrink-swell potential	1 1/2' to 3 1/2'	moderate
Re	Good	Poor: moderate to high shrink-swell potential	Fair to Good: fair stability	slope of 0 to 3 per cent	moderate to low shear strength moderate to high shrink-swell potential	4'	high or moderate
Sm	Good	Poor: moderate to high shrink-swell potential	Fair: fair to poor stability moderate to high shrink-swell potential	-slow internal drainage; slope of 1 to 8% -high plasticity	low shear strength moderate to high shrink-swell potential slow permeability	4'	moderate
So	Good	Poor: moderate to high shrink-swell potential				4'	high or moderate
Tv	Fair	Poor: high shrink-swell potential	Fair: fair to poor stability -high shrink-swell potential	-slow internal drainage slope of 1 to 8% -high plasticity	low shear strength high shrink-swell potential slow permeability	4'	high
Wn	Fair	Poor: high shrink-swell potential	Fair: fair to poor stability -high shrink-swell potential	-slow internal drainage slope of 1 to 8% -high plasticity	-low shear strength -high shrink-swell potential -slow permeability	4'	high

* Frost Penetration 15"

Source: USDA, Soil Conservation Service, Soil Survey of Riley County and Part of Geary County (June, 1975)

b. Slope

The primary objective of the slope analysis is to understand the over-all pattern of the slopes on the site, which will be helpful in determining the best land uses for various portions of the site.

c. Drainage

The drainage (hydrography) pattern analysis is to study what existing patterns of runoff affect the site and where are the high points, the ridges, valleys, streams, swales, etc. This will show where water will be coming from, which areas will be kept drained, and how they will affect the planning of the site.

d. Climate

The conditions of climate influences the site planning, the location and orientation of structures, the equipment for cooling and heating, the fenestration, the materials and the planting in general.

e. Composite Diagram (p. 33)

This synthetic diagram is the result of all analysis in a graphical way. It shows all of the development values superimposed upon each other.

C. Planning Concepts

a. Cluster Concept

The concept of cluster is to group the houses together and preserving the land thus saved for common open space.

The advantages of this concept are that the developer, by cutting the length of street and utilities ducts, and by allowing flexibility to preserve natural features can reduce the per unit costs, and that the homeowners can have a small, private yards as well as a large, common areas of green open spaces for outdoor enjoyment.

b. Mixture Uses

The mixture uses, emphasizing the mixture of land uses, dwelling types, and densities, is a major part of the PUD concept.

The mixing of residential, commercial land uses which were decided by the process of analysis, will accomplish a compatible and healthy PUD for the site.

As for the mixing dwelling types, the single family, duplex, townhouse, and apartment will be the major four different housing on the site. The advantages of this mixing dwelling type are avoiding monotonous repetition of a single type, reserving more land for the residents to utilize for the purpose of enjoyment, and providing a wide diversity of housings for people to choose.

As far as the density is concerned, there is, in fact, no such thing as an ideal density. The suitability

of a density varies from site to site, dwelling type to dwelling type. There are four different dwelling types in this PUD, and each dwelling type has its own appropriate density.

The density of each type of dwelling is very difficult to choose. If the density is too low, it will result in high costs of land development, increased outlay for operating utility services, and long travel distances. On the contrary, if too high, it will result in low livability in terms of air, light, and open space. Therefore, the reasonable density for dwelling types on the site are:

Single family	2/acre
duplex	5-6 /acre
townhouse	8/acre
apartment	12/acre

c. Circulation System

(1) Vehicular

Based on site analysis information, two loops of collector streets are planned. They are laid out to discourage high speed vehicles. Cul-de-sacs and private courts are used for providing safe access to and from house sites in small housing groups.

(2) Pedestrian

The purpose of the pedestrian circulation is to provide an unbroken ribbon from residences to open space, community facilities, and convenient stores. It is so planned that the residents can take the pedestrian walkway to almost anywhere they want to go within the site. In addition to these,

a continuous pedestrian walkway is planned around the open space to provide the residents a nice "jogging track," and "a place to take a walk."

Steps are avoided wherever possible. Ramps for easy change in grade are used as they make the transition easier for wheelchairs and elderly residents.

d. Open Space System

Open space planning as a system represents a breakaway from the traditional block and lot building patterns. The open space, the public streets and the individual homes are the three integral parts of the planned unit development.

On the site, there are two major open spaces. One of them is the valley at north-west corner and its extension toward south-east corner. This linear shape area is kept from development mainly because of the consideration of not disturbing natural drainage pattern. The other open space is in the center of the major loop. It is logically located next to higher density housing.

The community center is located almost in the center of the site and is connected conveniently by a pedestrian circulation system. This location will also give a first impression-image to the visitors.

D. Site Planning Criteria

a. Residential Land

(1) Lotting

- Lot lines should be approximately at right angles to street or radial to a curved street.
- Lot lines normally should be straight.
- Avoid acute angles with side lines except under special topographic conditions.
- Avoid odd-shaped or pie-shaped lots.
- Street that intersect at acute angles should be avoided.
- The lot depth should be about twice its width.
- Lot size varies among the types of dwelling unit.

The average lot size for each type of housing on the site are set as follows:

Single-family	70' X 100'
duplex	50' X 100'
townhouse	34' X 100'
apartment	-----

(2) Housing Arrangements

- Single family detached houses are located at the south edge of the site along Kimball Avenue. The area south of Kimball has single family detached houses. This arrangement makes a smooth transition from low density to higher density housing.
- Duplex housing is located on the north-east corner of the site, along K-113. This is also in consideration of transition because all the houses across K-113 are single-family detached type.
- Townhouses are located next to open spaces, considering the small backyard in these units. Basically,

townhouses are in a 8 unit building. Four of these 8 unit buildings form a nice private court.

- Apartments are placed on the north-west portion of the site, also next to the open spaces, considering residents' ready need for open space to relax. The west side is the highest area on the site. By locating apartments (3-story) here, "the image of the community" can easily be created.

(3) Street and Parking

Criteria of street design

	Pavement width	R.O.W.
collector	36'	50'
cul-de-sac	20'	26'

Parking

- Single-family and duplex

Private garages with a private driveway has been provided. There are 2 parking spaces per dwelling unit.

- townhouse

A garage is provided for each unit. An extra parking space for each unit is also provided in the public court formed by four 8-unit buildings.

- apartment

One and one-half parking spaces per unit are provided. Additional parking spaces for guest are also provided.

b. Shopping Center

The principle of simplicity is the key to shopping center design.

The shopping center in this community is identified as a "Neighborhood Center" type.

"The supermarket is the key. The drugstore is almost equally needed." ¹

The L pattern is chosen for the design of this neighborhood center because it is appropriate for site condition and is best adapted to a neighborhood center.

A supermarket and a drugstore are placed at two ends, connected by an enclosed corridor and a series of stores.

A bank is also provided at the major entrance area.

The width of the stores is dominated by the "front foot" concept -- as narrow as possible. Depth ranges from 40' - 150'. 75' is chosen for this design. As for parking space, the ratio of 3 to 1 (sq.ft.) (including car stalls, the moving aisles, access drives, planting spaces, pedestrian walkways) is the guideline. ²

¹ Urban Land Institute, Community Builder's Handbook, p. 317

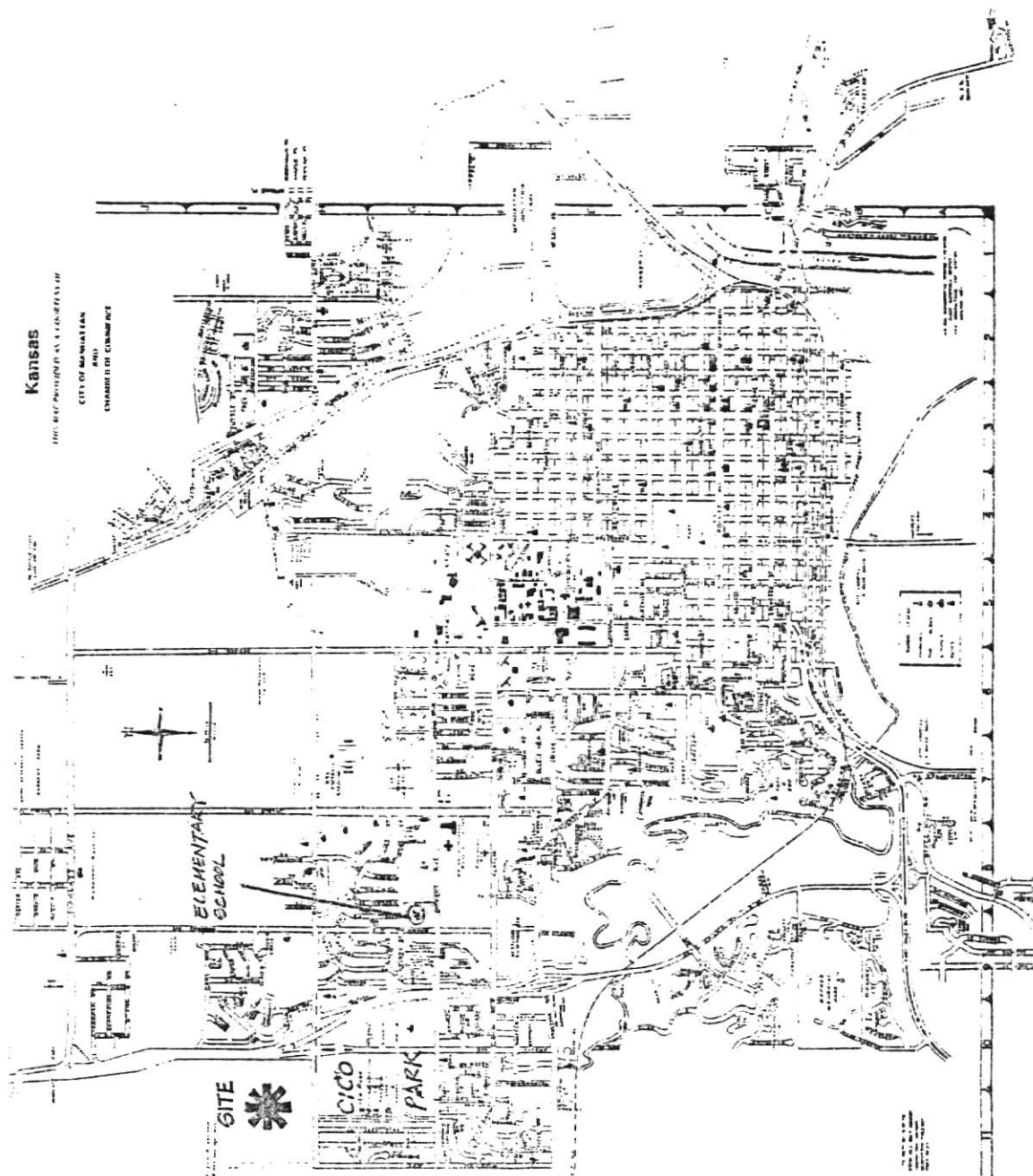
² Ibid., p.341

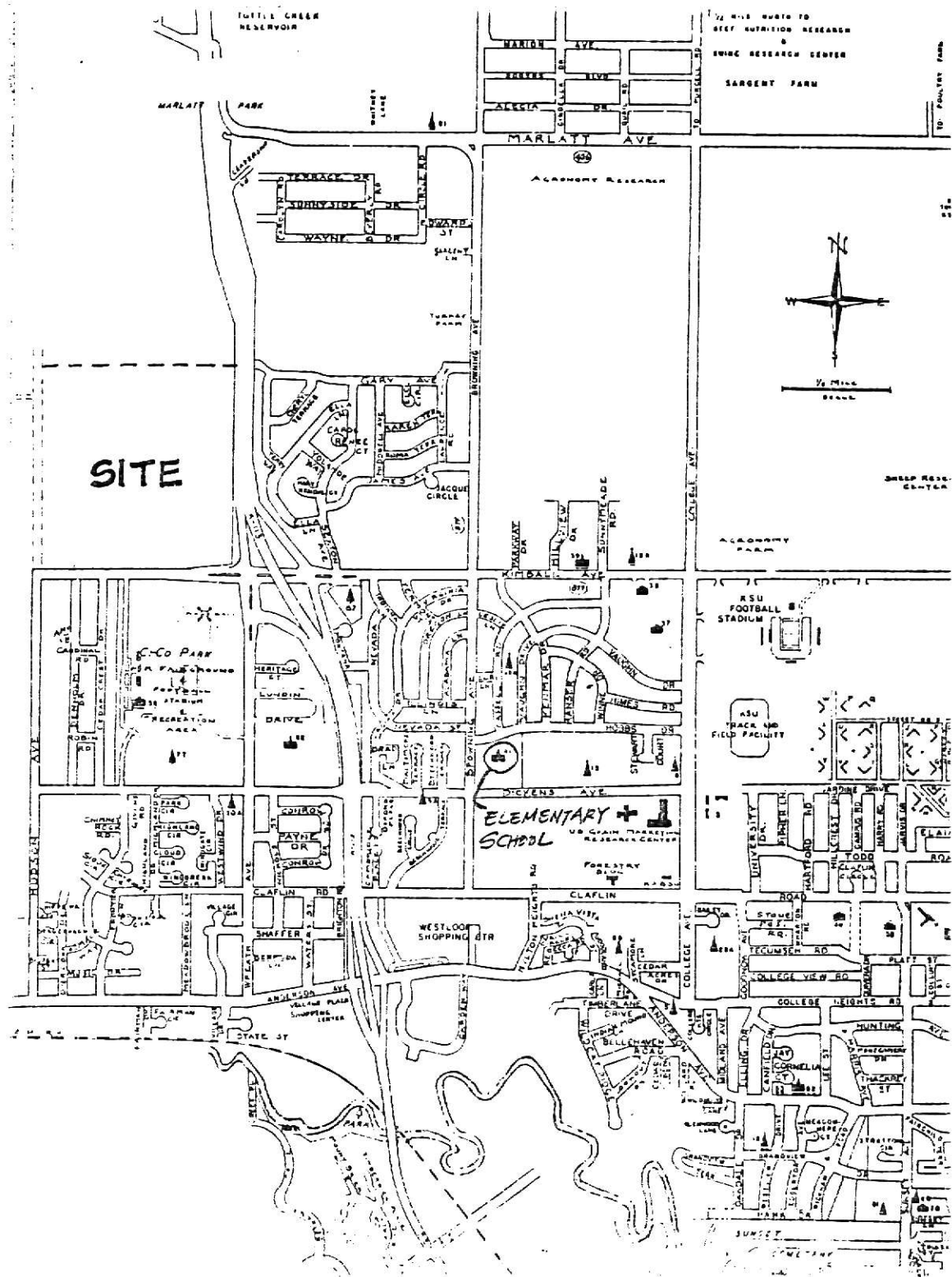
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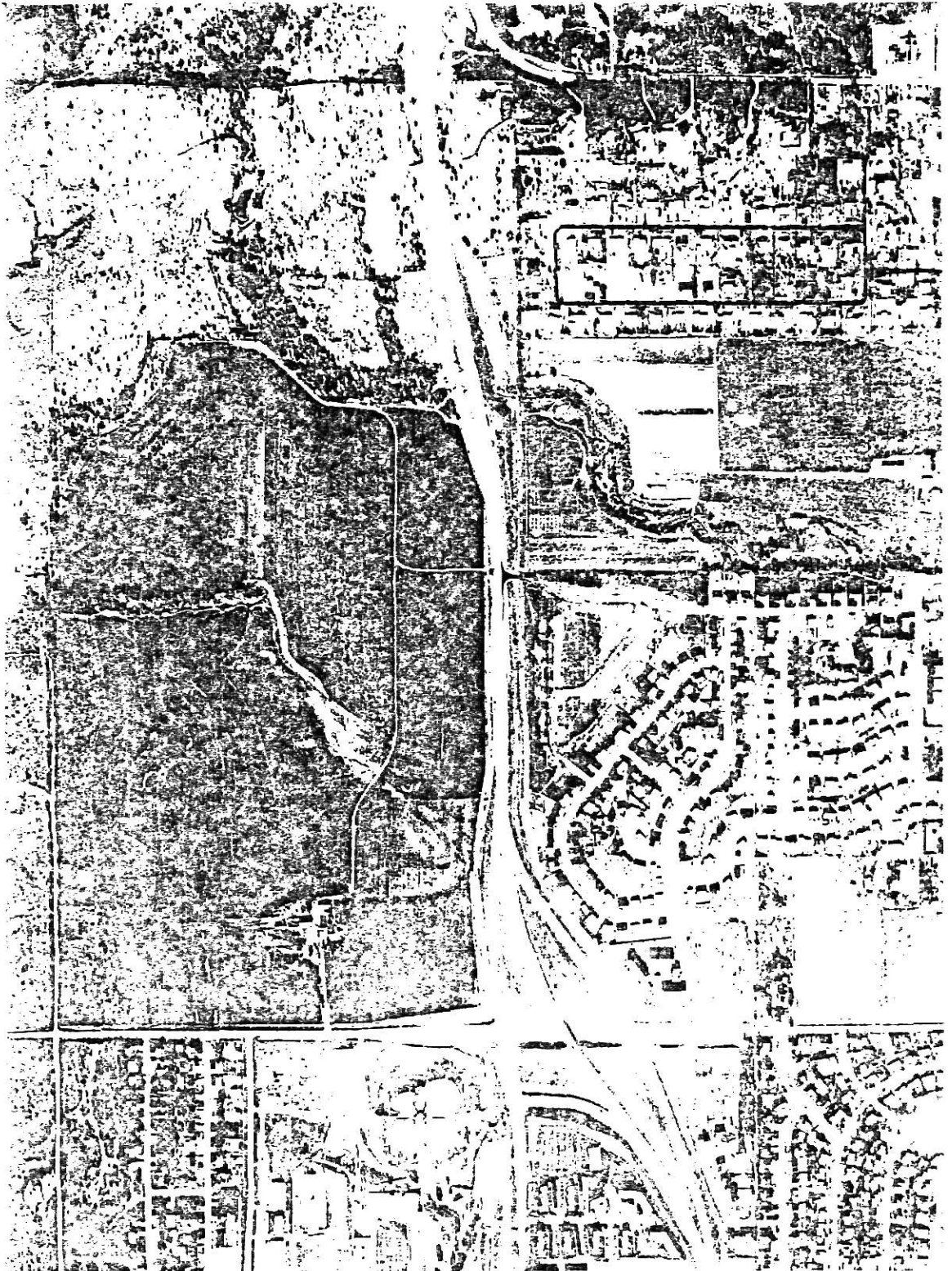
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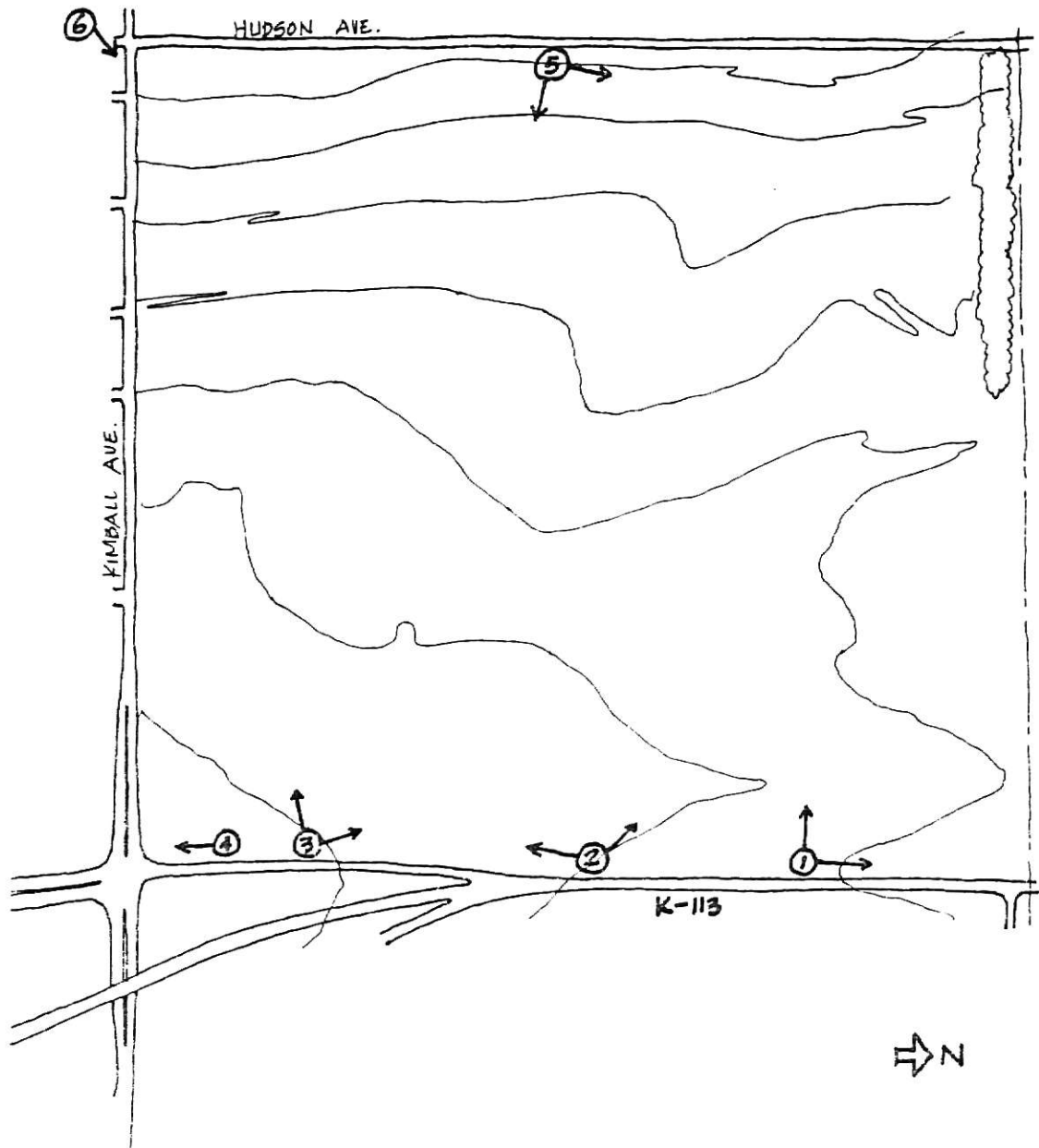
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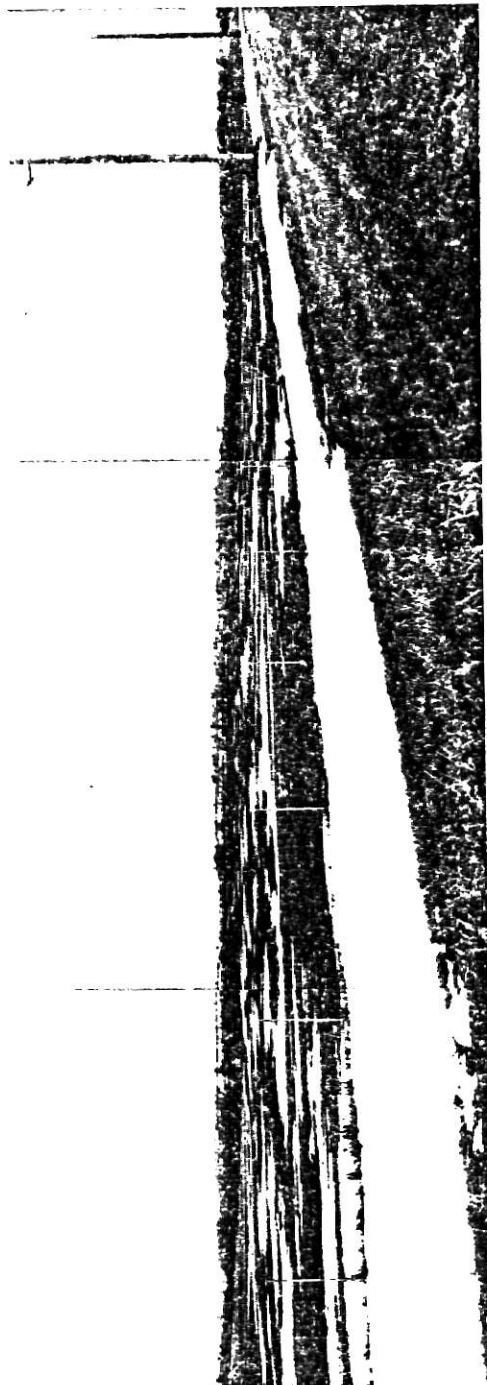
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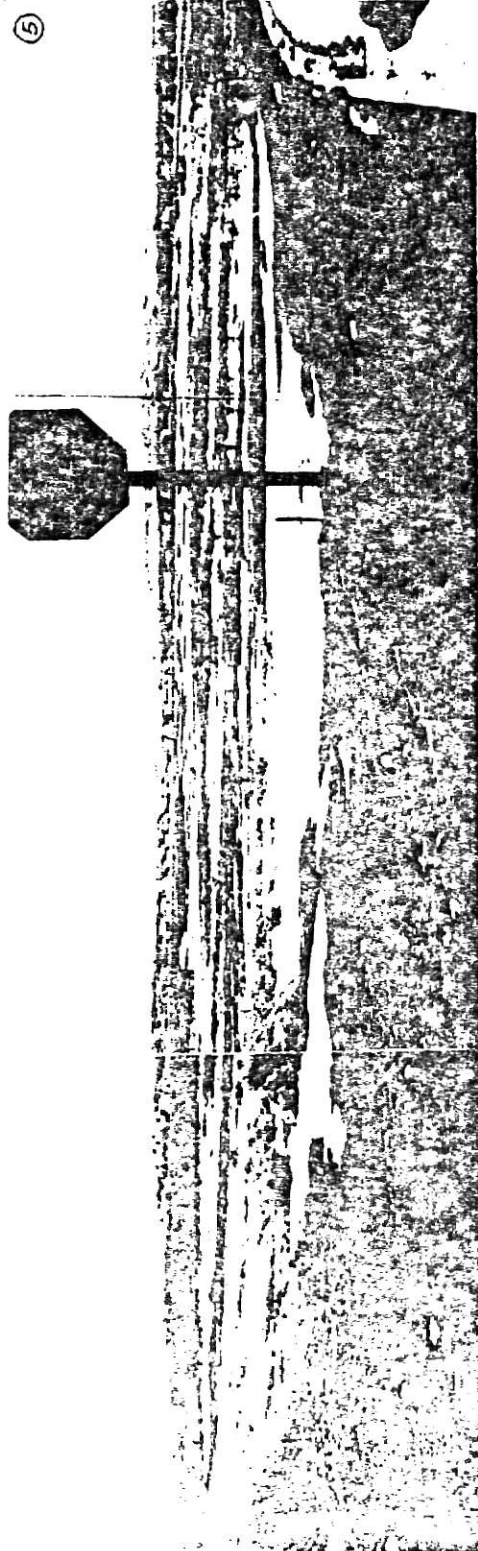




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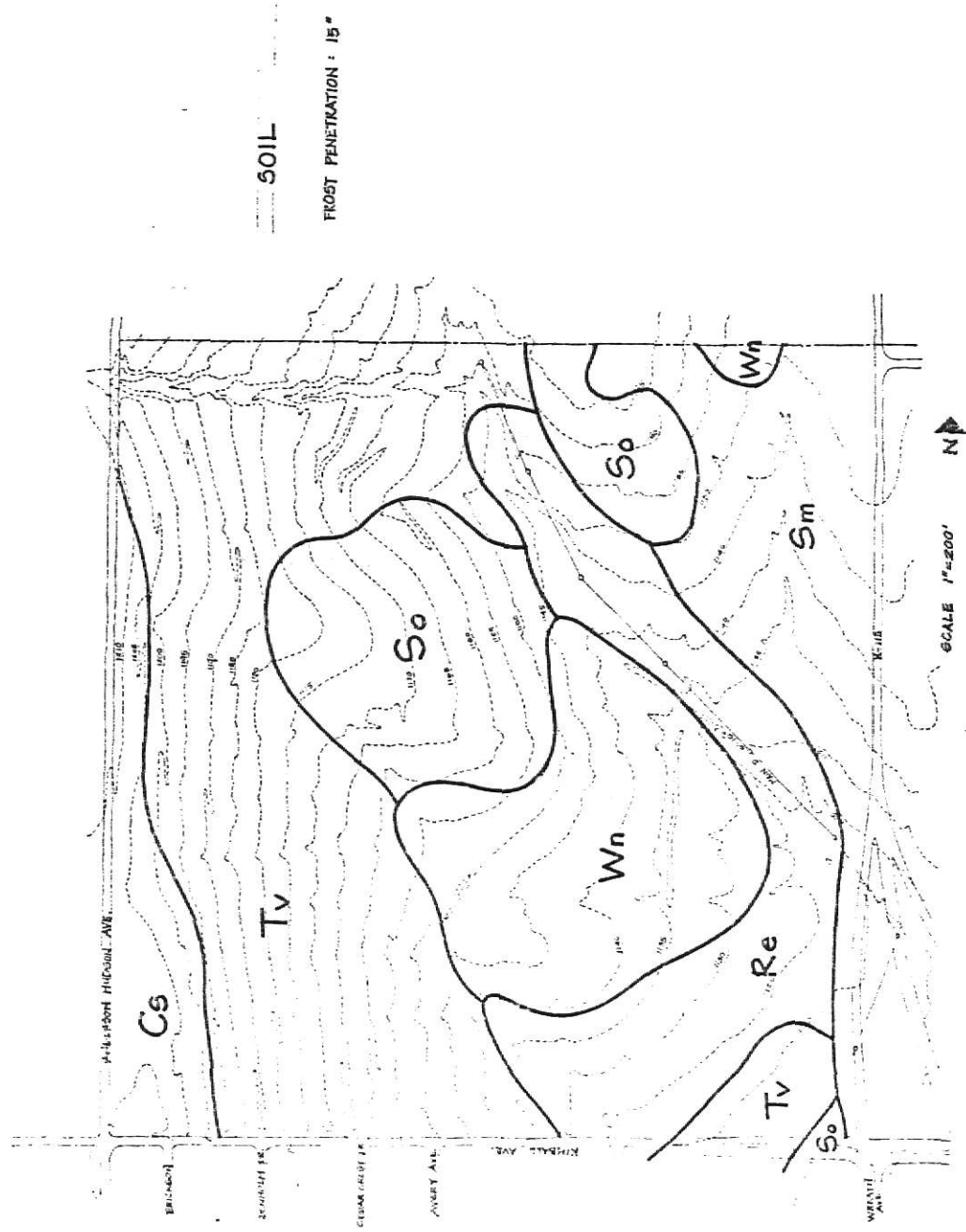


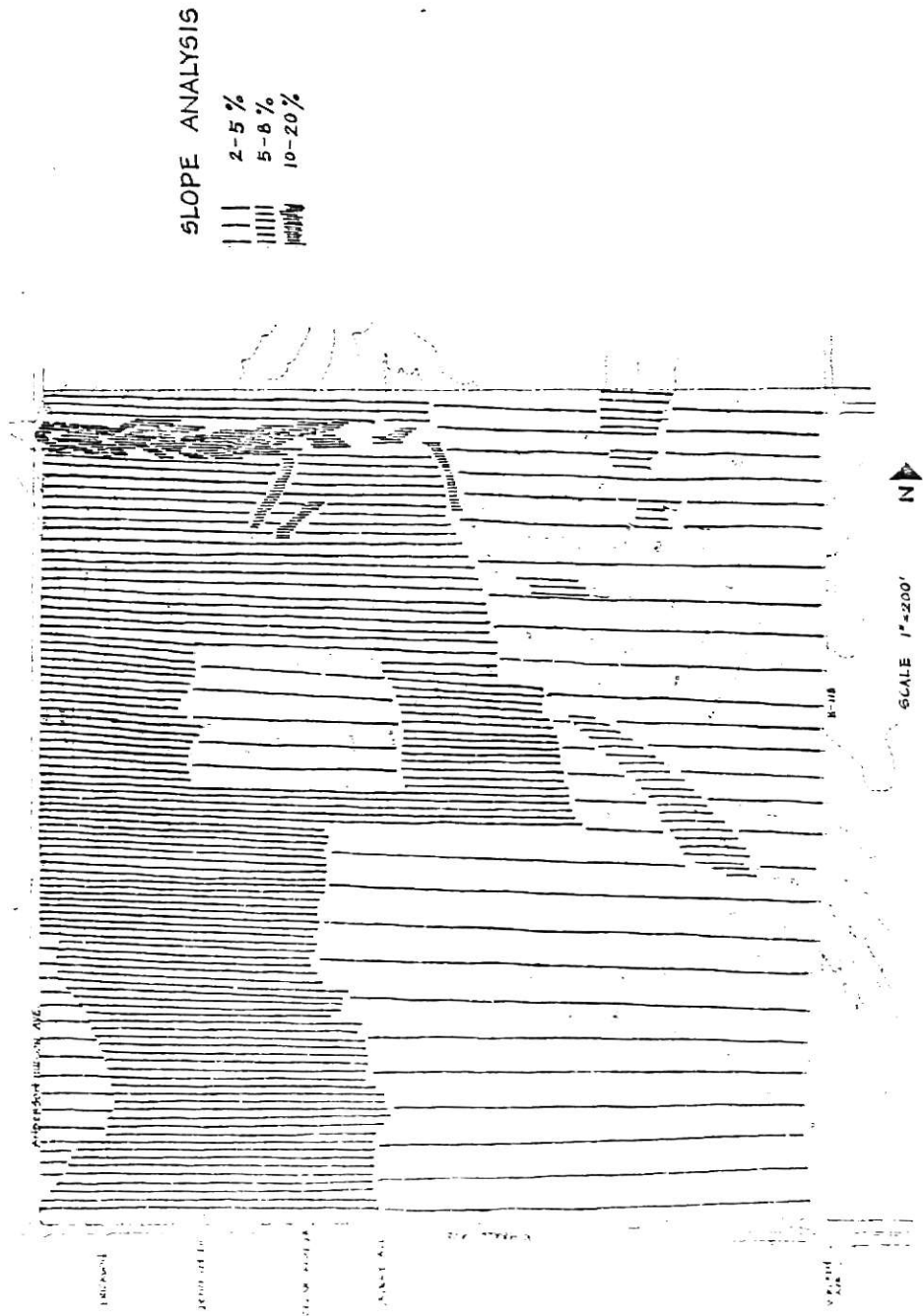


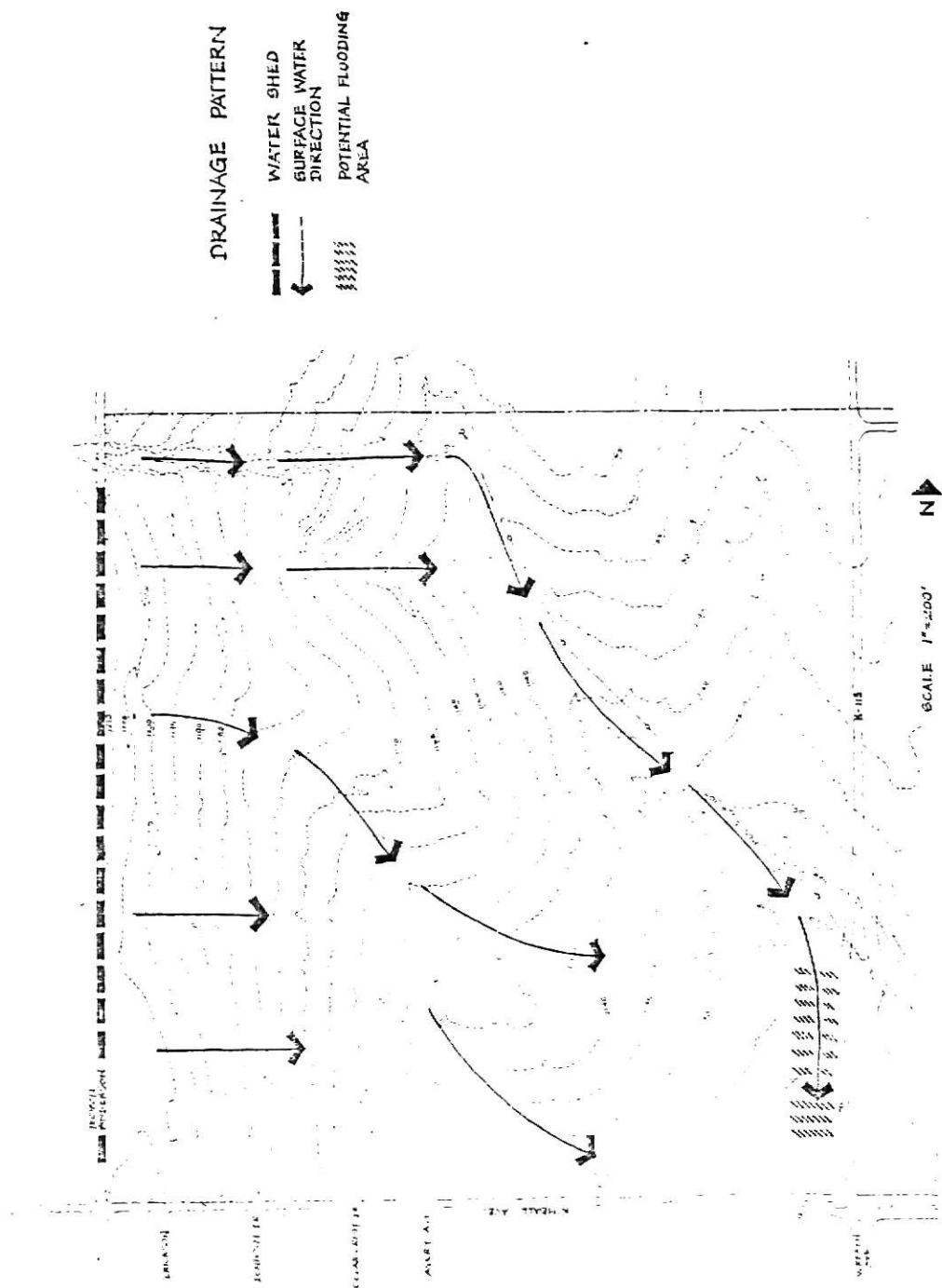


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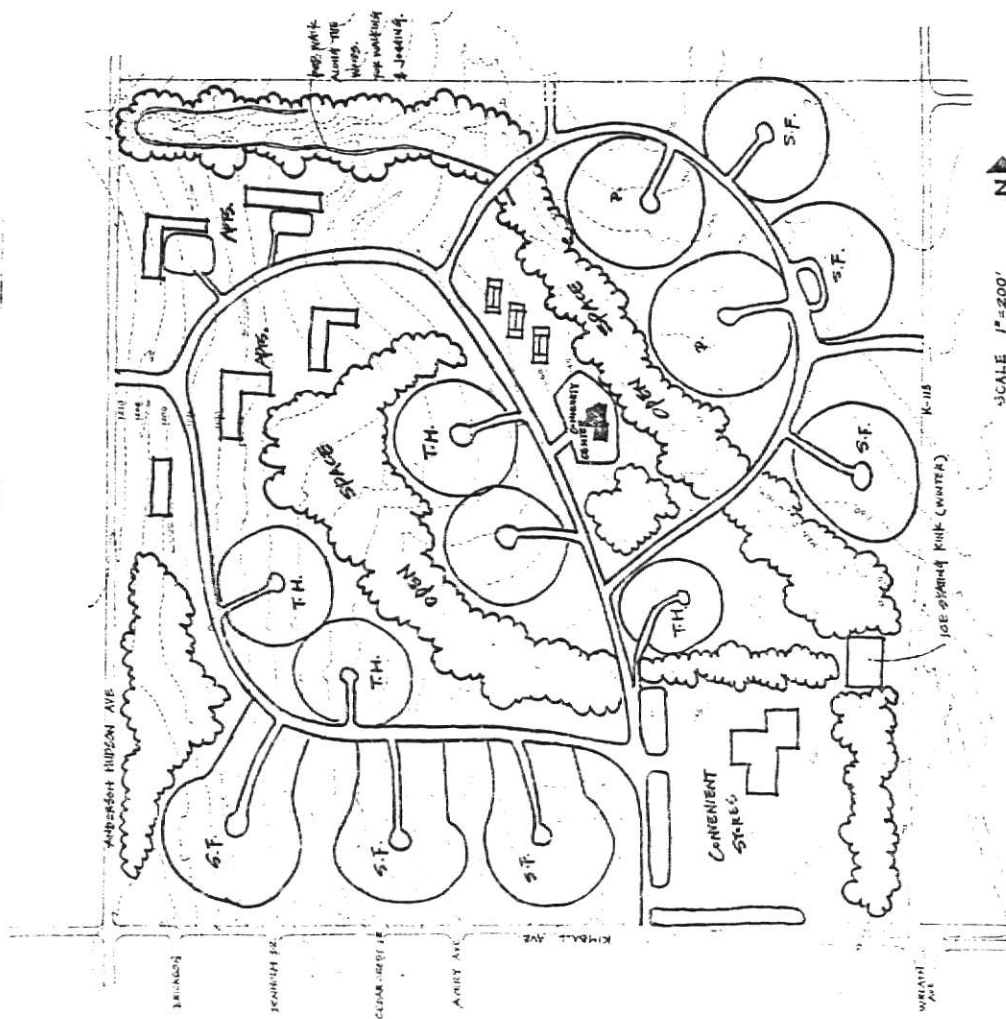


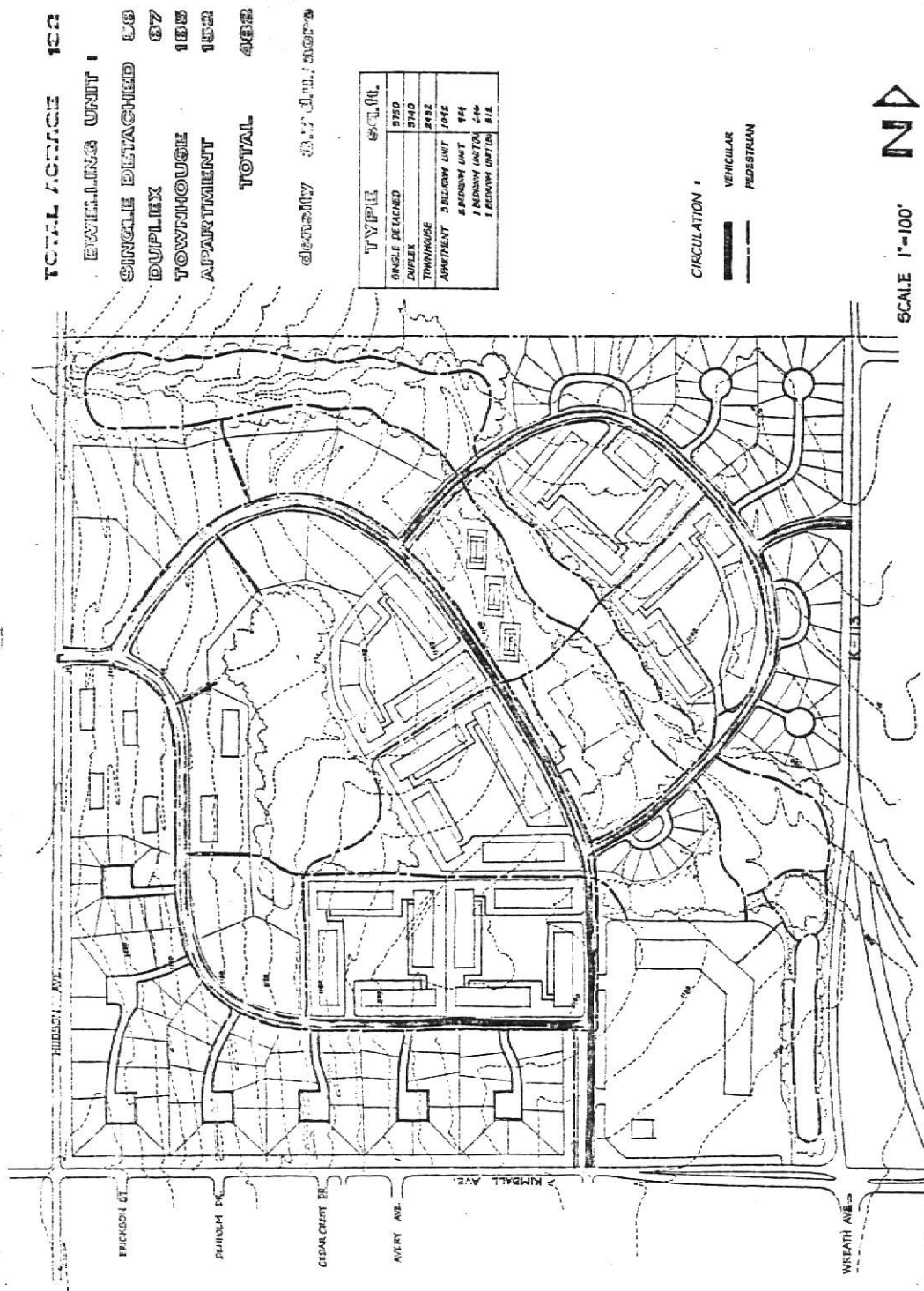






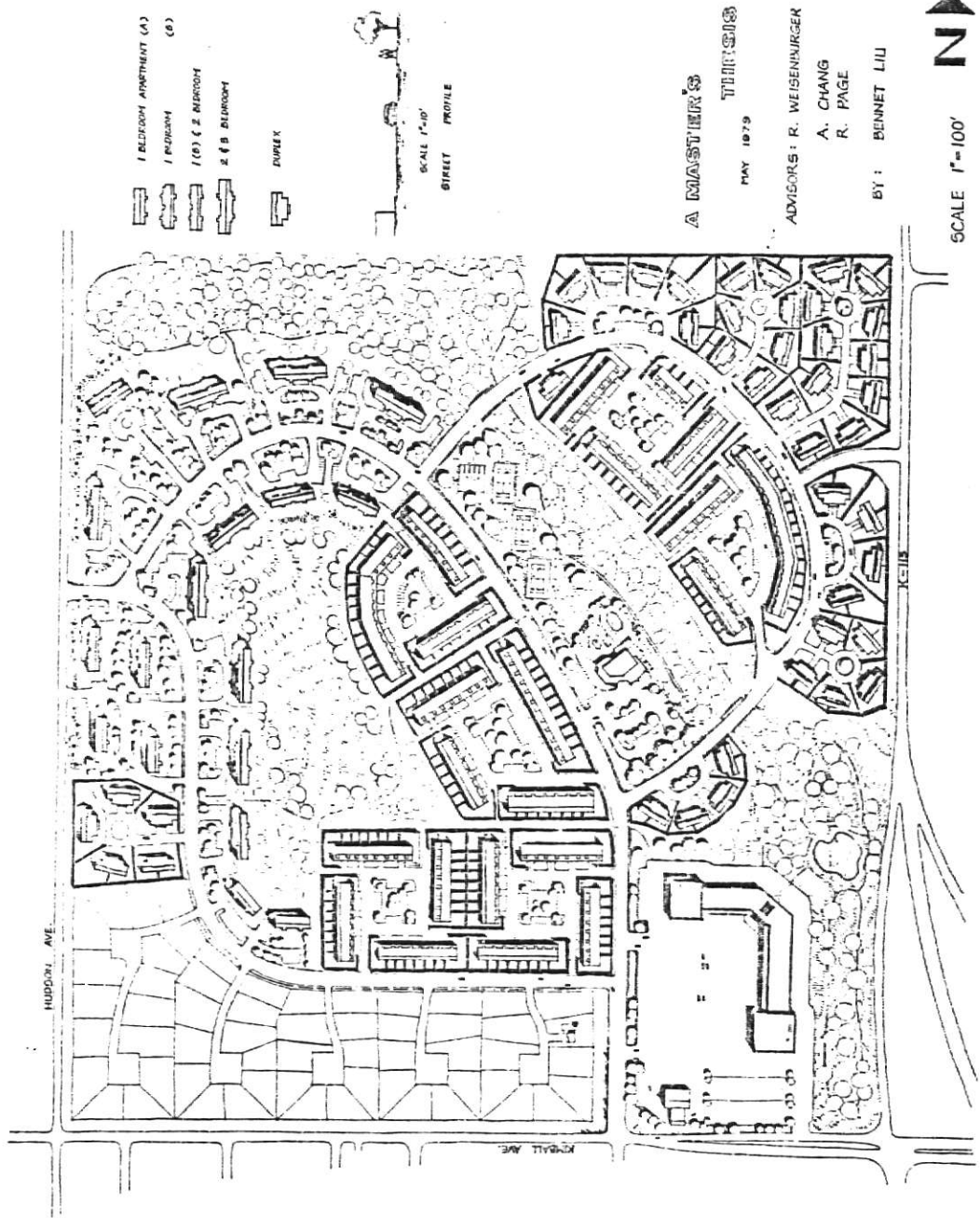
CONCEPTUAL DIAGRAM SITE DEVELOPMENT





A PLANNED UNIT DEVELOPMENT

CANDLEWOOD PARK

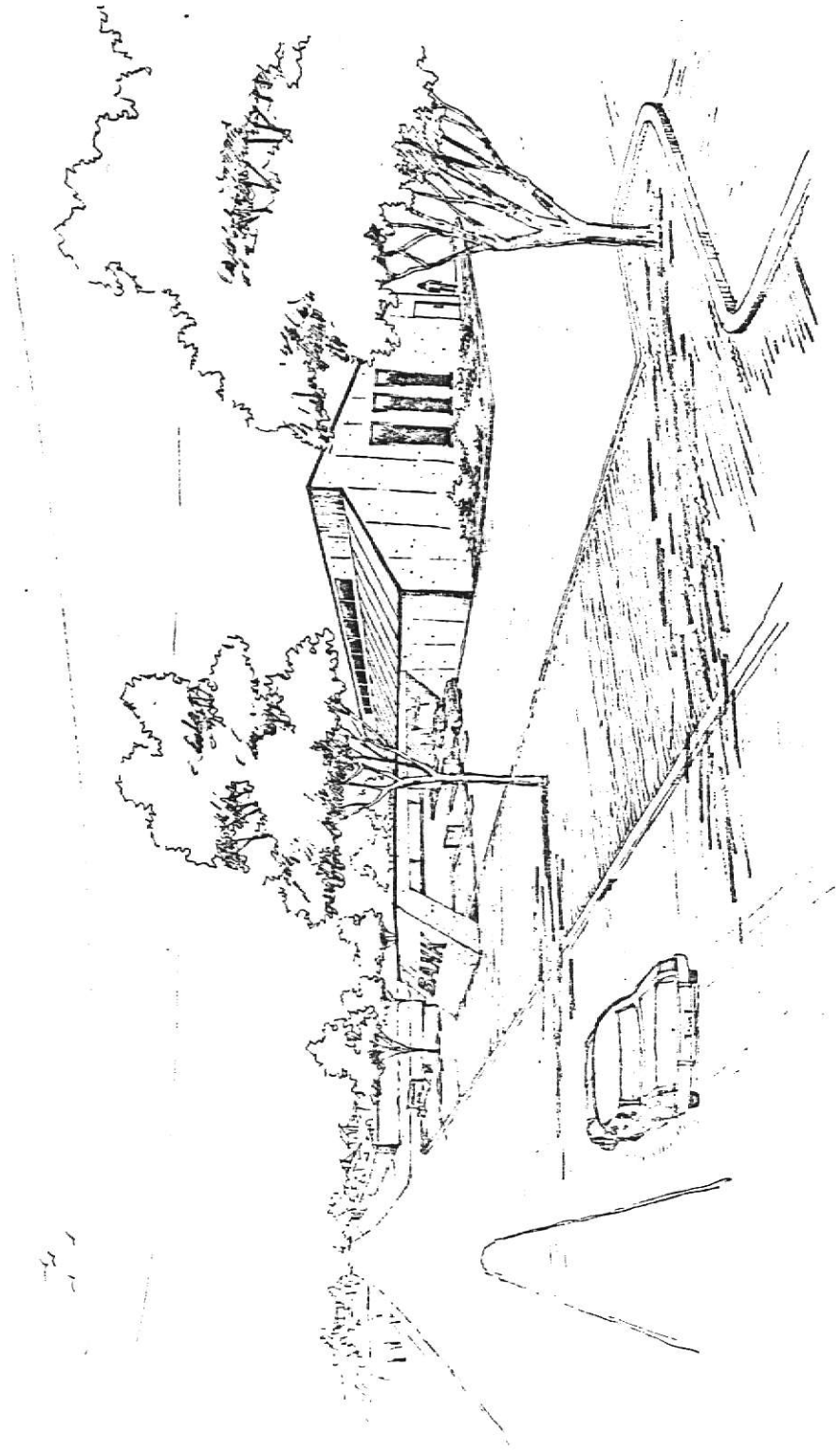


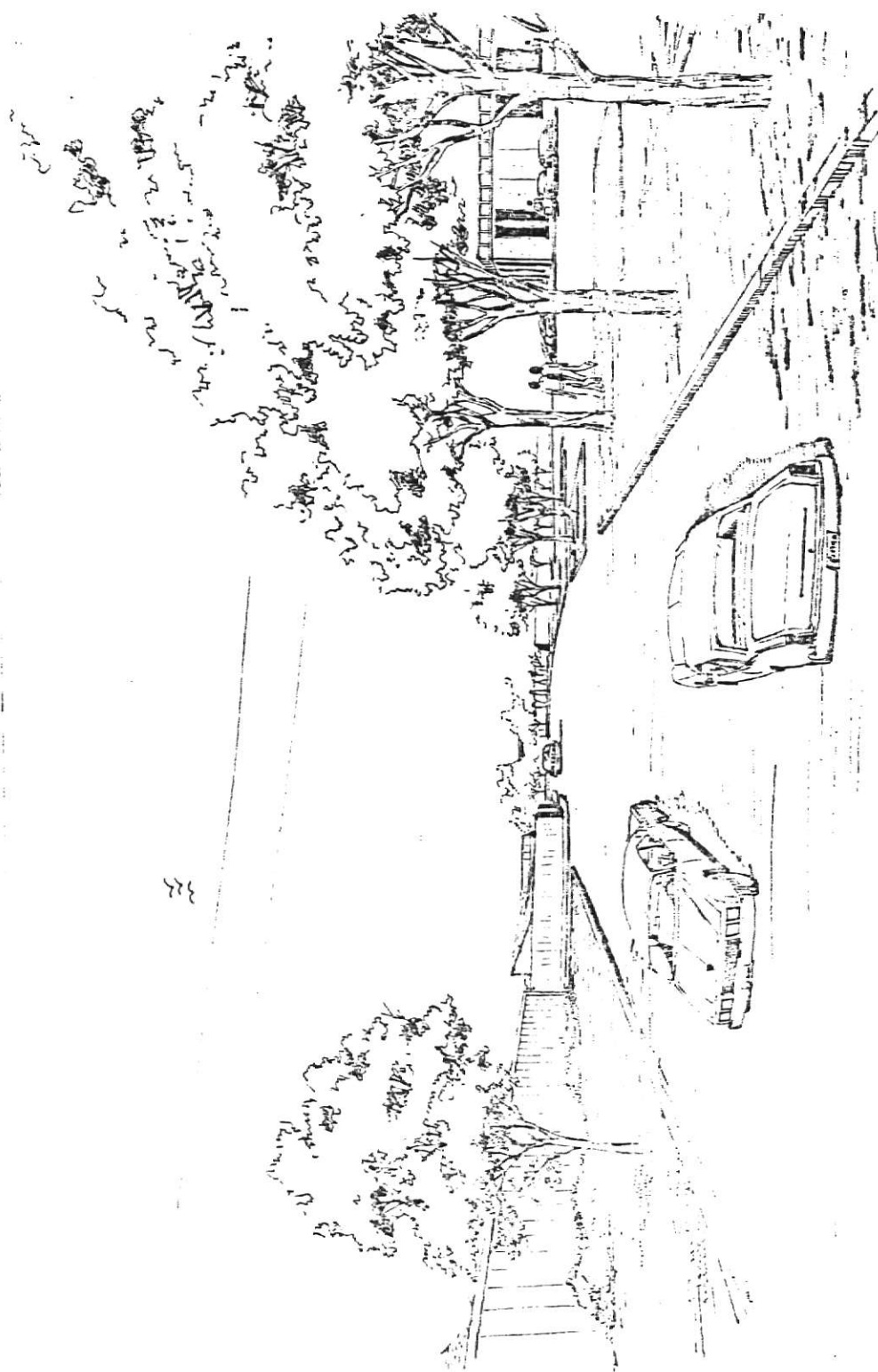
- 1 BEDROOM APARTMENT (A)
- 1 BEDROOM (B)
- 1 (B) & 2 BEDROOM
- 2 (B) BEDROOM
- DUPLEX

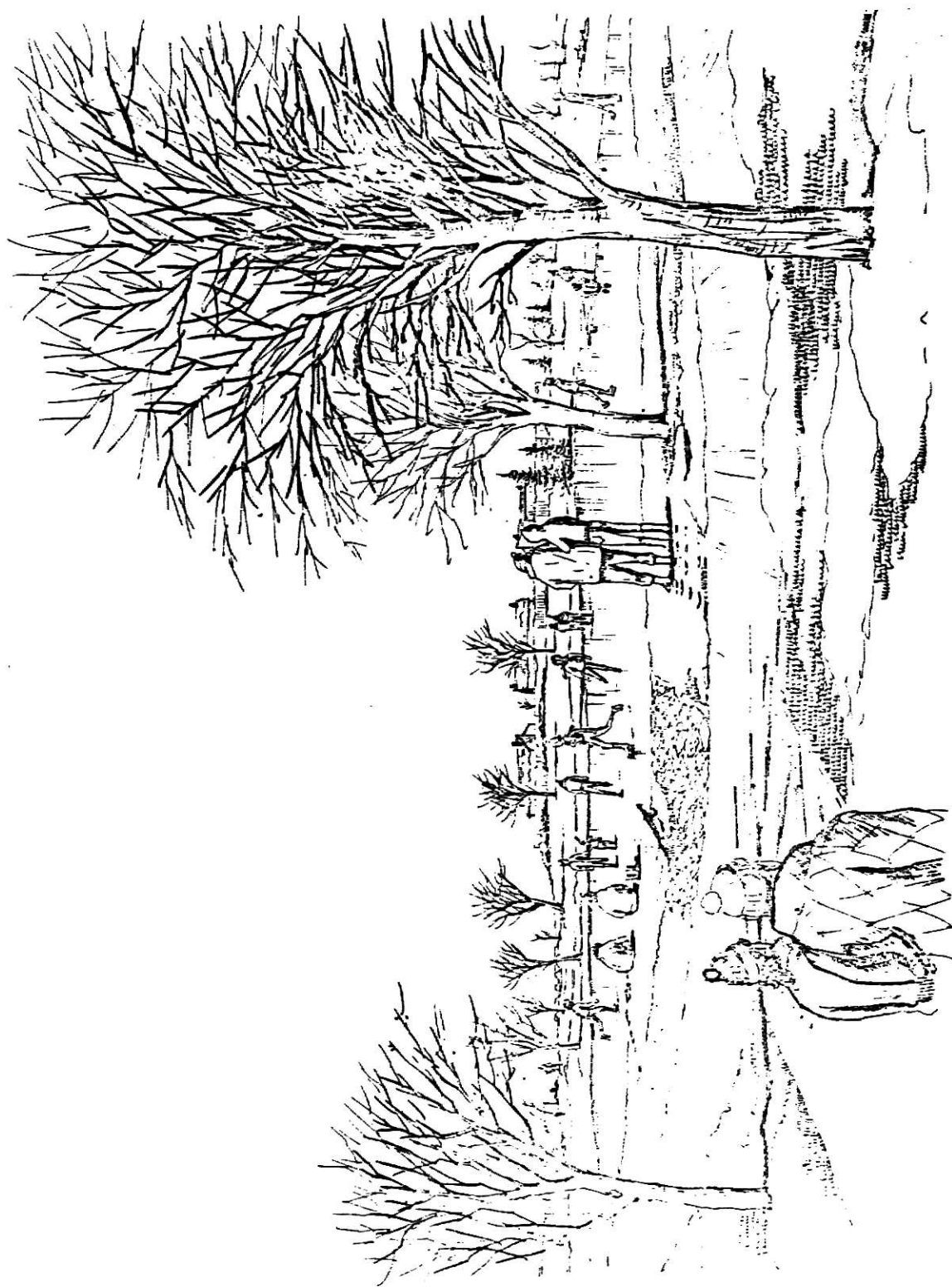
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STREET PROFILE

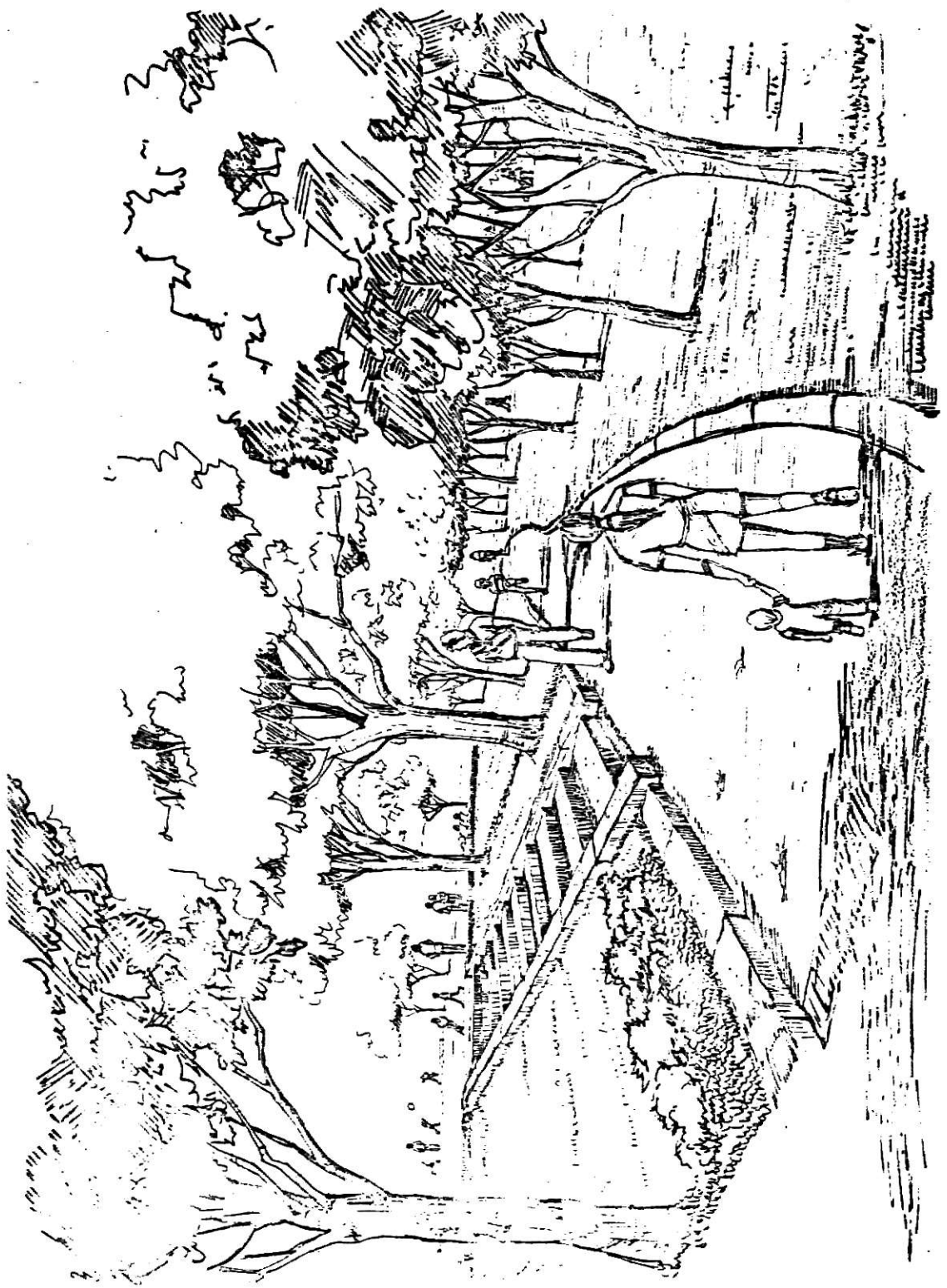
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ADVISORS: R. WEISBERGER
A. CHANG
R. PAGE
BY: BENNET LIU

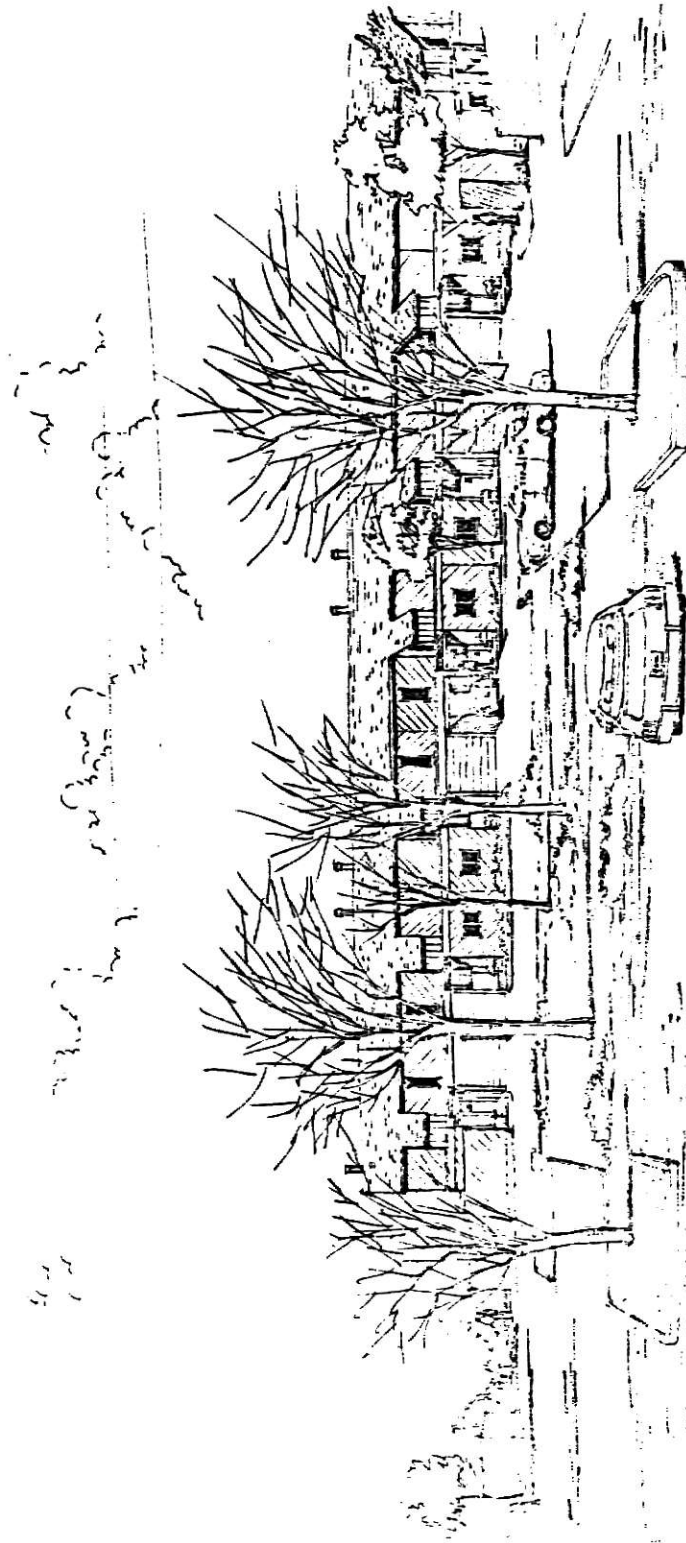
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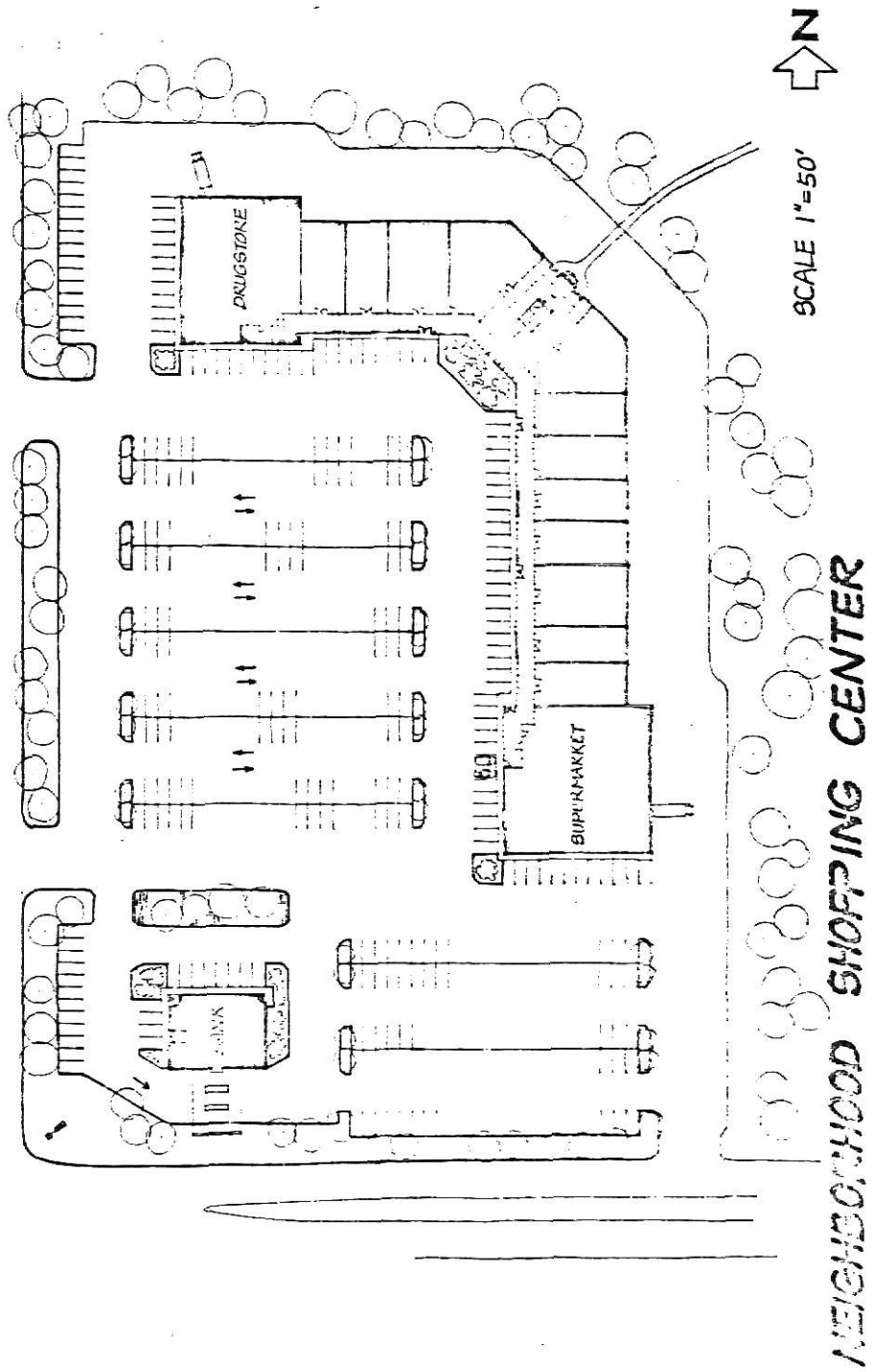








Arch



NEIGHBORHOOD SHOPPING CENTER

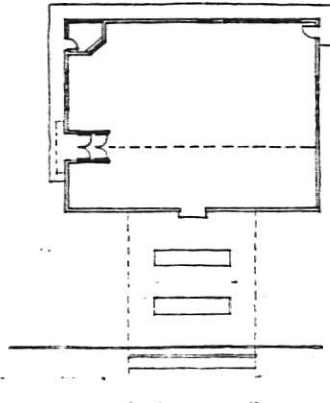
WEST ELEVATION 1" = 30'



TYPICAL CROSS SECTION



BANK FLOOR PLAN 1" = 20'

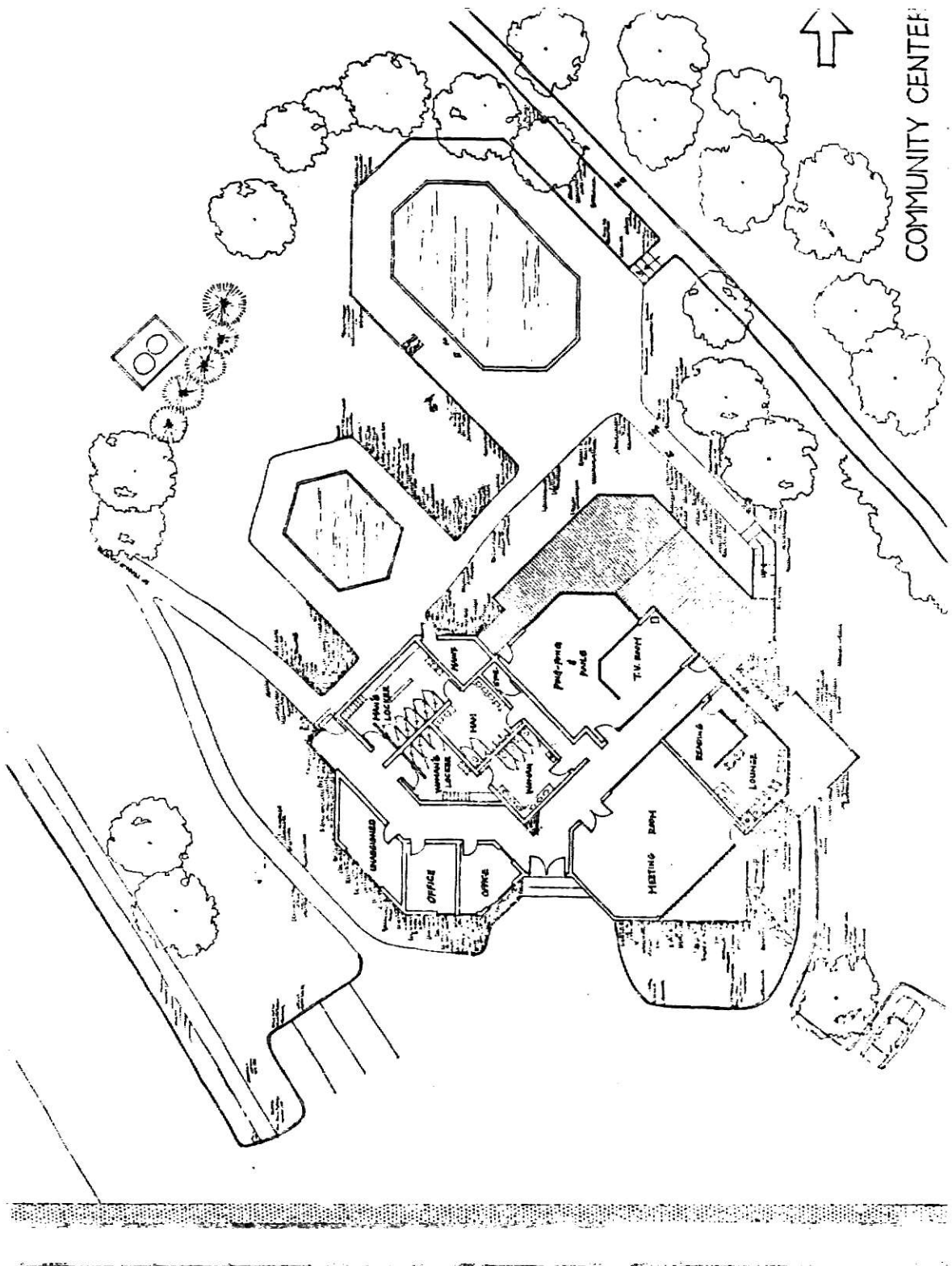


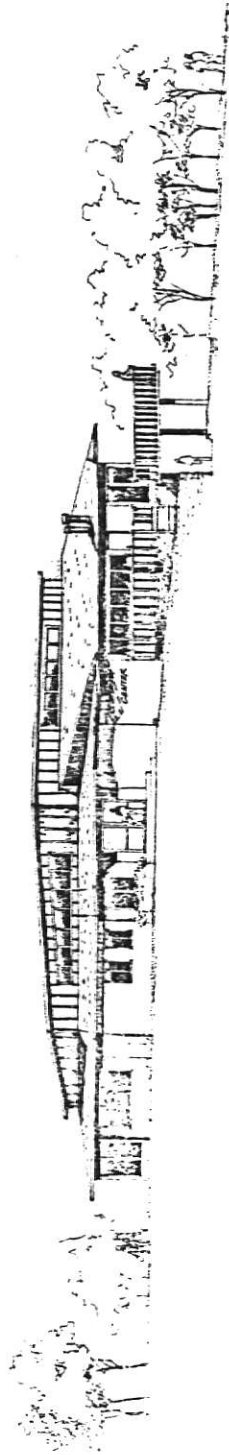
WEST ELEVATION

SOUTH ELEVATION

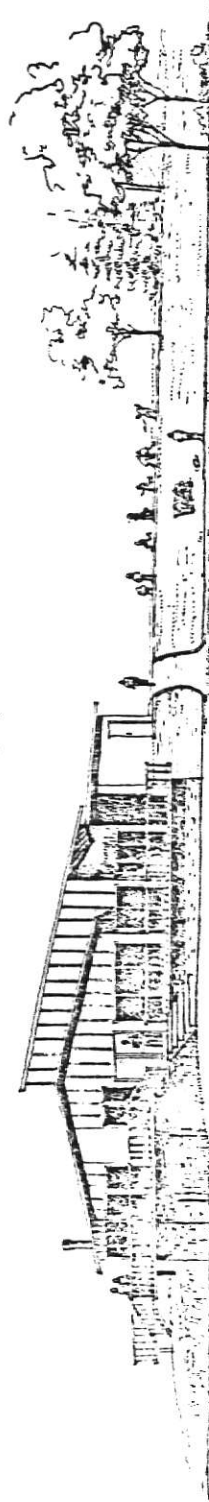
EAST ELEVATION



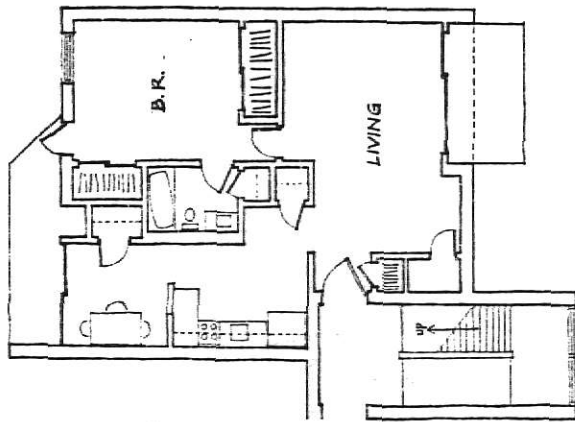




SOUTH ELEVATION SCALE 1"=10'

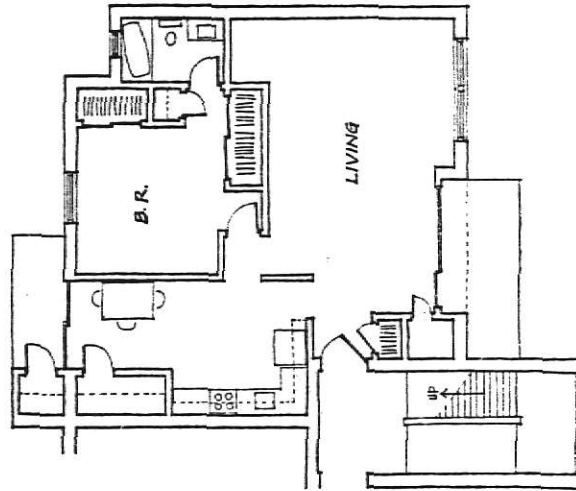


NORTH - EAST ELEVATION



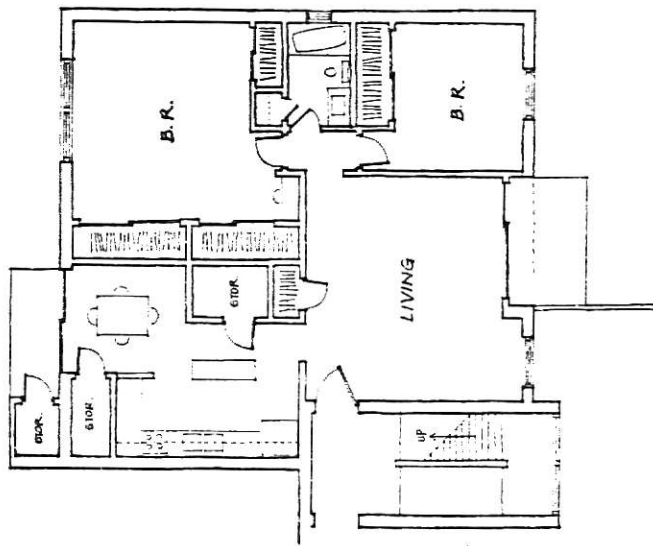
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SCALE 1"=5'-0"



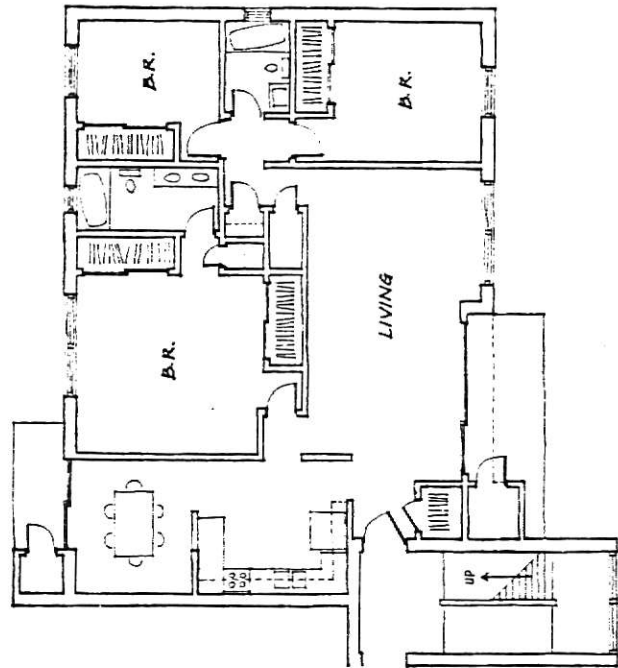
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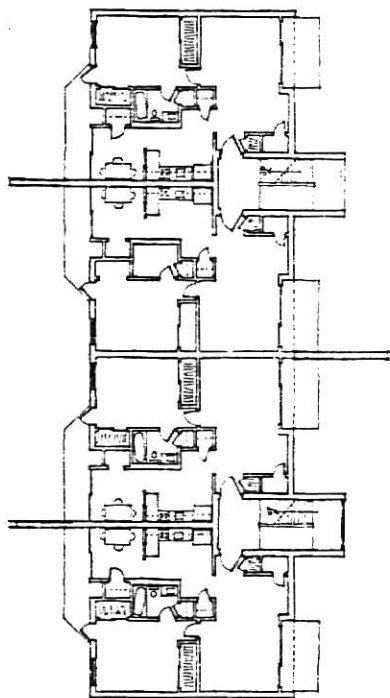
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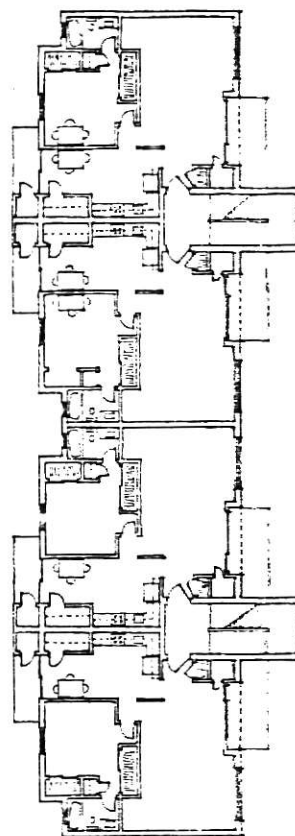
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3 BEDROOM UNIT
SCALE 1"=6'-0"

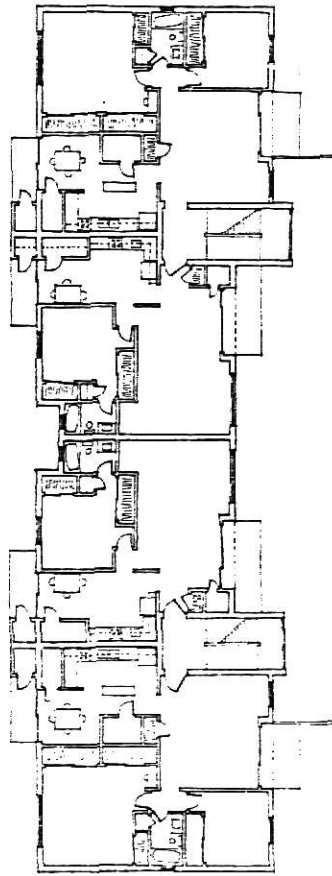




1 BEDROOM (A) COMPLEX
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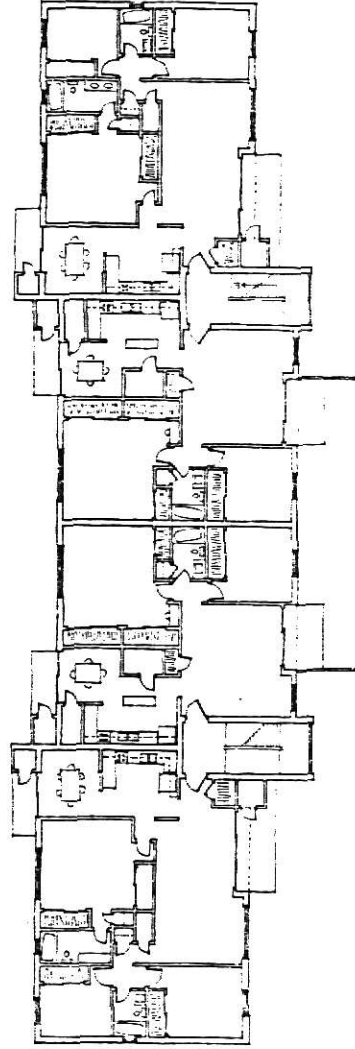


1 BEDROOM (B) COMPLEX
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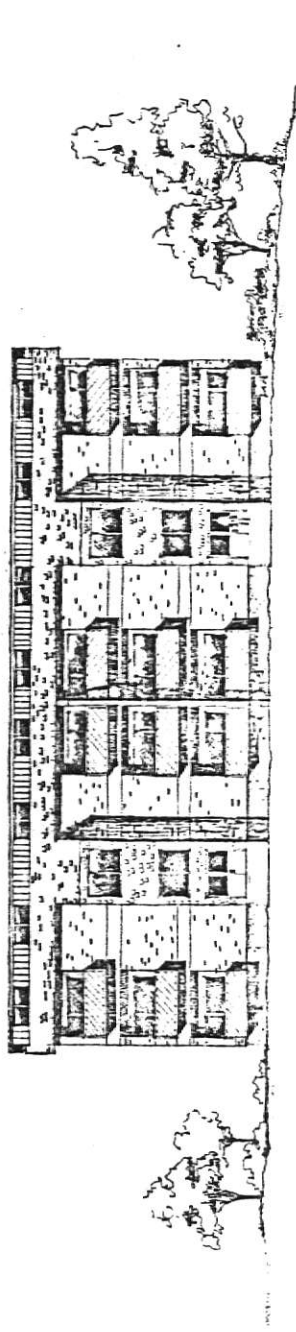
1 (B) & 2 BEDROOM COMPLEX

SCALE - 1"=10'-0"

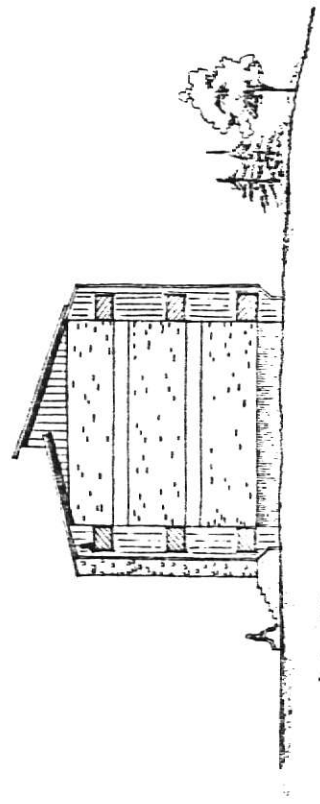


2 1 3 BEDROOM COMPLEX

SCALE - 1"=10'-0"

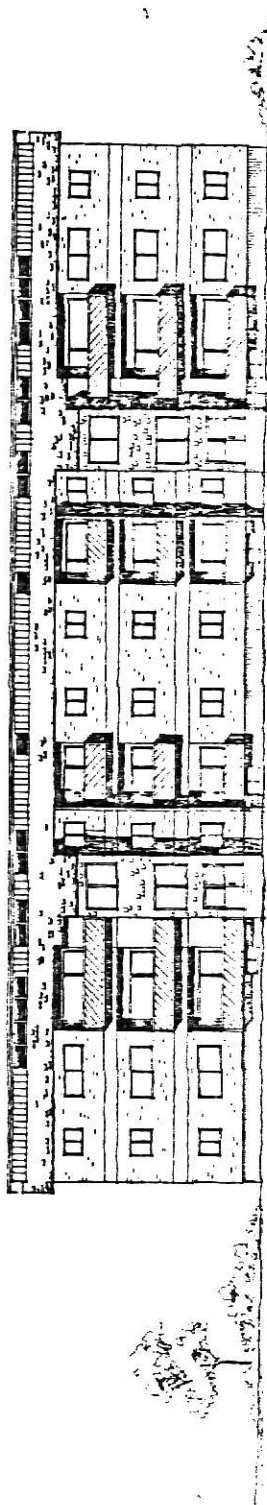


FRONT VIEW

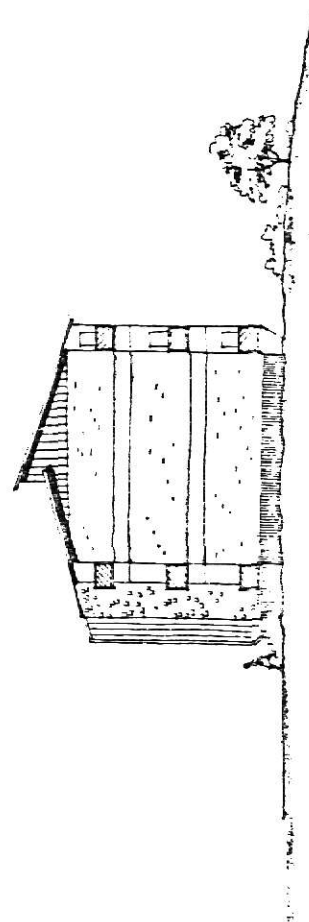


SIDE VIEW

1 BEDROOM APARTMENT

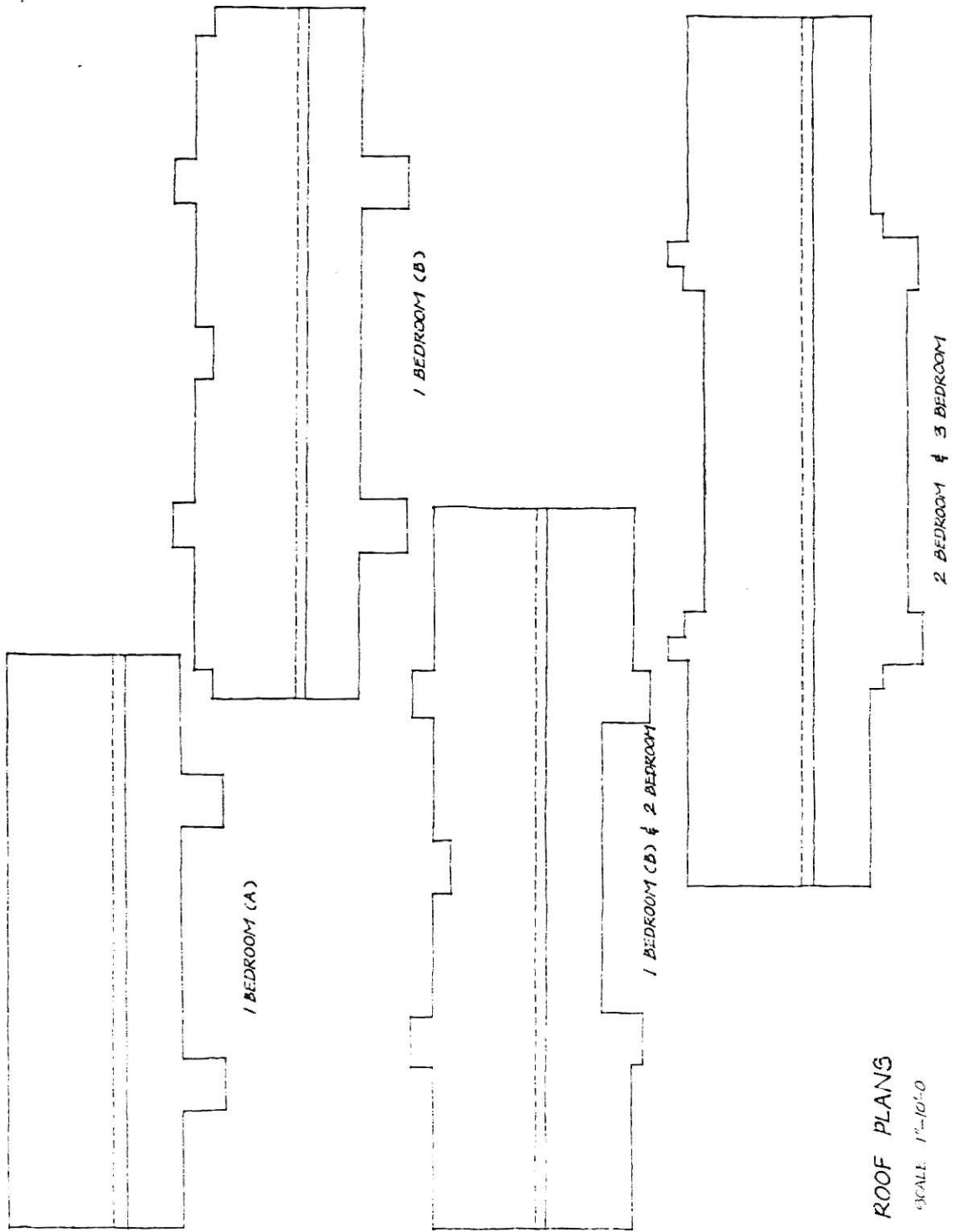


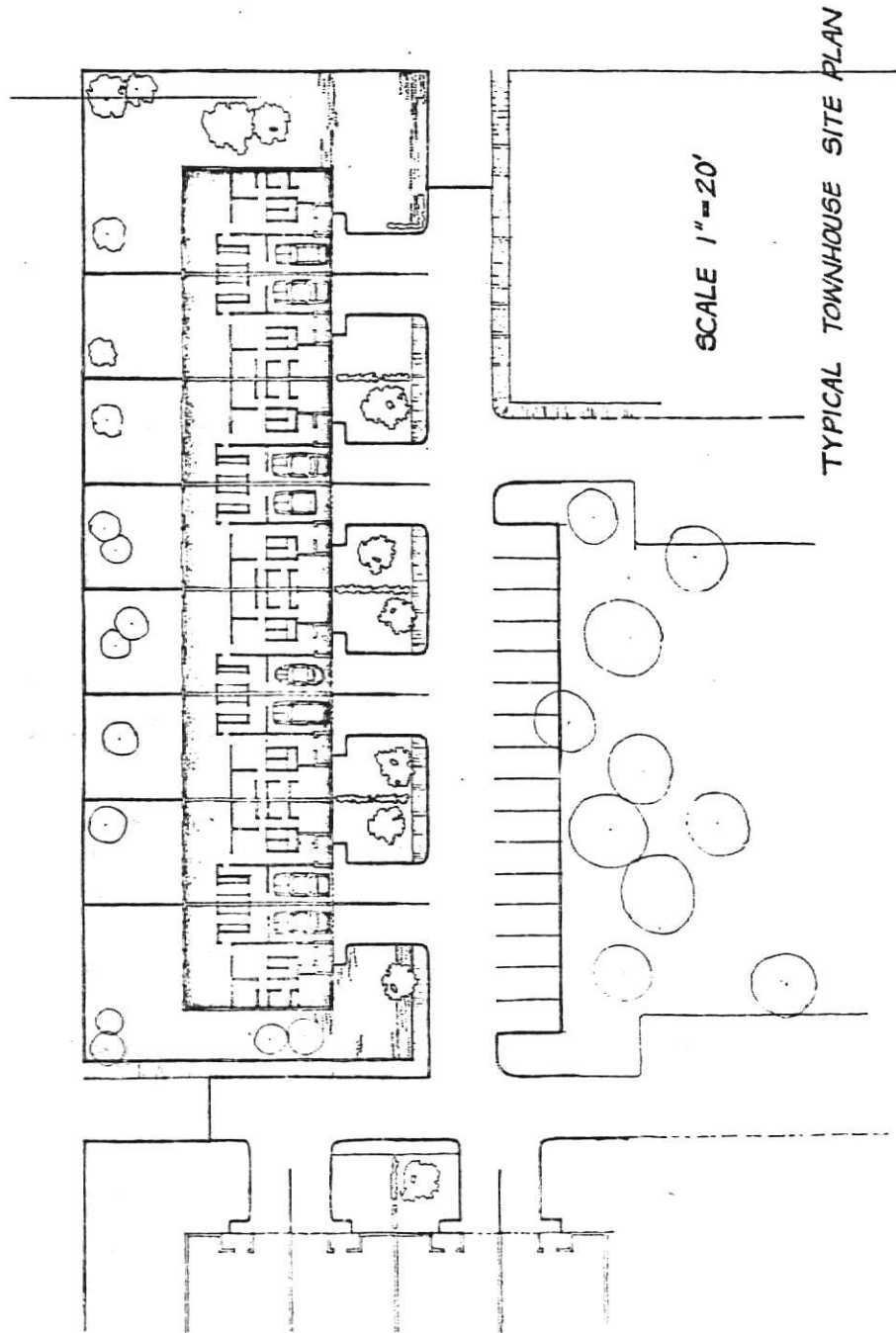
FRONT VIEW

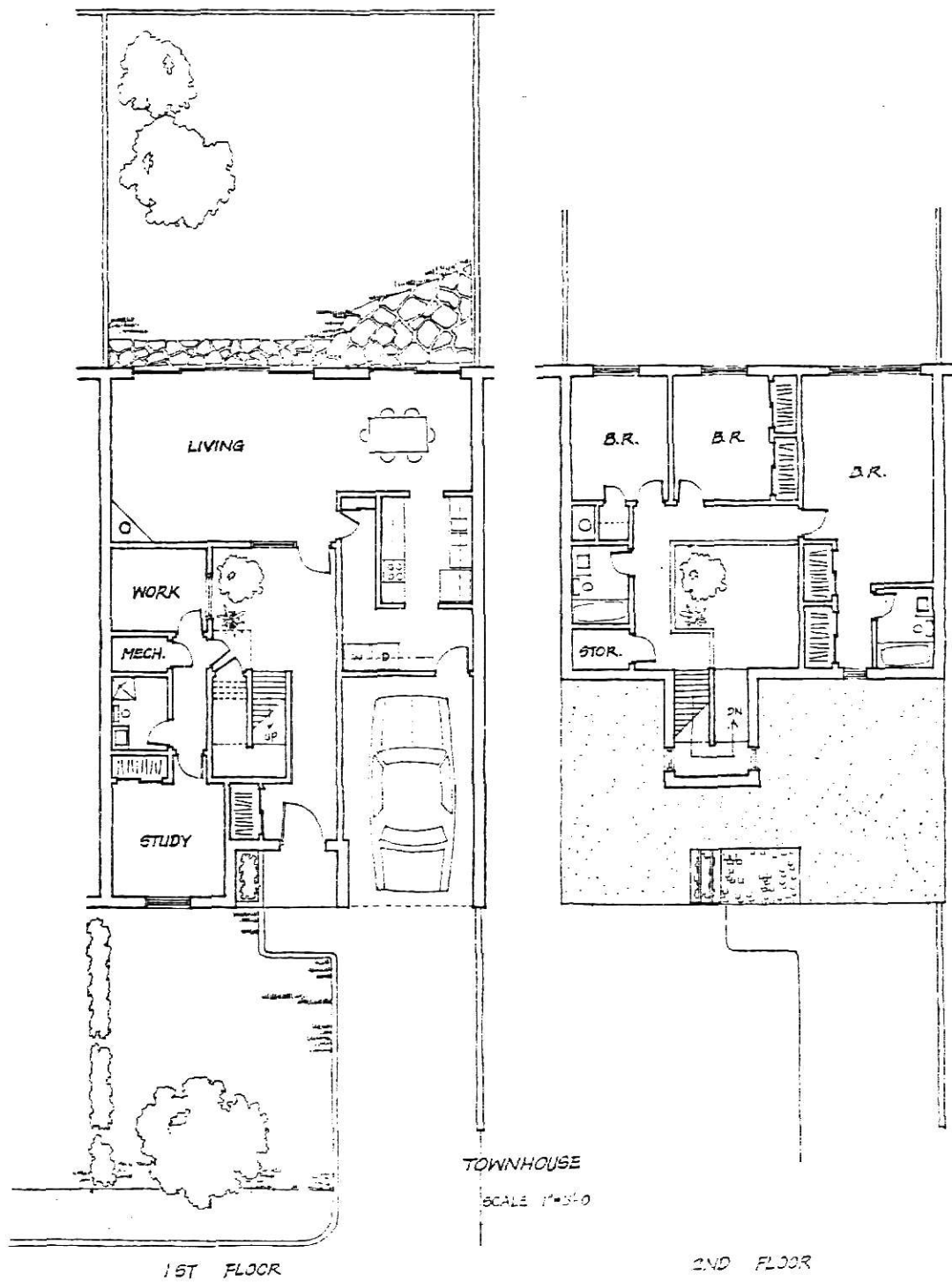


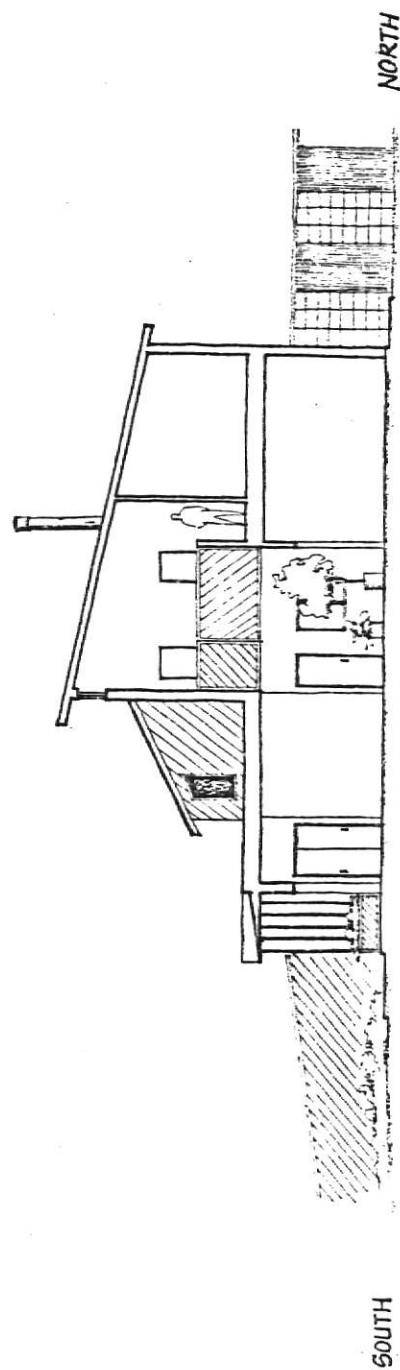
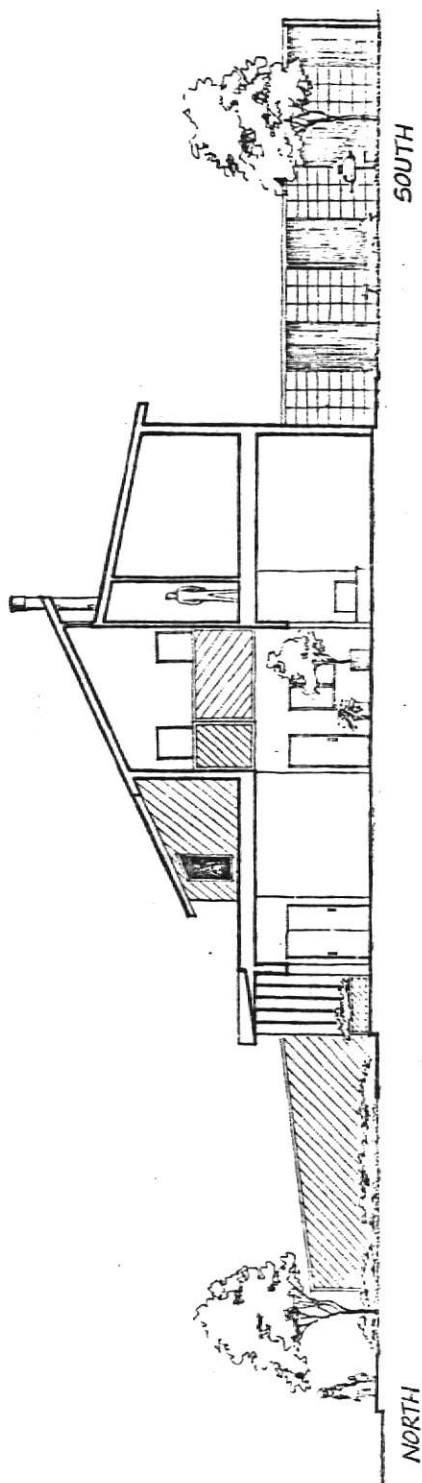
SIDE VIEW

2 & 3 BEDROOM APARTMENT



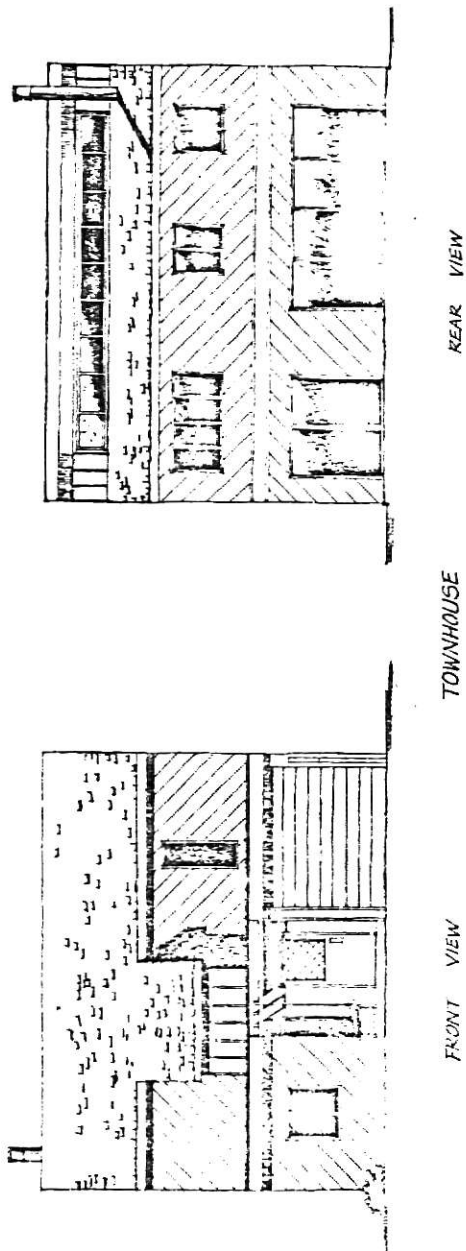


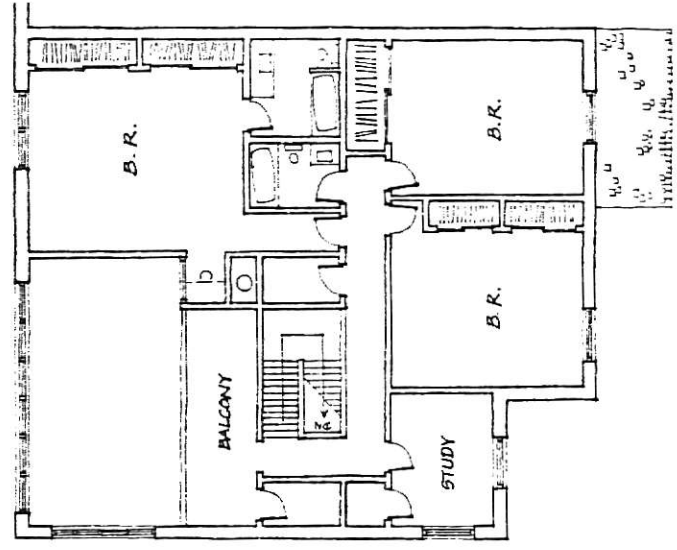
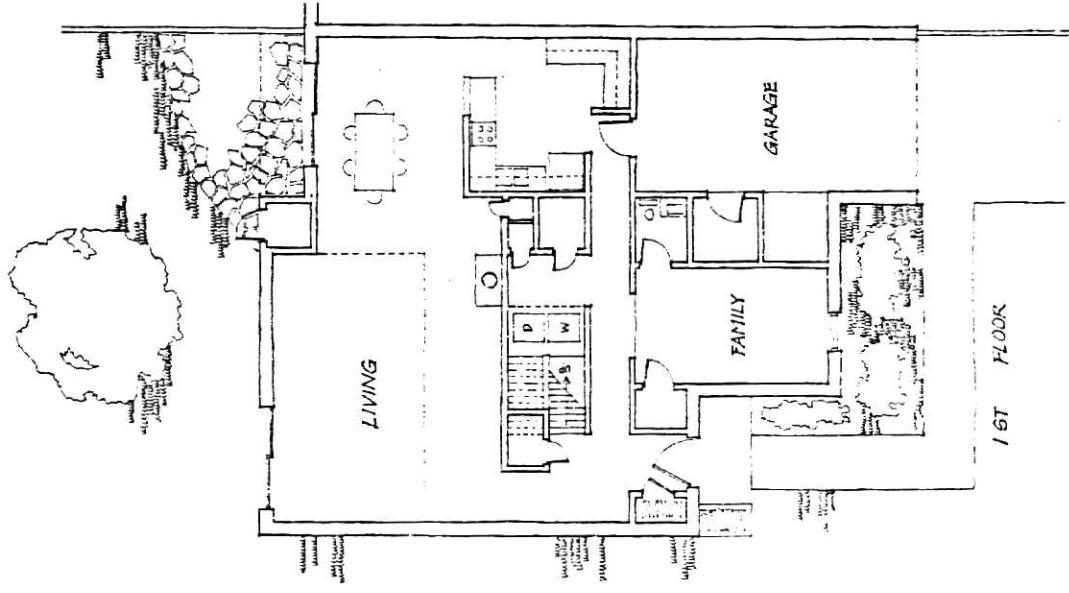




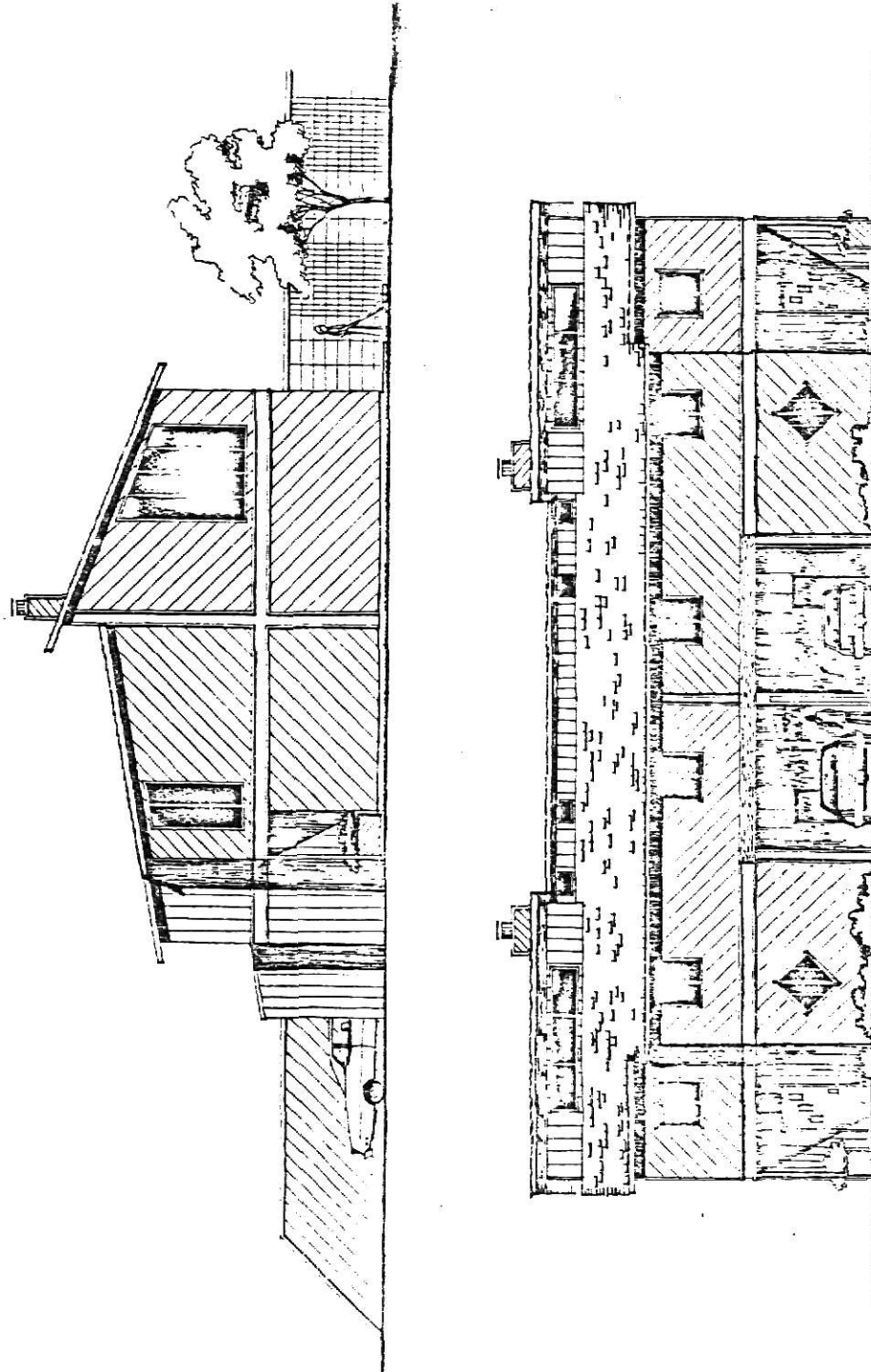
SCALE 1"=5'-0"

SECTION (TOWNHOUSE)

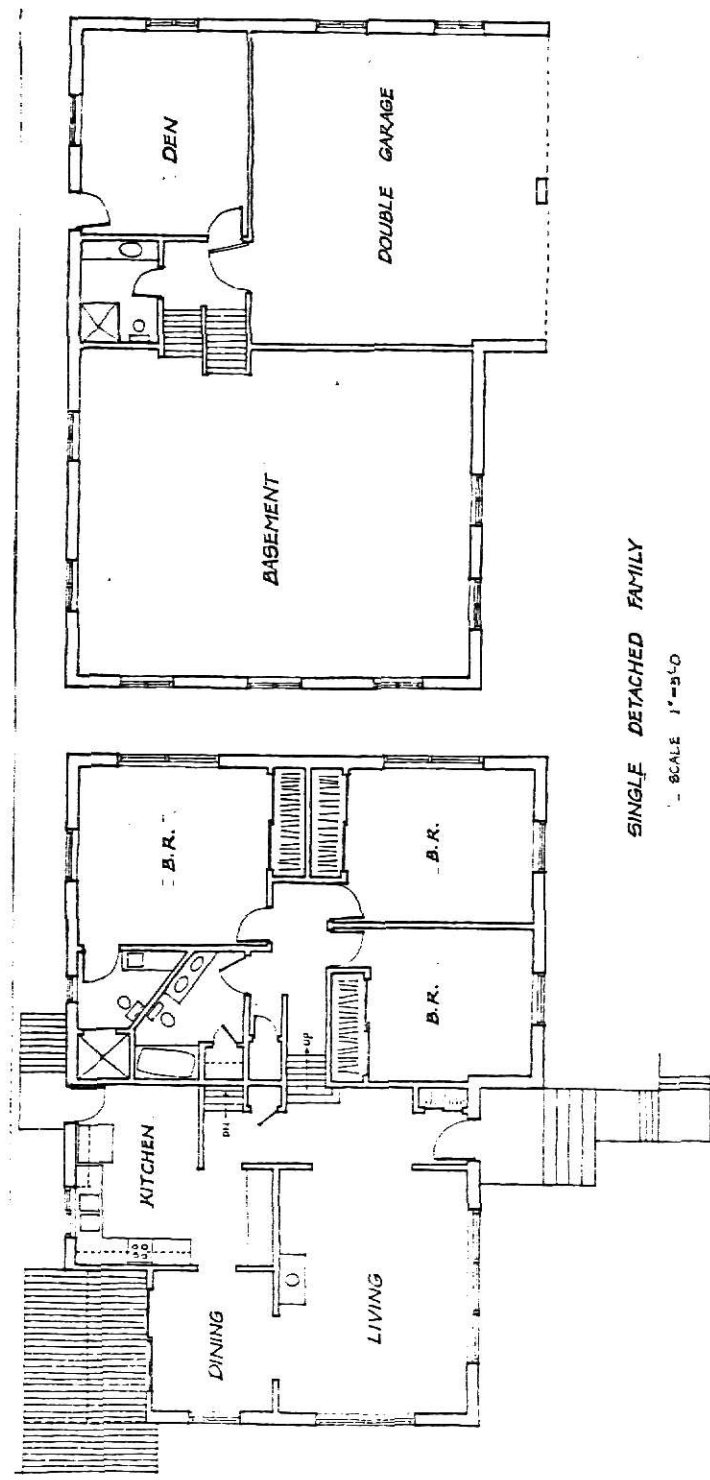




DUPLEX
SCALE 1"=8'-0"

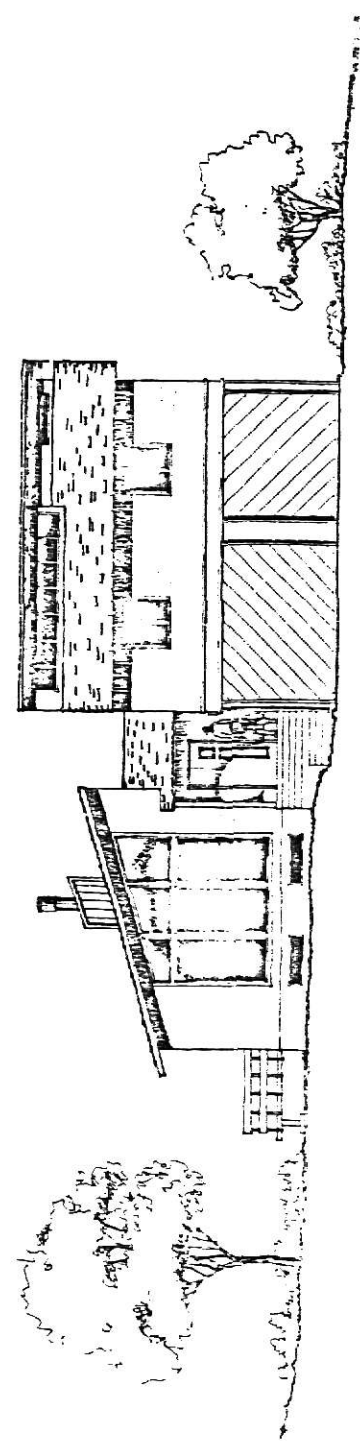


DUPLEX



SINGLE DETACHED FAMILY

SCALE 1"=5'-0"



VIII. BIBLIOGRAPHY

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AN OPEN SPACE COMMUNITY (PUD) DESIGN STUDY

by

Bennet Ting-yi Liu

B. Arch. , Kansas State University

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the
requirements for the degree

MASTER OF ARCHITECTURE

Department of Architecture

Kansas State University
Manhattan, Kansas

1980

ABSTRACT:

An open space community is an efficient solution to the present situation of land wasting in the suburban area or the fringe of cities. With planned unit development, utilization of land could be more efficient, pleasant environment could be achieved lot easier, than conventional land subdivision.

This thesis focuses on the design process of an open space community. The site, 132 acres, is located northwest of the city of Manhattan, Kansas. The total residential units (a mixture of single detached houses, townhouses, and apartments) are about 500. The process includes analysis and design of site layout, vehicular and pedestrian circulation, a recreation center, a small convenient shopping center, and the residential units on the site.