

PROTOTYPE DEVELOPMENT FOR LOW INCOME SETTLEMENTS, NAIROBI, KENYA

by

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Submitted in partial fulfillment of the requirements for the degree of

Master of Architecture in Advanced Studies

at the Massachusetts Institute of Technology

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Department of Architecture January 1974

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Nairobi, Kenya

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FOR LOW INCOME SETTLEMENTS  
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Kenya Police  
General Services Unit L.R. 9041  
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ABSTRACT

This is a study on land use in urban areas and focuses on the low income communities in Nairobi, Kenya.

It is based on proposals already made by the Nairobi City Council for the Eastern Extension Area, Nairobi, for development of low income communities and all the associated services.

In order to take advantage of a vast amount of existing information on the Eastern Extension Area, and very few physical development proposals, this study has attempted to give guide lines for land use through a prototype development proposal. This also takes into account the earlier proposal made by the Nairobi City Council to the World Bank.

By providing these guidelines one hopes to have more realistic, efficient and effective settlement designs for the low income communities. It will also provide a framework of discussion and evaluation for physical land utilization policies.

Thesis Supervisor: Horacio Caminos

Title: Professor of Architecture

## PREFACE

This study is part of the Eastern Extension Area, Nairobi, Kenya, started by the Nairobi City Council. The study area is located in the midst of a much larger area which is undergoing tremendous change in terms of housing and industrial development. It has a high population growth and is in the transition from agricultural to urban functions. The large well established African communities at Eastlands are expanding at a fast rate, and will soon be exerting a tremendous strain on the basic existing services. The sheer force of metropolitan expansion makes the Eastern Extension Area ripe for development.

The proposal also keeps in mind the recent proposals made by Nairobi City Council and the 'Urban Settlement Design in Developing Countries Program' at the M.I.T., to international funding agencies.

I am very grateful for the support, advice and guidance received from Professor Horacio Caminos during the period of my study in his program. I also thank the Urban Settlement Design in Developing Countries Program, School of Architecture and Planning, at M.I.T., for making available, a great deal of research already carried out by the program, as background information for this study. I would also like to acknowledge the personal assistance from Reinhard Goethert and members of the class.

My thanks are also due to Professor Hans Mammen, at the Royal Academy of Fine Arts, Copenhagen, and finally the financial support received from the Danish Agency for International Development is gratefully acknowledged.

Credits: 'The Urban Settlement Design in Developing Countries Program' for the use of research material. Praful Patel, George Gattoni and Tari Chana for the use of photographs and maps.

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# INTRODUCTION

This study concerns itself with the aspects of land use in urban development, and focuses specifically on the physical layout and land subdivision through prototype projects for low income settlements.

Nairobi with its accelerating urbanization and a high growth rate is fast accumulating all the ill effects of this fantastic growth given the lack of comprehensive long term policies in land utilization employment and housing.

The low income sector, which accounts for 70% of Nairobi's population is the most acutely affected. Official housing supply has not kept up with created demand, and this has resulted in large temporary, unserviced settlements. In 1971, one-third of the population was living in temporary unserviced settlements. Even after projected housing programs have been executed, there will still be a deficit of 23,000 units between 1972-1974. Added to this figure is the deficit of 38,000 units from 1962-1972. Making a total deficit of 60,000 by 1974.

The Eastern Extension is proposed to meet some of the housing needs and provide employment for the low income sector of population in Nairobi. The development will have to take into account not only the problems of shelter, but also related aspects of employment, finance, services and administration.

## The Aims Of The Study:

- To propose guidelines for more realistic, efficient and effective settlements for the low income group.
- To provide a framework of discussion and evaluation for physical land utilization policies.

## Intended Applications:

- An approach for reference in the field of land utilization.
- A set of guidelines for prototype residential developments for those involved in the planning of such developments.

Effective policies and goals are required for the efficient use of land if benefits for a maximum number of people at a minimum cost are to result. A physical layout is a useful initial determinant of efficiency in terms of cost and function of the development. A physical development proposal is therefore, the main determinant for subsequent commitment, in all phases of the process of 'housing'. Sound physical layout become a very critical factor in the low income sector of the population, where action has to be taken in the confines of very strict priorities and needs.

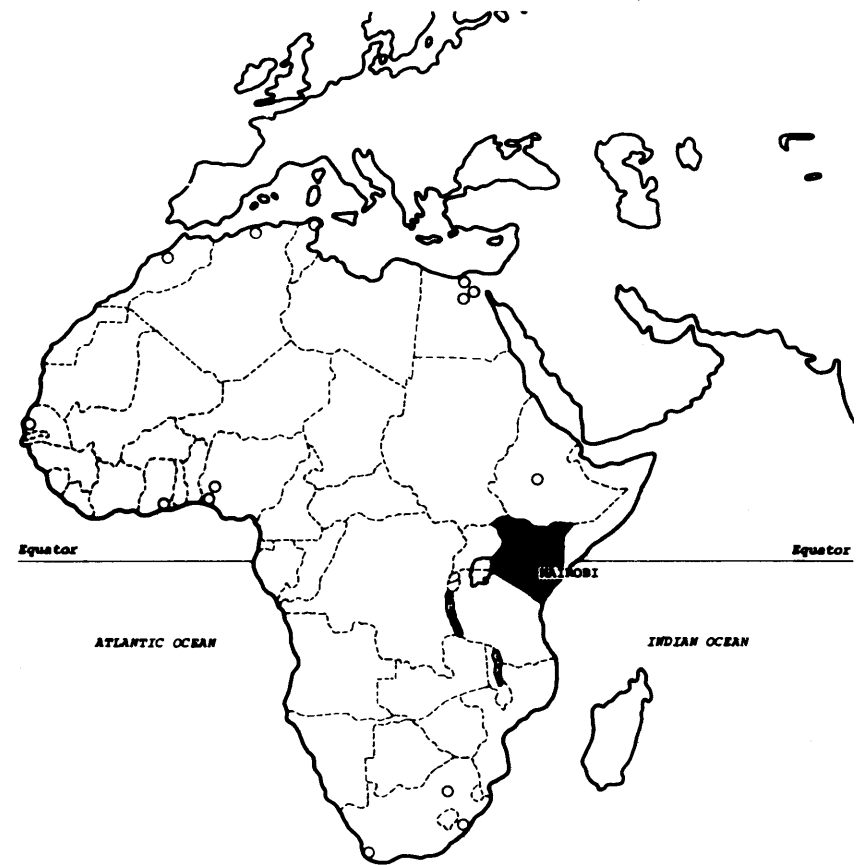
## KENYA CONTEXT

Prior to 1886, when the first attempt was made to define the Kenya boundaries, the east coast of Africa enjoyed a fair amount of contact with the outside world. Mombasa, at the coast had established it self as a major stopover point for routes into the interior and also to the Far East. The coast therefore had an early history of urbanization, unlike the interior which had no urban tradition. The coastal towns dated back to 700 AD, and were of Arab and Persian influence. This impact however, did not penetrate the interior.

The interior of Kenya was opened as a desire of the British to establish economic links with the Kingdom of Uganda, and the need for communication lines from the coast to Uganda.

**EVOLUTION OF THE INTERNATIONAL BOUNDRIES OF KENYA:**  
The first time an attempt was made to define Kenya,s boundaries was in 1886 when an Anglo-German agree-ment established the boundry that seperates the mainland portion of Tanzania from Kenya. In 1888 the British East Africa Company was formed to consolidate British interest in East Africa. In 1891, a further boundry was established with the signing of the Anglo-Italian Agreement, which recognised Italy's protectorate status over Ethiopia. Therefore the earliest boundry lines were demarcated keeping in mind the interests of the imperial powers.

The demarcation of the Western boundry is one of the most important in the evolution of the internal boundaries. The declaration by the British Government giving Kenya the status of Protectorate in 1895, and the defination of the boundaries of this protectorate in 1896, is the beginining of the boundry line of Western Kenya. This closely followed the Rift Valley North to South, indicating that it was strongly influenced by topographical details of Central Kenya.

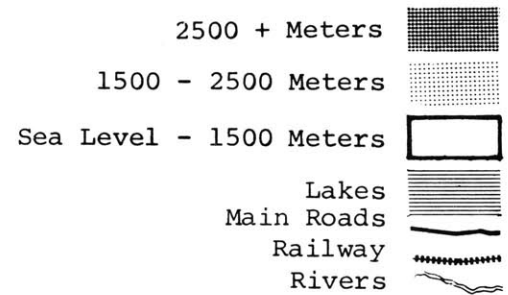
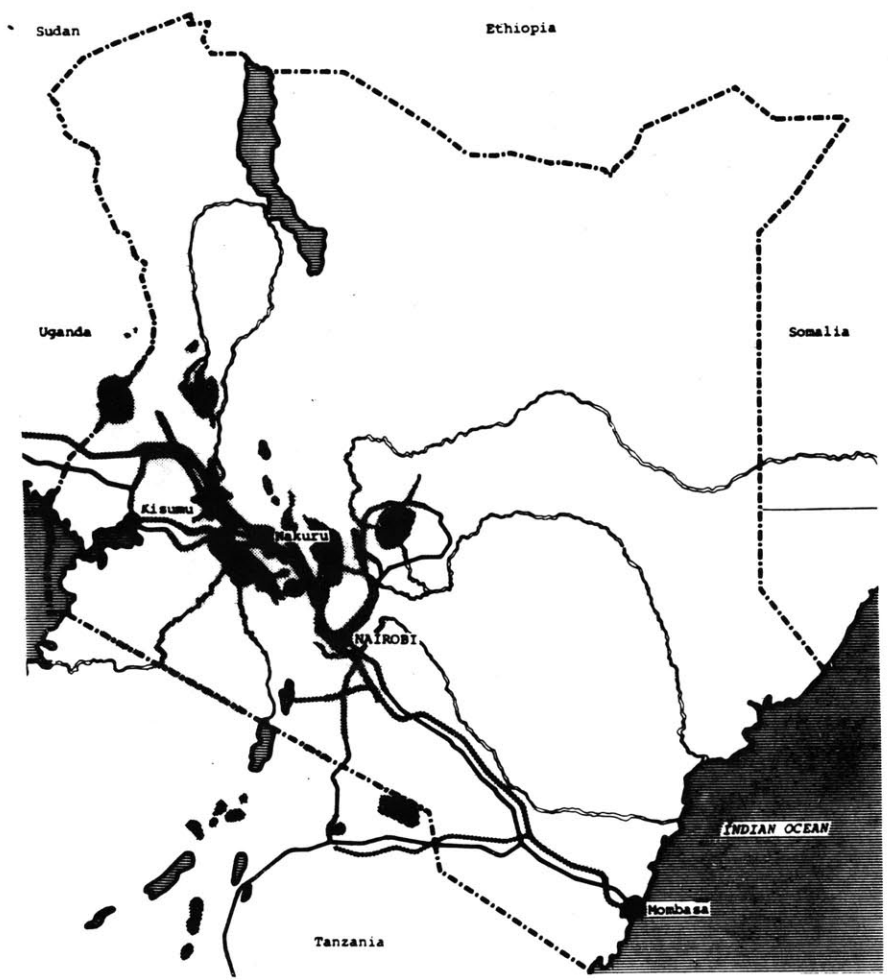


○  
Urban Centers Larger than Nairobi  
(Over half million population)

In 1902 this was extended to the Lake Victoria Basin, and right down to the fertile highlands of the Nakuru Naivasha area. In 1926 the areas west of Lake Rudolf were also included. Hence the international boundaries of Kenya were established on economic and strategic grounds. The railway from Mombasa, at the coast, to Kisumu, on the shores of Lake Victoria had now opened up the interior, and the organization of the interior boundaries required more than just strategic and economic approach

EVOLUTION OF THE INTERNAL BOUNDRIES:

The White Highlands, the heavily populated areas of Kenya were the first to be established. Subdivision of the interior of Kenya suggests the administrative convenience as the main consideration. In essence administrative boundries are just one aspect of spatial orgianization. Other important factors such as the ethnic homogeneity, economic orgainization, or political consideration could also be looked into. Since the British were mainly interested in the economy, they therefore only administered the parts that were economically important from their point of view. There was more emphasis therefore, on the newly settled White Highlands and the urban centers than the heavily populated african districts. Thus began the policy of seperate development or a dual approach which is to a large extent, responsible for the imbalances between the various areas of Kenya. It was however, not until 1962, that the importance of the diversity of the population, was felt to be an important element in the demarcation of the internal boundries. The constitutional conference in London set up a Boundries Commission which attempted to organize the physical and human resources of Kenya to meet its specific needs. It was at this time that Nairobi was given the status of Nairobi Area, a special area in the Central Province.





### URBANIZATION IN KENYA:

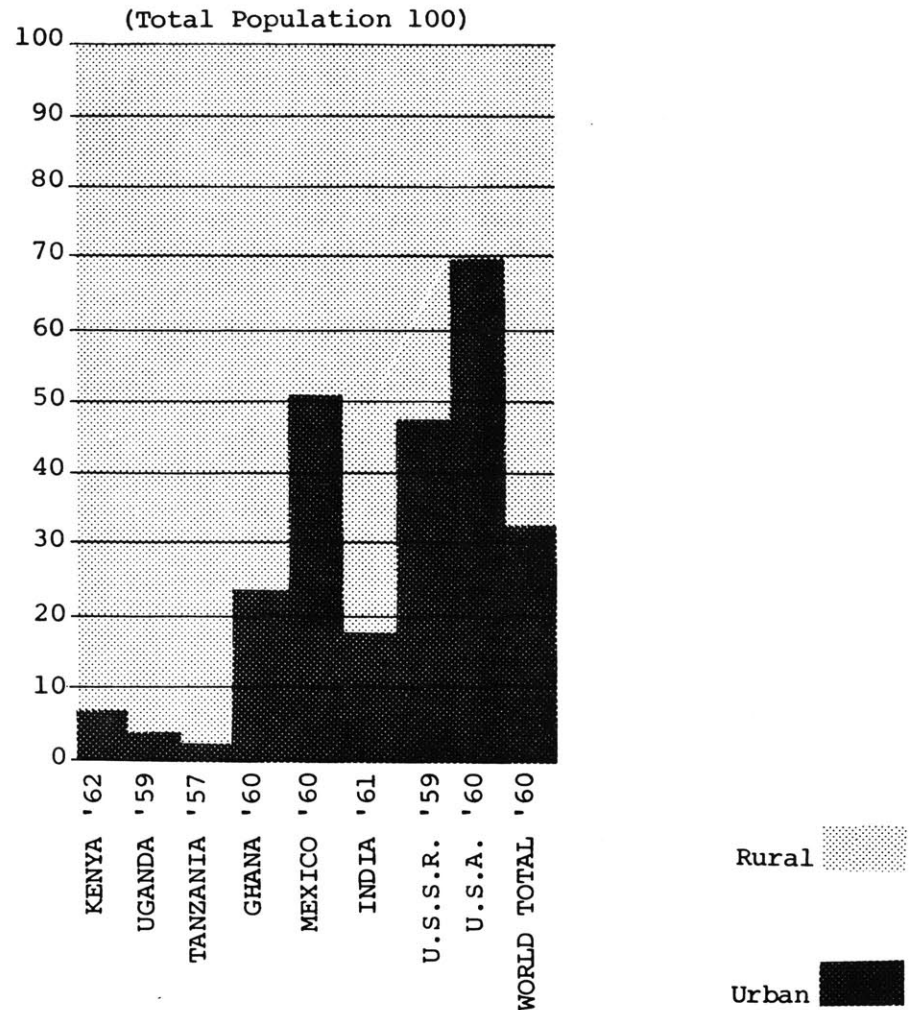
Apart from the coastal settlements, the urban centres in Kenya are a creation of European settlement and a result of the evolution of Kenya's administration. Most of these centres were established along routes into the interior. The urban centers are not only European in character, but were up until independence, very European and foreign in population composition. This was because of the restrictive policies, which not only kept the african from the urban centers, but also effectively, reduced non-african activities and resticted the attraction of the rural population. Most of Kenya s population is concentrated in an hour glass shape region with high population concentrations on the North West and South East belt. This shape also overlaps with the rainfall expectancy in this heavily populated area. Most of the area recieves an average of 20 inches of rain per year. Out of this the most important urban centers fall in the areas which were previously White Highlands or the scheduled areas.

Population within these broad divisions is concentrated in a few urban centres. Kisumu, on the Lake had in 1962 73.5 % of the total urban population of the region. Nairobi had 63 % of the highland region. Nakuru 9 %, Eldoret 4.6 %, Thika 3.2 % . Mombasa, at the coast had 92.9 % of the urban population.

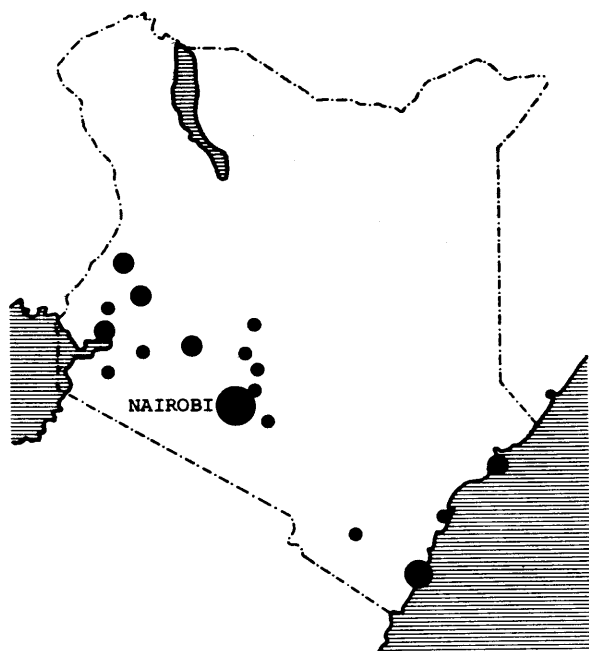
Despite the restrictive policies urban population shows a marked increase. Comparing 1948 Census figures to the 1962 figures, there was a rise of 135% in the urban areas or an annual growth rate of 6.3%. About 90% of all urban population is along rail served areas.

Volume of movement is still very small in comparison with the total population of Kenya. In 1962, only 7.8% of Kenya's total population was living in urban centers. The importance however, of the African migration is reflected in the fact that during 1948

and in 1962, the urban African population increased by 174% mostly in Nairobi and Mombasa. Nairobi clearly shows its impact as the main attraction center. Causes which have led to this are both natural and man made. The island of European settlement created a gap between these settlements and the rest of the rural areas. This set the pace for the mobility of the population between these areas.



## GROWTH OF URBAN CENTERS IN KENYA 1948-1969



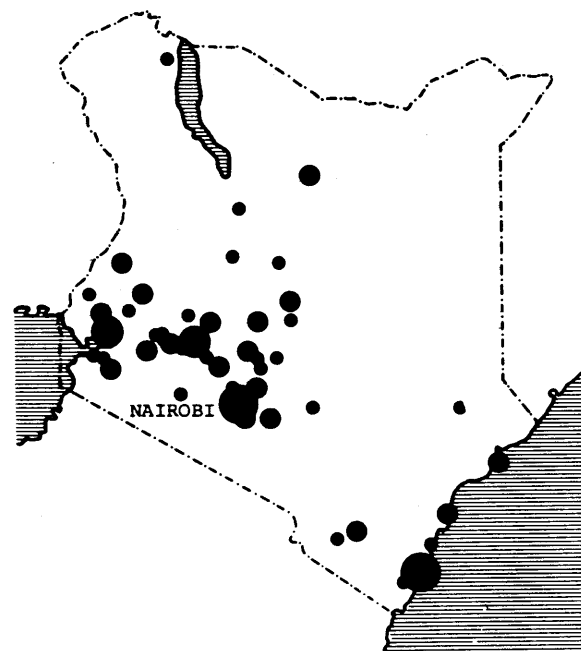
## 1948 Census

Urban Population:	276,240	5.1%
Rural Population:	5,129,786	94.9%
Total Population:	5,405,926	100.0%

Nairobi: 118,976 2.2%

Number of Urban Centers with over 2000 inhabitants: 17

## GROWTH OF URBAN CENTERS IN KENYA 1948-1969



## 1969 Census

Urban Population:	1,082,437	9.9%
Rural Population:	9,860,268	90.1%
Total Population:	10,942,705	100.0%

Nairobi: 509,286 4.9%

Number of Urban Centers with over 2000 inhabitants: 48

#### TRANSPORT RESOURCES DEVELOPMENT:

It is essential to understand this as the basis of the network of the country and the economic activity this has generated. It has also contributed to the mobility of the population. The railway and its development is an important factor in the movement of population. Since Kenya as a country (physically) is a result, largely of the after effects of the completion of the railway from Mombasa to Kisumu; Its implementation created work opportunities in the development of industrial centers and the creation of urban centers. In the 1962 Census 89.9 % of urban population was in towns served or developed by the railways. The main aim of the railway of course, was to link the coast to the Kingdom of Uganda and to consolidate British Imperial ambitions in the area. But as it happened, it developed the areas through which it passed. People of these areas therefore enjoyed greater mobility.

#### COLONIAL LAND CLASSIFICATION:

The pattern of land classification in the rural areas was as follows;

- a) The leasehold and the occasionally freehold land held by Europeans and Asians.
- b) The White Highlands or the scheduled areas.
- c) The African rural population in peasant holdings.

This division created the consequent gap in the economic opportunities between the two and the African lands provided the reason and basis for the movement of population. Before 1901, little division of land had taken place. The railway link complete, the desire to generate revenue stimulated the move to offer land to European and South African settlers. Freehold leases of 99 years and later of 999 years were offered. The White Highlands were therefore firmly set, as well as the base for economic inequality in Kenya.

Besides the movement being generated by the pull factor, there is also the movement generated by the areas themselves. These areas are heavily populated with subsistence farming as the only means of survival. People are pushed out of these areas. This also suggests that natural factors are important in the mobility of the population. Areas where available land cannot maintain an adequate standard of living, or even support improved living conditions. In parts of Western Kenya, more than 60% of the land is devoted to growing crops. In North Nyanza land fragmentation has reached an advanced stage due to over population. The carrying capacity of land thus becomes a critical element in the process of migration. The problem of man to land ratio is therefore important

Planning becomes a problem when we do not know who leaves the rural areas and at what age. Population movement in Kenya is highly selective of age and sex. Generally between the ages of 15 - 39, indicating a large number of people in their productive years. At the receiving end the selective impact of migration is demonstrated by the age-sex pyramid, and also shows the overwhelming masculine character of the migrating population.

Whatever the population composition, the change in numbers, be it at the receiving end or the supplying end, becomes an important planning element. The most important problem is to curb to channel the effect of migration, with careful longterm plans in the already congested areas. At the receiving end HOUSING becomes a major problem. And also to what an extent is the new comer integrated in the social, economical and physical terms.

The population of Kenya is increasing rapidly and urbanization, though at the moment, affecting a small part of the population, is posing many critical problems. In the City of Nairobi the increase is between 3-5 times faster than that of the total

population in the country. The rate of increase poses the major problem. therefore the main supply areas in Kenya of migrating population become problem areas from a development point of view.

Because the towns of Kenya can only provide a limited number of additional jobs, the migration only leads to the worsening of the conditions in the urban areas in the face of a lack of planning. In the field of new industrial development, the economic challenge posed by migration calls for an industrial location policy that does not merely depend on the advantages of the existing infrastructure.

Housing implications due to migration are but one aspect of the multiple social problems which affect education, health, job oppurtunities, transport networks, and other services. It is specifically in these respects that the urban areas are superior to the rural areas. Lack of these services, on the other hand, are the major causes of movement from the rural to the urban areas. In Nairobi alone housing shortfall is 7500 units per year. Unauthorised units have grown to 60,000 over the last ten years. The official housing provision is very slow and available at costs which the low income people cannot afford.

# NAIROBI METROPOLITAN AREA

Nairobi is situated at the South Eastern end of the agricultural heartland of East Africa. The immediate environment consists of the productive highland areas and the Athi Plains. It enjoys the advantage of four major land routes

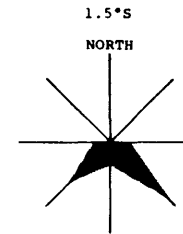
The capital of Kenya, and the largest city in Central Africa. Located 80 Km south of the Equator, at Latitude 1 1/2 degree south and longitude 37 degrees East it has two rainy seasons, one from March to May and the other from October to December.

low humidity and combined with the high altitude results in a very temperate climate. It has high sunshine and the prevailing winds are from the south.

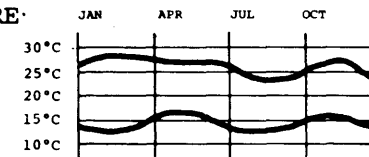
Developed on a model of separate developments, zones and areas in the city were scheduled to be developed as those only for the Europeans, Asians and Africans respectively. These breakdowns clearly defined the city center in the middle, with a rail served industrial area to the south of the railway station. Although the racial divisions no longer exist, but they have now been replaced by income groups. The high, medium and low incomes settling in the former European, Asian and African areas respectively.

Nairobi started as a railway encampment in 1899 and has grown into a major commercial, administrative and communications center. It is also the center of major industrial development. It has a per capita income of 5,000 K.Shs. as compared to 680 K.Shs. at the coast, and 160 K.Shs. at Kisumu. The average per capita income for the country is 1,000 K.Shs.

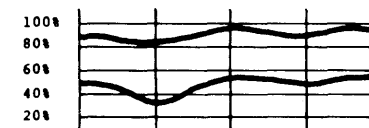
WIND



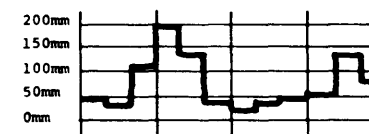
TEMPERATURE



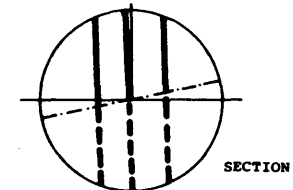
HUMIDITY



RAIN

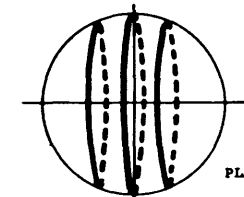


SUNSHINE



SECTION

SUN

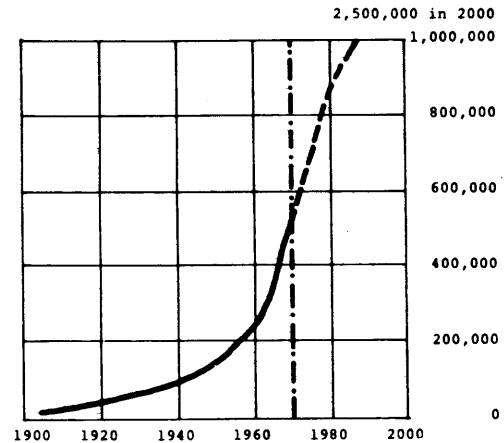


PLAN

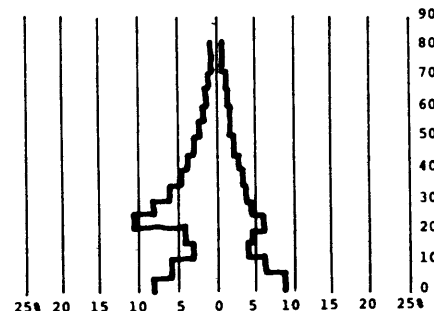
The present population of Nairobi is 580,000 with a growth rate of 5.5% per annum. The population is expected to reach 2.9 million by the year 2,000. 60% of the population is male, of which 30% are in the 15-50 years age bracket. 20% are females, again between the ages of 15-50.

75% of the households have an annual income of less than 9,000 K.Shs. 17% of the households have an annual income below 2,400 K.Shs. These figures are based on the average income per month of the head of the household.

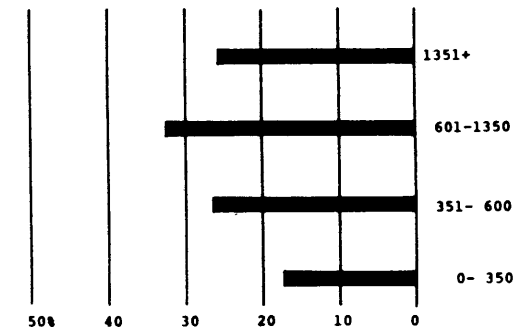
70% of the households cannot afford housing costing over 12,000 K.Shs. or rent of more than 100 K.Shs. per month. On the lowest end, that is people who earn less than 2,400 K.Shs. per annum, they cannot afford a house costing more than 600 K.Shs or rent of more than 50 K.Shs per month.



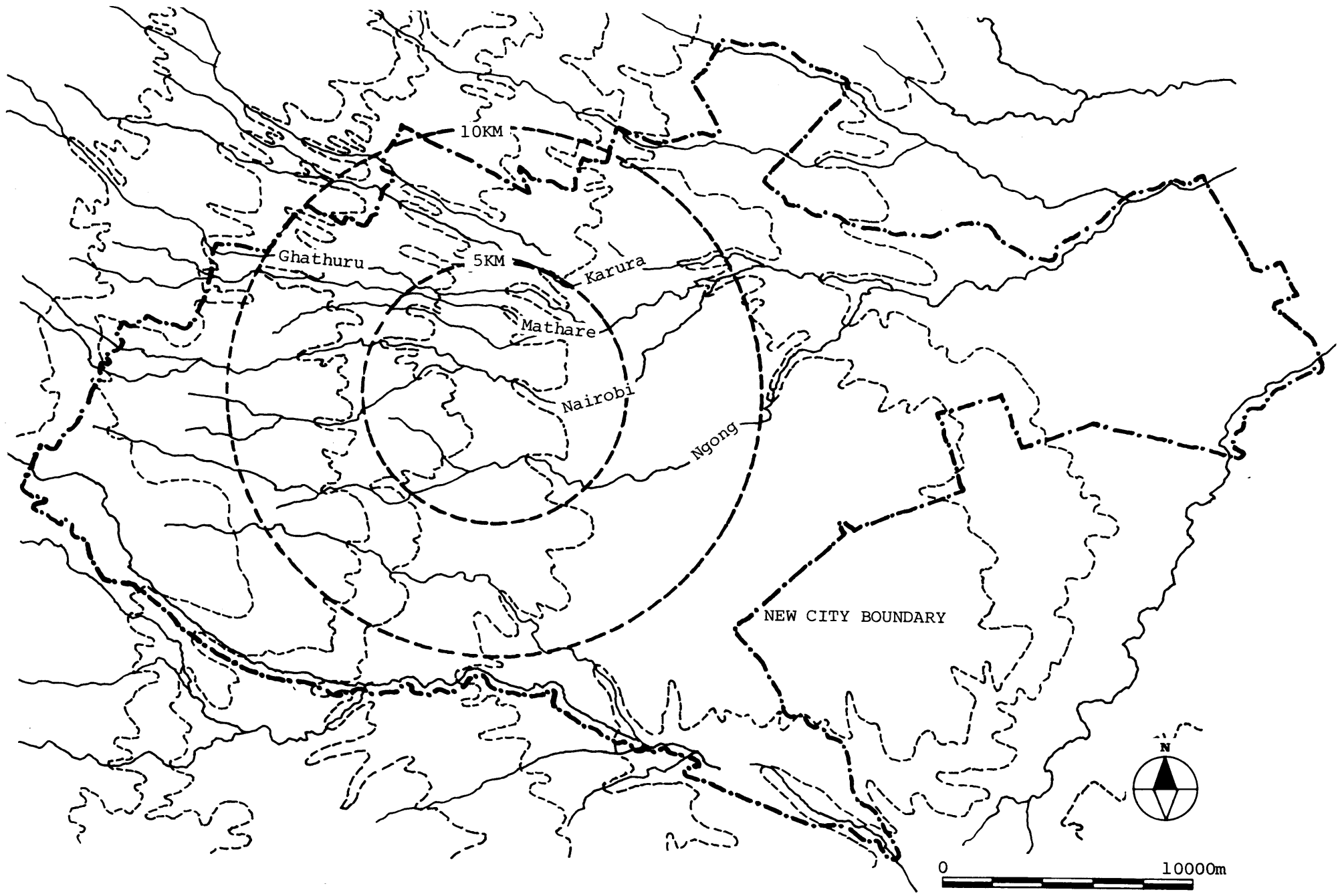
**URBAN POPULATION GROWTH**  
horizontal: dates; vertical: population



**URBAN POPULATION DISTRIBUTION**  
Census, 1969; population, 509,000  
males: M. 303,000; females: F. 206,000  
horizontal: percentages; vertical: ages



**URBAN ANNUAL INCOME**  
Approximate 1969; population, 509,000  
horizontal: percentages; vertical: dollars

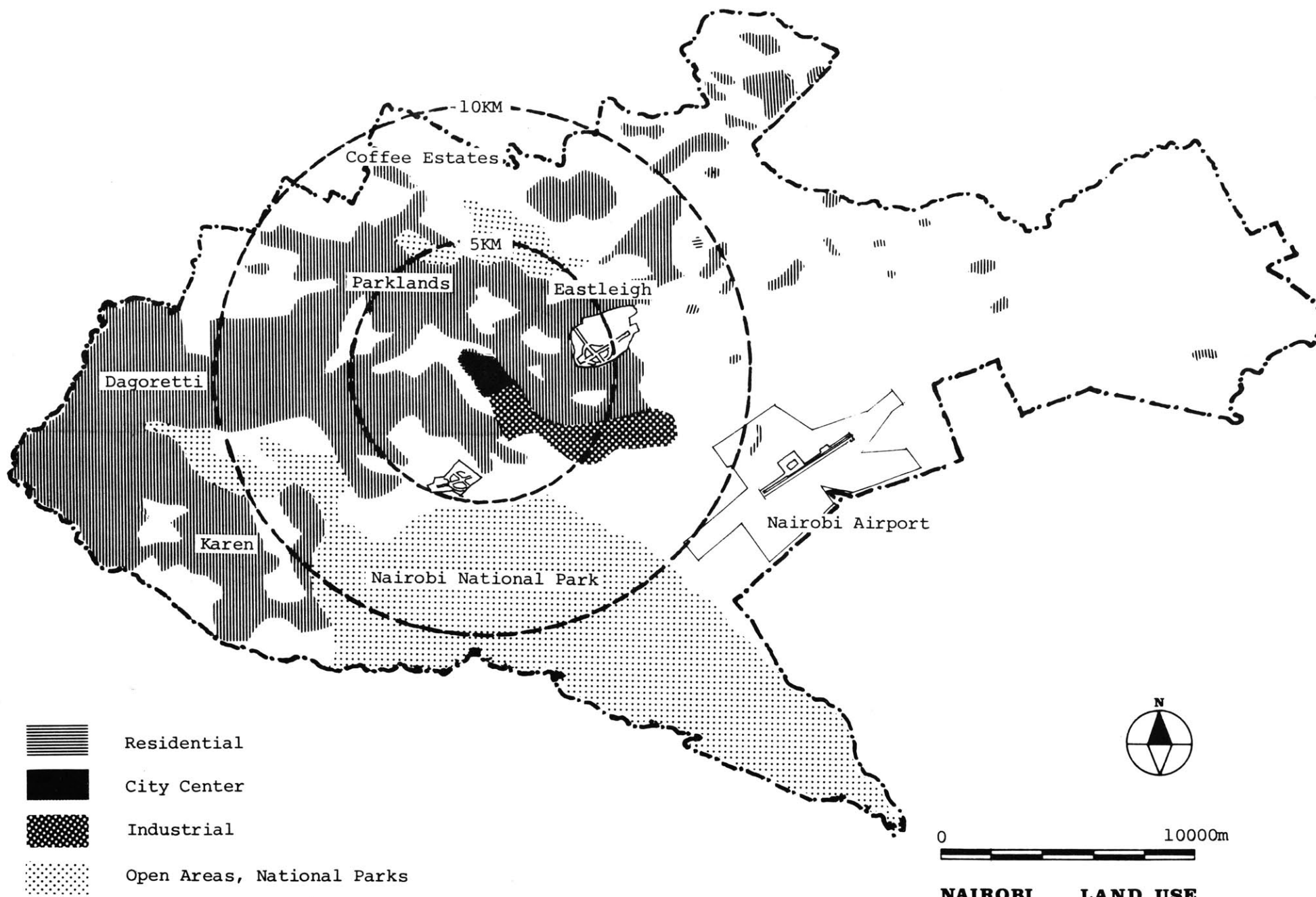


**NAIROBI TOPOGRAPHY**

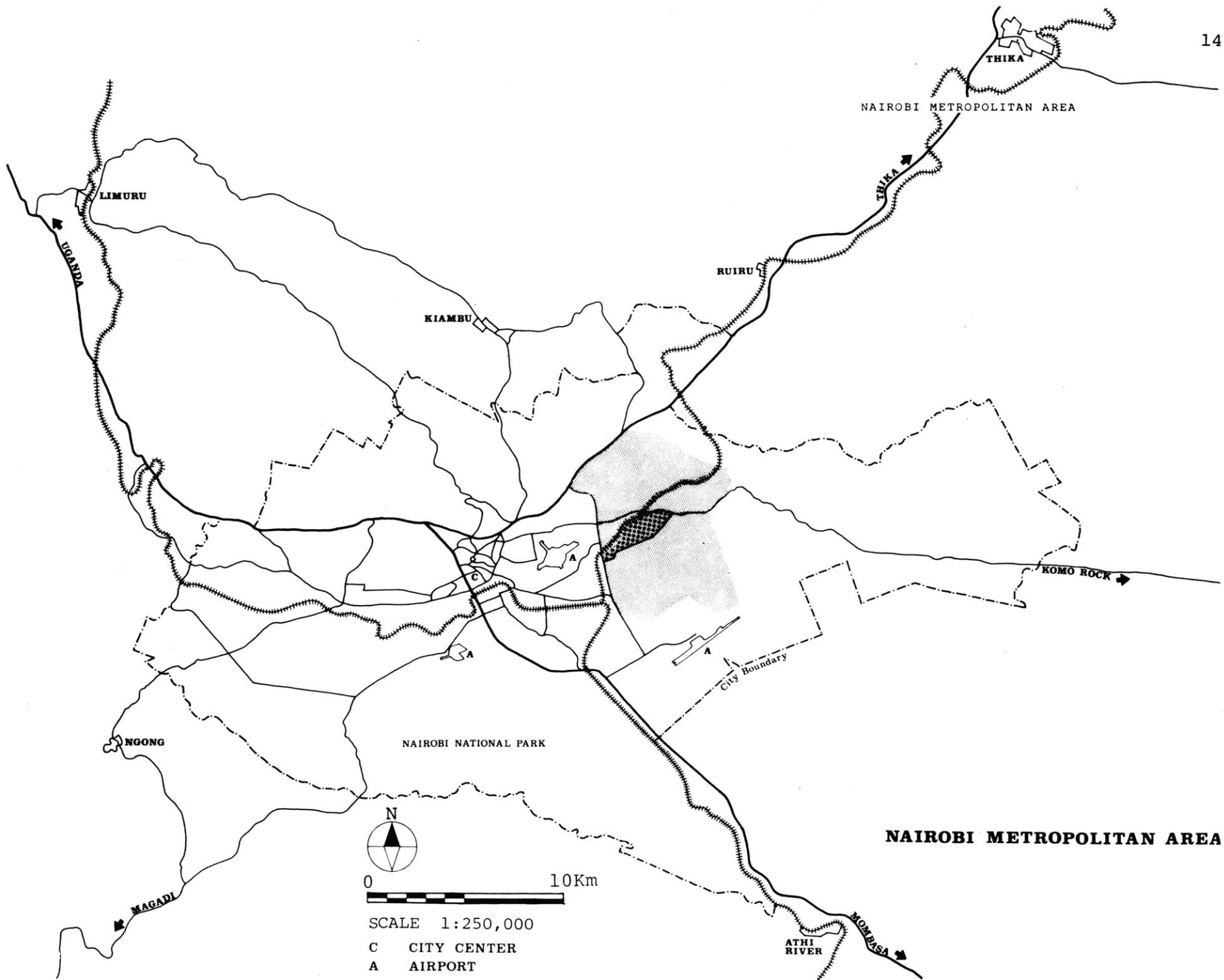


**NAIROBI CIRCULATION**





**NAIROBI LAND USE**



N  
0 10Km  
SCALE 1:250,000  
C CITY CENTER  
A AIRPORT

**NAIROBI METROPOLITAN AREA**

NAIROBI METROPOLITAN AREA



NAIROBI CITY CENTER: Racecourse Road, connecting to River Road is a typical example of tenement housing in the city center. Three or four stories structures with internal courts. Dwelling Units are single rooms or an apartment. Commercial activities and small scale industries on the ground floor fronting on to the main street.



NAIROBI EASTERN AREA: A typical street in the Eastlands Area gives indication of the tenements. Mostly residential except for commercial activities at corner stores. The nature of the street is essentially pedestrian.



EASTERN EXTENSION, IMMEDIATE ENVIROMENT: Kariobangi Housing Estate to the north of the site, administered by the Nairobi City Council. The Outer Ring Road is an important connection to the city center and other industrial areas. Both official transport by bus, and by illegal mini-buses is available.



EASTERN EXTENSION, IMMEDIATE ENVIROMENT: Photograph shows the actual site and the conditions on it, such as vegetation, slopes, scattered dwellings, and power pylons. The site has easy access to the city center and the nearby industrial area. It is close to existing infrastructure and transport.

## EASTERN NAIROBI AREA

This is the larger context of the Eastern Extension Area which has an overall development plan. In this particular study the areas proposed for development is indicated on the map at right. This area has been defined as sites 2 and 5 in the Eastern Extension Study carried out by planners in Nairobi. Included in the study is all the area east of site 5

### LAND FEATURES:

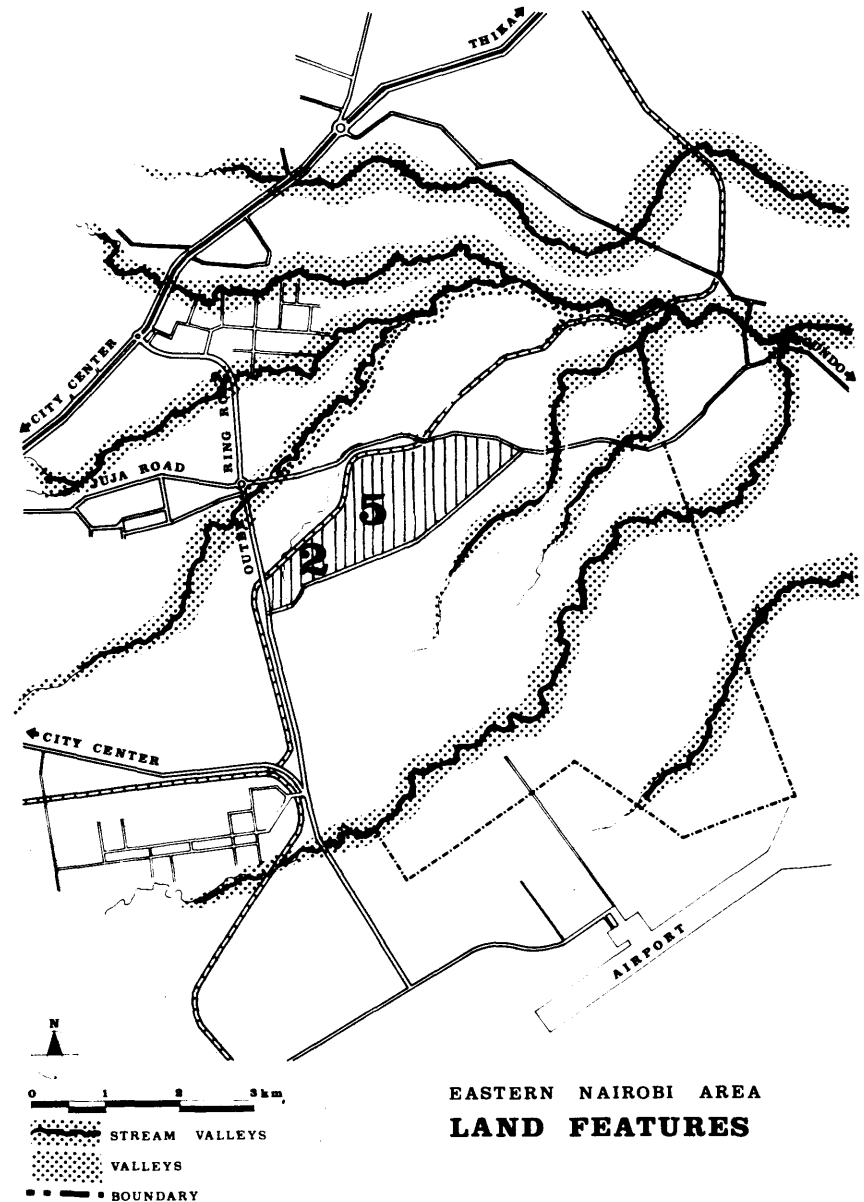
Stream valleys running East West define distinct elongated segments of land , mostly flat and well suited for residential development.

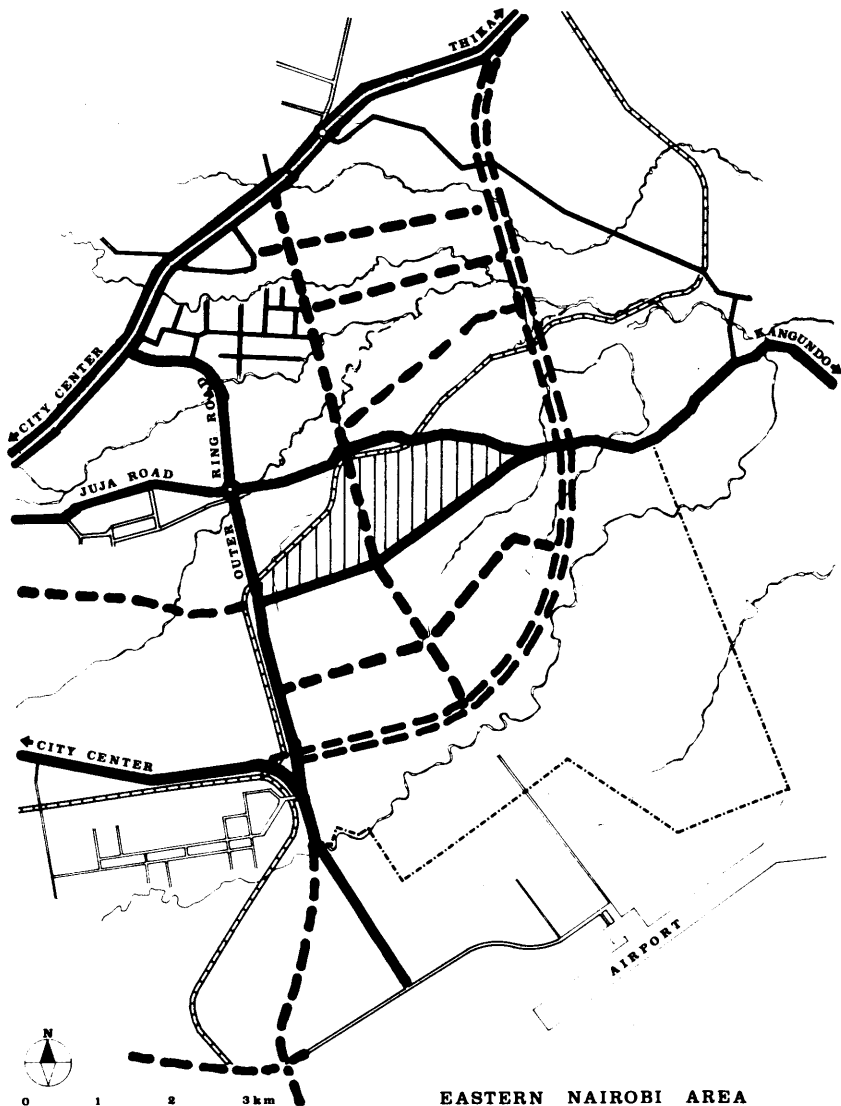
### LAND USE:

- EXISTING: - Residential: Kariobangi, Ruaraka and a few isolated housing units.  
 - Industrial: Dandora and Ruaraka.
- Projected: - Residential: Expansion of the existing areas.  
 - Industrial: Dandora and the expansion of existing Nairobi Industrial Area along proposed by-pass highway.

### CIRCULATION:

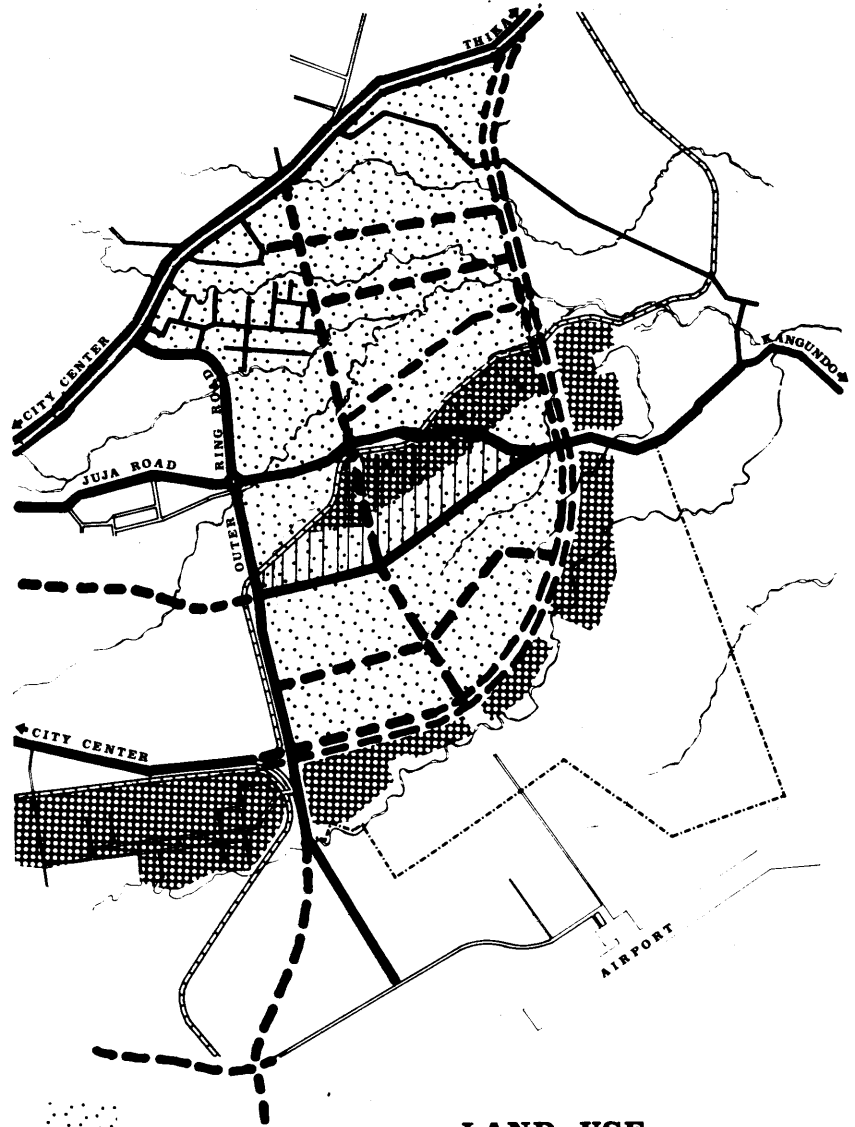
- Major Roads: Existing:  
 Outer Ring Road, Komo Rock Road, Kangundo Road.
- Major Roads: Projected:  
 By-pass highway.
- Commercial : Individually proposed for each of the proposals.
- Roads : On ridges of segments.





**EASTERN NAIROBI AREA  
CIRCULATION**

— EXISTING ROADS  
- - - PROPOSED ROADS



**LAND USE**

••••• RESIDENTIAL  
▣▣▣▣ INDUSTRIAL



# POLICIES / GOALS

## PRIMARY USE: RESIDENTIAL

- The primary use of the site shall be residential.
- The following supporting land uses are implied: schools, clinics, parks and playgrounds, commercial facilities and markets.
- The site will allow for a development of commercial and public facilities at the intersection of the two major roads.

## INCOME GROUPS: PREDOMINANTLY LOW INCOME

- A low income community is the aim of the development.
  - Medium Low : KShs 331-850 per month.
  - Low : KShs 191-330 per month.
  - Very Low : KShs below 190 per month.
- In addition to the above there will also be units and/or sites provided for medium and upper medium groups of population.

## INTENSITIES OF LAND USE: MEDIUM TO HIGH

- The range of gross densities planned for is:
  - 200 to 400 persons/Ha.
  - 200 persons per Hectare assumes: A community in predominantly one story structures.
  - 400 persons per Hectare assumes: That in reality and over time densities will be higher than stated above. Therefore an expansion to 2-3-4 stories, and higher room occupancies as well as encroachment into open areas will occur.

## FORMS OF TENURE: PRIVATE OWNERSHIP, CONDOMINIUM OWNERSHIP, LEASE AND RENTAL

- A variety of tenure options will be offered by the proposed development. Main ones being rental and long term lease. There will also be private ownership and co-operative ownership. A subletting of rooms is expected to take place in all the proposed forms of housing.

## FINANCING: PUBLIC AND PRIVATE

- Both public, i.e. Nairobi City Council, and such bodies and the private sector will be responsible for the development of the proposed project.

## CIRCULATION: INTERNAL/EXTERNAL COORDINATION

- The circulation network will provide a framework for the development of the site.
- The internal circulation network will be linked with the external network as follows;
  - To Komo Rock Road on the North boundary, main access to city center, and Dandora
  - To the new Kangundo Road on the South boundary, access to Nairobi Industrial Area and Dandora.
  - To Outer Ring Road to the West providing access to the Outer Ring Road Housing Estate.

## UTILITIES: CONNECTORS TO EXISTING NETWORKS:

- All utility systems will be interconnected into the existing and planned city networks:
  - Sewer: to the proposed Industrial Area sewer.
  - Electricity: into existing network at Dandora.
  - Water: to proposed 1974 waterlines and also to existing Outer Ring Road Estate and Kariobangi South lines.
  - Refuse; Nairobi City Council.

## DEVELOPMENT MODE: INCREMENTAL GROWTH

- The site will be developed incrementally.
- Two periods are considered:
  - PRELIMINARY: Initial studies and promotion.
  - IMPLEMENTATION: In three phases of development. This will include the development of the western end of the site during phase one, the eastern end during phase two and the central spine center during phase three. The whole development will have a cycle of construction, habitation, evaluation and revision. This cycle will be repeated till saturation is reached in three time periods.

# ASSUMPTIONS

## ASSUMPTIONS:

- a) The railway will not be re-aligned in the near future, and the traffic on this line is likely to stay the same.
- b) The proposed main road going North to South, will exist as has been proposed in the Eastern Extension Study.
- c) Sites 2 and 5 (as defined in the Eastern Extension Study ) will be developed as one area, in conjunction with all the area to the East of site 5 right up to the Komo Rock Road.
- d) Site 6 will be treated as part of the Kariobangi South Housing Estate, and will be developed as such.
- e) The initial development will have supporting public services in the form of elementary schools, nursery schools, utilities, transport facilities ( bus line ) but will not have extensive commercial and small scale industries.
- f) The initial development will reflect the future growth of the development.
- g) The initial development will share certain public services and be socially akin to the adjacent estates of Kariobangi South, Outer Ring Road, Kariobangi and Dandora.
- h) The main circulation around the site are already laid out and it is assumed that they will remain so in the future.
- j) The proposed site is on land which is both crown property and privately owned. It is assumed that any purchase of land will be in installments of the plots already laid out, or will be purchased all at one time.
- k) The power pylons that cross the site at two points will not be re-aligned in the near future.

# THE SITE

## AREA:

Gross area of site:	320	Ha.
Land adjacent to railway:	12	Ha.
Land adjacent to power lines:	19	Ha.
Land for development:	279	Ha.

## SITE BOUNDRIES:

The site is strongly defined by man made features on all sides:

North : Dandora railway line and Komo Rock Road.  
 East : Intersection of Komo Rock and Kangundo Roads.  
 South : Kangundo Road.  
 West : Outer Ring Road.

## ACCESSES:

Komo Rock Road, Outer Ring Road and Kangundo Road.

## LOCATION:

Walking distance to sources of employment in Dandora, Ruaraka and the Nairobi Industrial Area is only 4 Km away.

The city center of Nairobi is 10 Km. to the west of the site.

## TRANSPORTATION:

Existing public transportation along Outer Ring Road to the City Center, the industrial area and the adjacent housing estates.

## TOPOGRAPHY/SOIL CONDITIONS:

Elongated site, and mostly flat, with slope less than 0-5 %.

Black Cotton Soil , 2-3 feet.

Weathered Lava, 0-20 feet.

## LAND OWNERSHIP:

Nairobi City Council owns site number 2.  
 Khan Estates, a private concern, owns the rest of the site.

## LAND COSTS:

Costs vary from 300 K.Shs.-3,700 K.Shs. per Ha.

The total cost of acquiring the land at the maximum value would be 800,000 K.Shs.

## UTILITIES:

Adequate services available for future connections of sewers, electricity and water.

## EXISTING STRUCTURES,EASEMENTS,RIGHT OF WAY:

The existing railway line and its uncertain future.  
 The two power lines running south-west to north-east and south-east to north-west.

## OTHER FACTORS:

Views: : Good views of its surroundings.

Smoke,Odors : None at the moment, but the proposed steel mill to the east is likely to have some effect later.

Dust : None.

Flooding : The site is well drained.

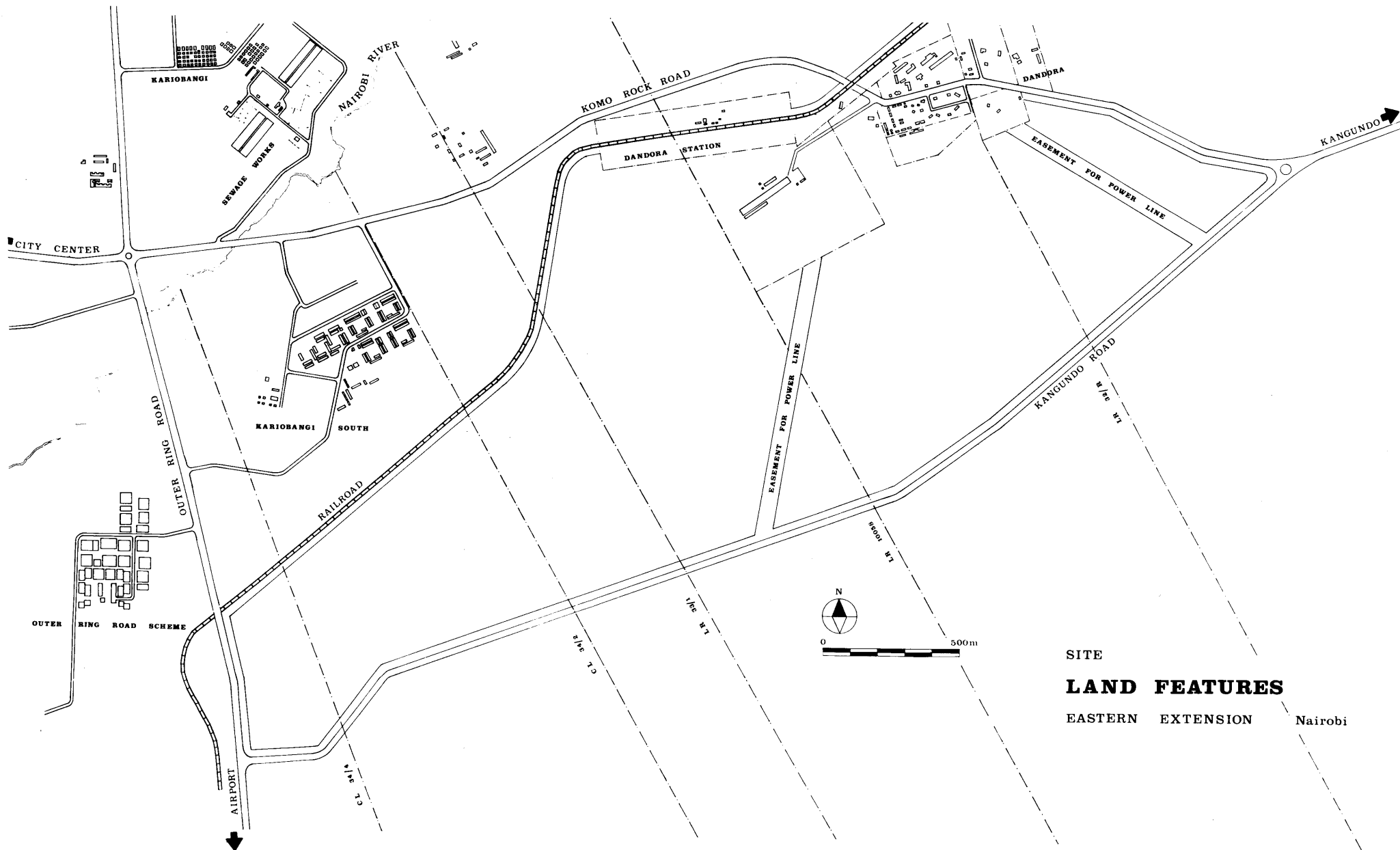
Hazards : The existing railway line should meet public safety requirements.

Airports : It is out of the areas which are in the airfield approach limitations.  
 The proximity to the military airfield could be a source of nuisance.

## RECOMMENDED INVESTIGATIONS:

The soil conditions of the site should be carefully and extensively studied and all soil conditions identified.

-----  
 The map opposite shows: Boundries; Adjacent developments; Existing Roads around the site; The right of way for these roads; The easement for the power lines.



SITE  
**LAND FEATURES**  
 EASTERN EXTENSION Nairobi

# LAND USE PLAN

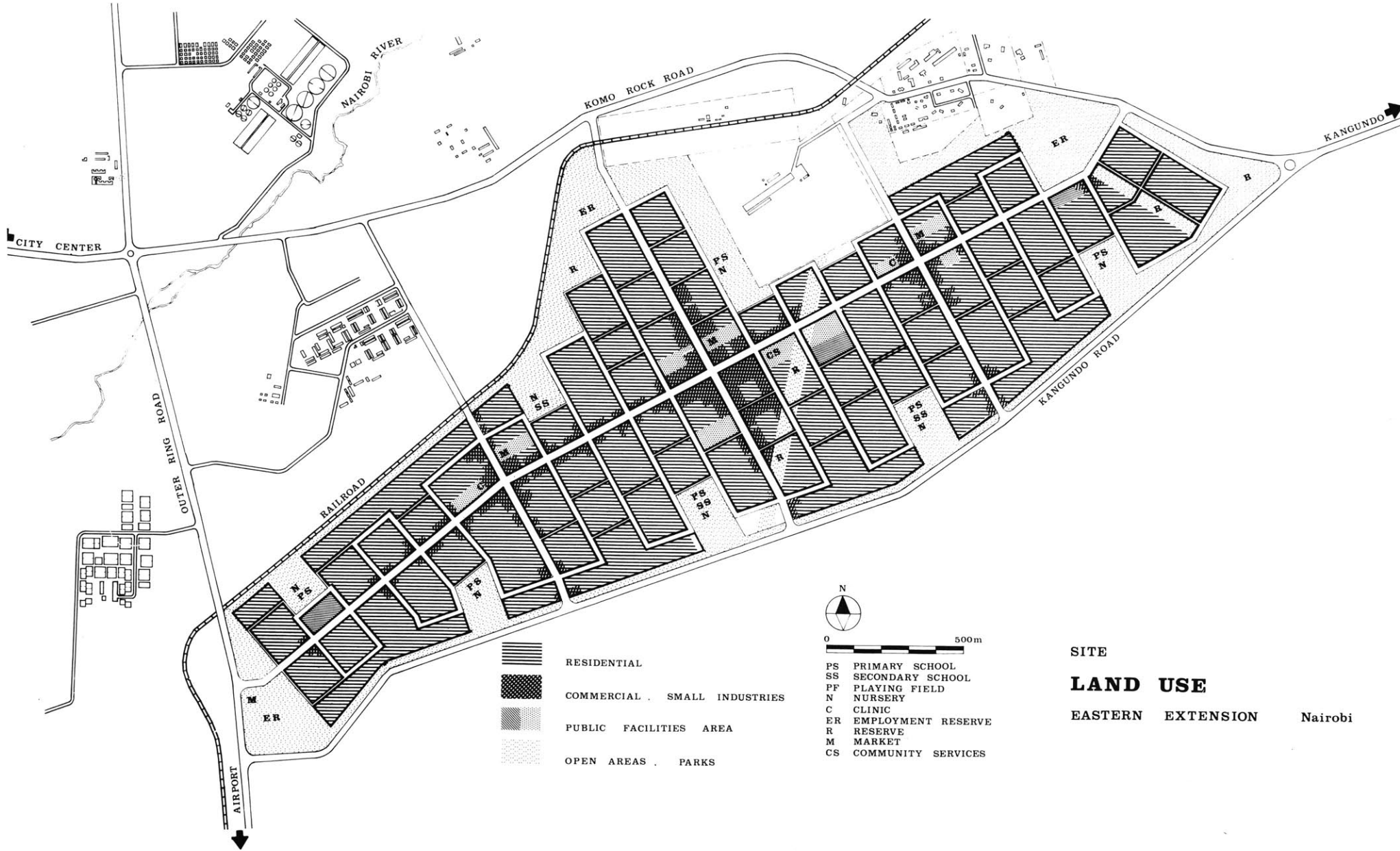
	Ha	%
Gross area within boundries of site :	320	
Land adjacent to railway easement :	-41	
<b>AVAILABLE LAND FOR DEVELOPMENT</b> :	<b>279</b>	<b>100</b>
<b>PUBLIC LAND</b>		
- circulation (length 32,600 m) :	36	13
- schools, playgrounds, open areas, parks and hospitals :	70	25
- NCC markets, public facilities, reserve land :	28	10
<b>PRIVATE LAND</b>		
- residential, small industries, commercial:	145	52





The site has a potential population of 55,000 people to 110,000 people at saturation level. The site development at saturation will be one of a medium sized town and therefore should be planned as such, not in terms of community services, but also in terms of the following options:

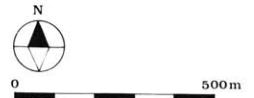
- different income groups
- diversity of choice in land tenure.
- diversity in housing programs.
- public and private developers and funding.

THE LAND USE PLAN: ( opposite page )

- OPEN AREAS, PARKS: located along the periphery of the site along Kangundo Road, and existing railway line. Along the line to take advantage of the irregular shaped land parcels and possible re-alignment, and along the road as a buffer between the road and the residential development.
- SCHOOLS: adjacent to open areas and parks.
- PUBLIC FACILITIES AREAS: along proposed road running west-east and also along central road running north-south. At saturation the intersection at the middle of the site and the west-east spine will act as a strong point of public facilities for the total development.
- RESIDENTIAL AREAS: Are located on both sides of the proposed center spine and all the north-south intersection roads.
- OPEN RESERVE LAND: Is located at all junctions which connect the interior of the site to the external circulation network.



-  RESIDENTIAL
-  COMMERCIAL . SMALL INDUSTRIES
-  PUBLIC FACILITIES AREA
-  OPEN AREAS . PARKS



- PS PRIMARY SCHOOL
- SS SECONDARY SCHOOL
- PF PLAYING FIELD
- N NURSERY
- C CLINIC
- ER EMPLOYMENT RESERVE
- R RESERVE
- M MARKET
- CS COMMUNITY SERVICES

SITE  
**LAND USE**  
 EASTERN EXTENSION Nairobi

# CIRCULATION PLAN

This network is the primary ordering framework around which the site is developed.

The network also provides the utility spines for the site and to an extent, determines land values.

The network is considered to be under public ownership.

The network provides paths of movement

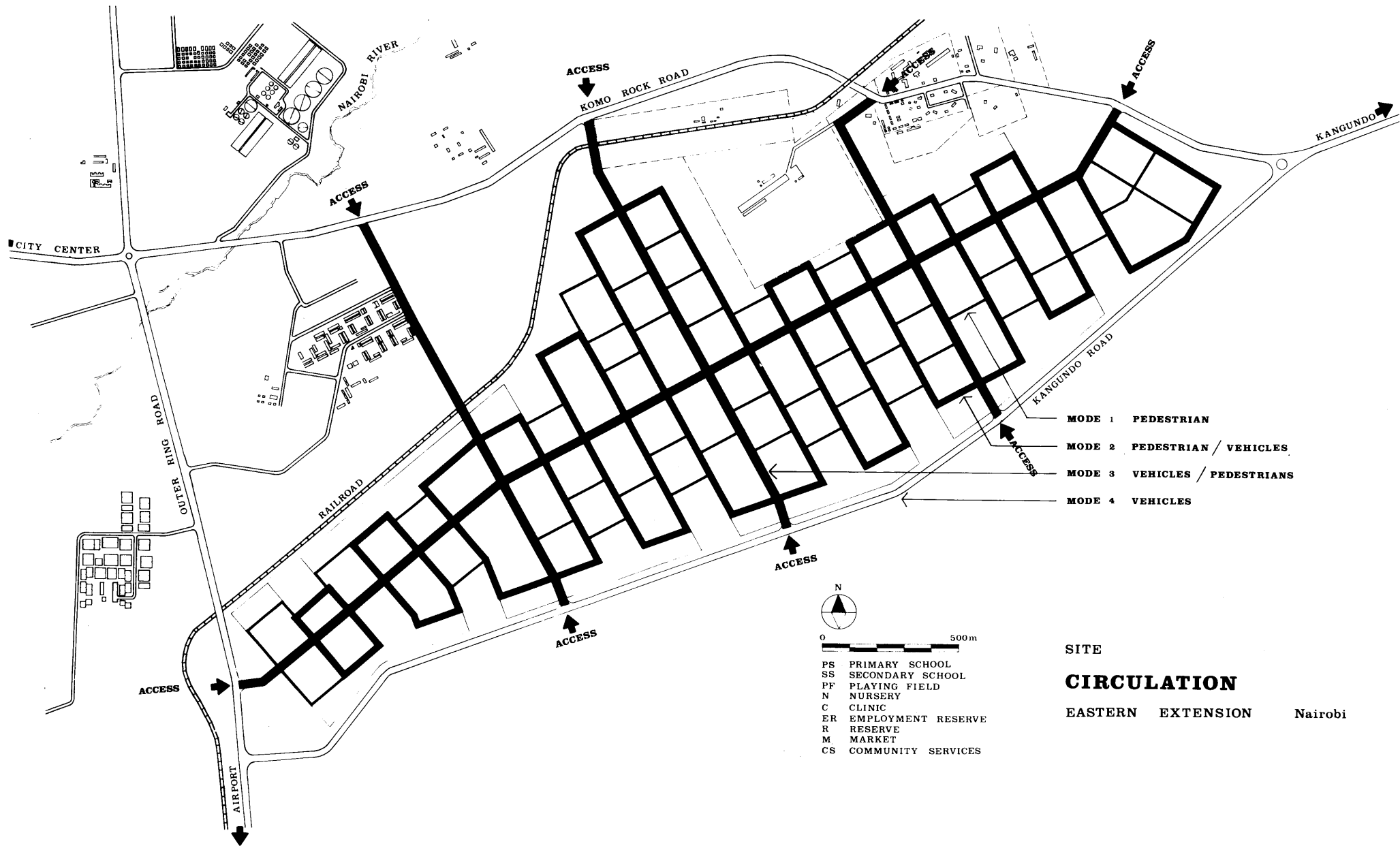
The network provides paths of movement for both pedestrians and vehicles.

The circulation layout is based upon:

- a) It is laid out within the existing and the proposed roads of the Nairobi City Council and the Eastern Extension Area plans and proposals.
- b) The layout that best serves the site is a main through road running west-east along with the topography of the site.
- c) The three north-south intersecting roads will give four divisions of the site which will be convenient sized urban units for a pedestrian population.
- d) The center road going west-east, will provide a simple local bus route with residential blocks on both sides within walking distance.
- e) The center road will be within walking distance, with its commercial and public facilities.
- f) The initial access will be from the Outer Ring Road and The Kariobangi South connection, providing easy connections to the City Center, Industrial Areas to the north and south and to the existing facilities of the Kariobangi South Housing Estate and the Outer Ring Road Estate. Other points of access for the future will be from Komo Rock Road to Dandora in the north and the Kangundo Road to the south and finally to Komo Rock Road at the Railway Station and to the south on the Kangundo Road

## CIRCULATION MODES:

- 1) PEDESTRIANS : use by pedestrians and emergency vehicles.  
Example: pedestrian walkways.
- 2) PEDESTRIAN AND VEHICLES: pedestrians will dominate over vehicles. Character and speed are established by the type of street layout and use.  
Example: Local streets going north-south.
- 3) VEHICLES AND PEDESTRIANS: Vehicles dominate, but do not control. Controls are provided for the pedestrian, crosswalks, traffic lights, and rails.  
Example: Main commercial street and north-south connections.
- 4) VEHICLES: exclusive use by vehicles, high speed and more volume of traffic as in the case of Komo Rock Road, Outer Ring Road and Kangundo Road.



- MODE 1 PEDESTRIAN
- MODE 2 PEDESTRIAN / VEHICLES
- MODE 3 VEHICLES / PEDESTRIANS
- MODE 4 VEHICLES



0 500m

- PS PRIMARY SCHOOL
- SS SECONDARY SCHOOL
- PF PLAYING FIELD
- N NURSERY
- C CLINIC
- ER EMPLOYMENT RESERVE
- R RESERVE
- M MARKET
- CS COMMUNITY SERVICES

**SITE**  
**CIRCULATION**  
 EASTERN EXTENSION Nairobi



# DEVELOPMENT PLAN

The development plan is based on the following:

- Land use, circulation, development, are inseparable interacting systems.
- Maximum flexibility should be provided to facilitate the continuous process of construction, habitation, evaluation and revision.
- Maximum flexibility should be provided within the overall ongoing and constantly changing social and economic contexts.

## INITIAL DEVELOPMENT:

The initial development is located on the site in an area that permits:

- Easiest direct access from the existing Outer Ring Road and the Kariobangi South Estate.
- Convenient pedestrian access to public transportation along the Outer Ring Road.
- Immediate utilization of existing and available infrastructures and services of the above said adjacent communities, in terms of sewer, water and electricity extensions. Initial use of schools, markets and public facilities, resulting in lower costs and therefore available resources could be focused on more important priorities.
- Proximity to job opportunities in the industrial area to the south and the industrial area of the Ruaraka area.

The initial development will include the following:

Land Uses: residential, commercial, small scale industries, public facilities and open areas.

Circulation: pedestrian walkways, local streets, main commercial street, and main north-south intersecting street.

Infrastructure: primary networks.

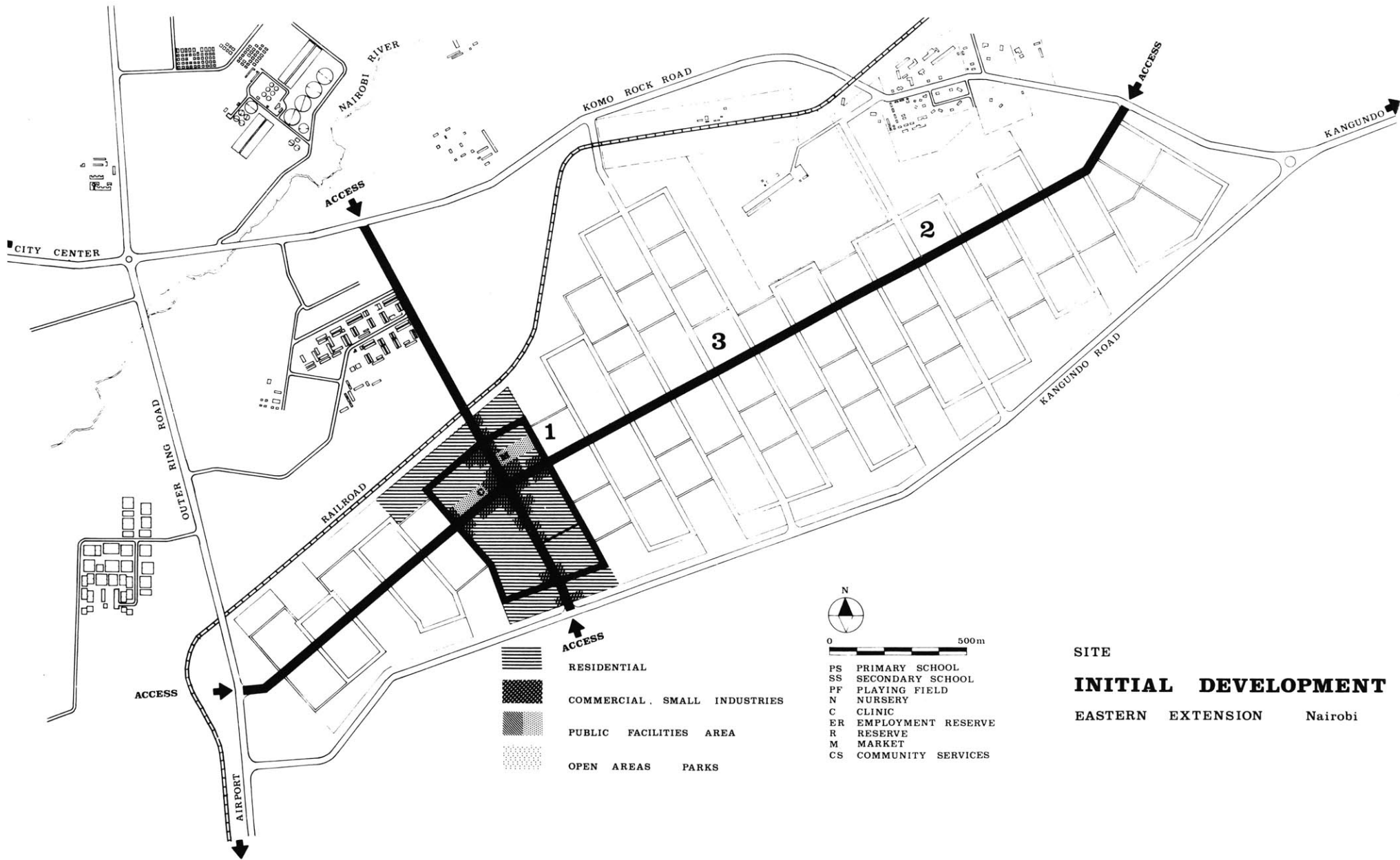
## SUBSEQUENT DEVELOPMENT:





The development of the site starts at the western end. The second phase is at the intersection of the north-south road at the eastern end. The final development will be at the center, indicated by numbers 1,2 and 3 on the map.



The plan is developed in two areas at opposite ends thus increasing land values at the center creating a very strong commercial center for the total development.

The plan:

- permits a natural progressive accretion of different land uses, circulation and infrastructure.
- maintains at any stage, the consistency between land use/densities/commercial potential and intensity of circulation and activities.



-  RESIDENTIAL
-  COMMERCIAL, SMALL INDUSTRIES
-  PUBLIC FACILITIES AREA
-  OPEN AREAS PARKS

-  N
- 0  500m
- PS PRIMARY SCHOOL
- SS SECONDARY SCHOOL
- PF PLAYING FIELD
- N NURSERY
- C CLINIC
- ER EMPLOYMENT RESERVE
- R RESERVE
- M MARKET
- CS COMMUNITY SERVICES

**SITE**  
**INITIAL DEVELOPMENT**  
 EASTERN EXTENSION Nairobi

## BLOCKS      LOTS      CLUSTERS

BLOCK is a portion of land bounded and served by lines of public streets, vehicular and pedestrian.

LOT is a measured parcel of land having fixed boundaries and access to public circulation or space.

LOT CLUSTER is a group of lots (owned individually) around a semi-private court (owned in condominium)

CONDOMINIUM is a system of direct ownership of a single unit in a multi-unit structure. The individual owns the unit in much the same way as if it were a single family dwelling. He holds direct legal title to the unit and a proportionate interest in the common areas and the underlying ground.

The proposed block layout is based on the following:

- MINIMIZATION OF:
- public ownership of land.
  - lengths of infrastructure per area served.
  - government ownership, responsibility and involvement.
- MAXIMIZATION OF:
- private ownership of land and private long lease.
  - private responsibility and involvement.

The grouping of lots around a court that serves both as semi-private space as well as access leads to a land subdivision type called 'horizontal condominiums' or 'cluster'. The control, use and maintenance of the court is a common responsibility of all within the particular cluster.

The blocks contain the following categories of lots:

- Exterior lots having access to the main road. Indicated on the circulation map as mode 3.
- Exterior lots having access to secondary roads. Indicated on the circulation map as mode 2.

- Exterior lots having access to pedestrian paths. Indicated on the circulation map as mode 1.
- Exterior/Interior lots having access to both public streets and the semi-private court of the cluster.
- Interior lots those having access only to the semi public court of the cluster.

The proposed layout permits:

### FLEXIBILITY IN LAND USES:

Different land uses can be accommodated in the block which are similar in shape and dimension.

- Residential
- Residential and Commercial
- Commercial and Light Industrial.
- Schools, Playgrounds and Parks.
- Clinics, Post Offices, Fire and Police Stations.
- Reserved Areas and other uses.

### FLEXIBILITY IN RESIDENTIAL DENSITIES AND HOUSING SUBSYSTEMS WITHIN THE SAME LOT STRUCTURE:

Lot clusters are of minimum optimum dimensions to permit flexibility.

- Progressive development units, company housing, tenement units, commercial units, and high rise units.
- Medium and high densities.
- Combinations of the above.

### DIFFERENT TYPES OF LAND TENURE:

Lot clusters are of a minimum optimum dimension to allow different types of land tenure without legal or administrative complications.

- Ownership
- Rental
- Lease
- Sublet

**EXPANSION AND TRANSFORMATION OF HOUSING SUBSYSTEMS:**

Lot clusters will facilitate expansion and transformation of buildings.

- Horizontal ( addition on the ground ) and vertical ( addition of floors ) giving expansion without changing the overall configuration of the lot cluster.
- Control of minimum spaces in the lot cluster courts.

**PROPOSED AND CONVENTIONAL LOT LAYOUTS:** A comparison with public housing layout in Thika.

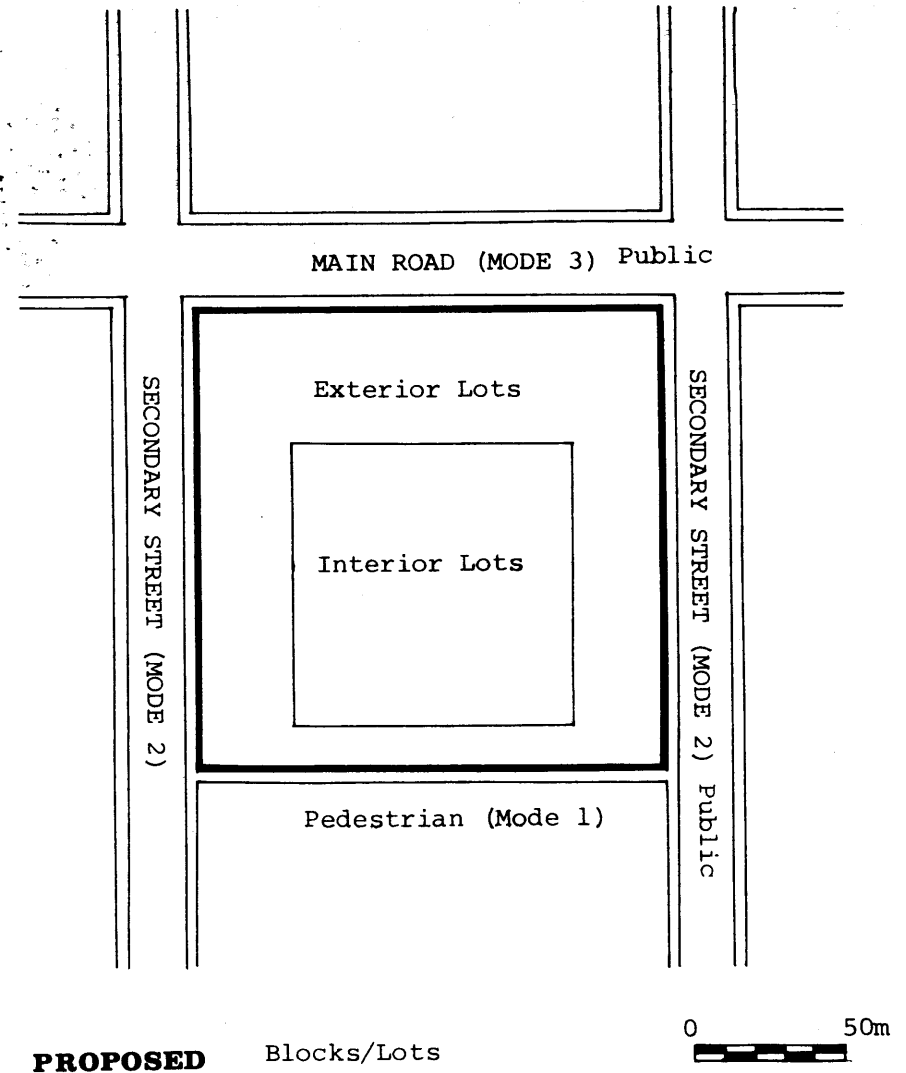
**ADVANTAGES OF THE PROPOSED LAYOUT:**

- Minimization of the public land for circulation, electricity, water, sewage networks, street lights, police protection, garbage collection.
- Savings for the Nairobi City Council in construction, maintainance and operation.
- Lots are grouped around a common court which serves as access as well as semi-private open space. This court is owned in condominium by the lot occupants who control and share the use of and the responsibility for the maintainance of the court.

**DISADVANTAGES OF THE CONVENTIONAL LAYOUT:**

- Wasteful public land for circulation, electricity, water, sewage networks, street lights, police protection, garbage collection.
- Heavy burden on the Nairobi City Council in construction, maintainance and operation.
- Lots face public streets as well as public service alleys. The lot occupants do not have control and responsibility of the public space adjacent to their properties. Public streets become unsafe, and cannot be maintained properly.

**BASIC BLOCK**

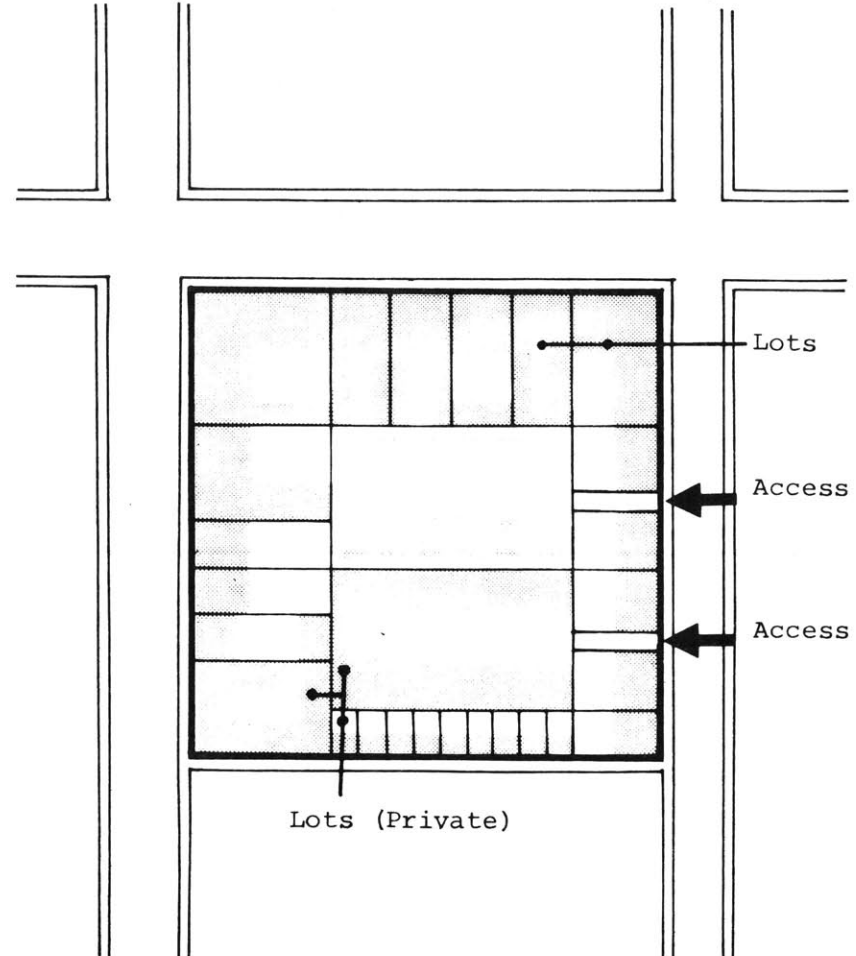
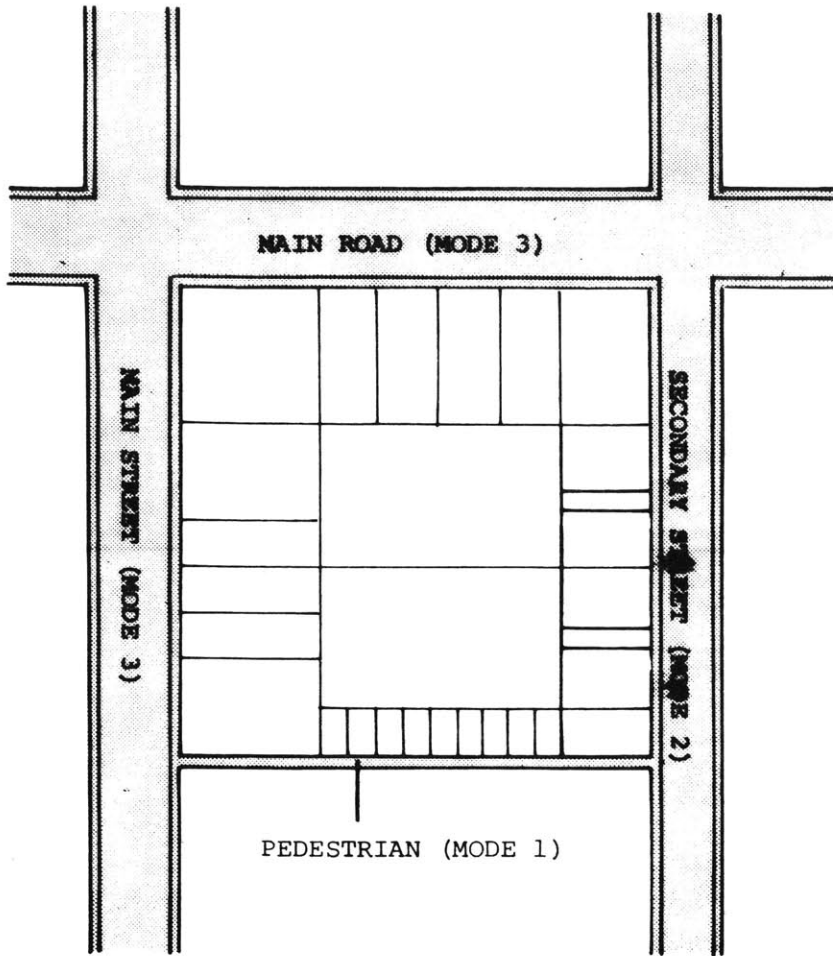


**PROPOSED** Blocks/Lots

CASE ONE

CIRCULATION

LAND USE



PROPOSED

Blocks/Lots



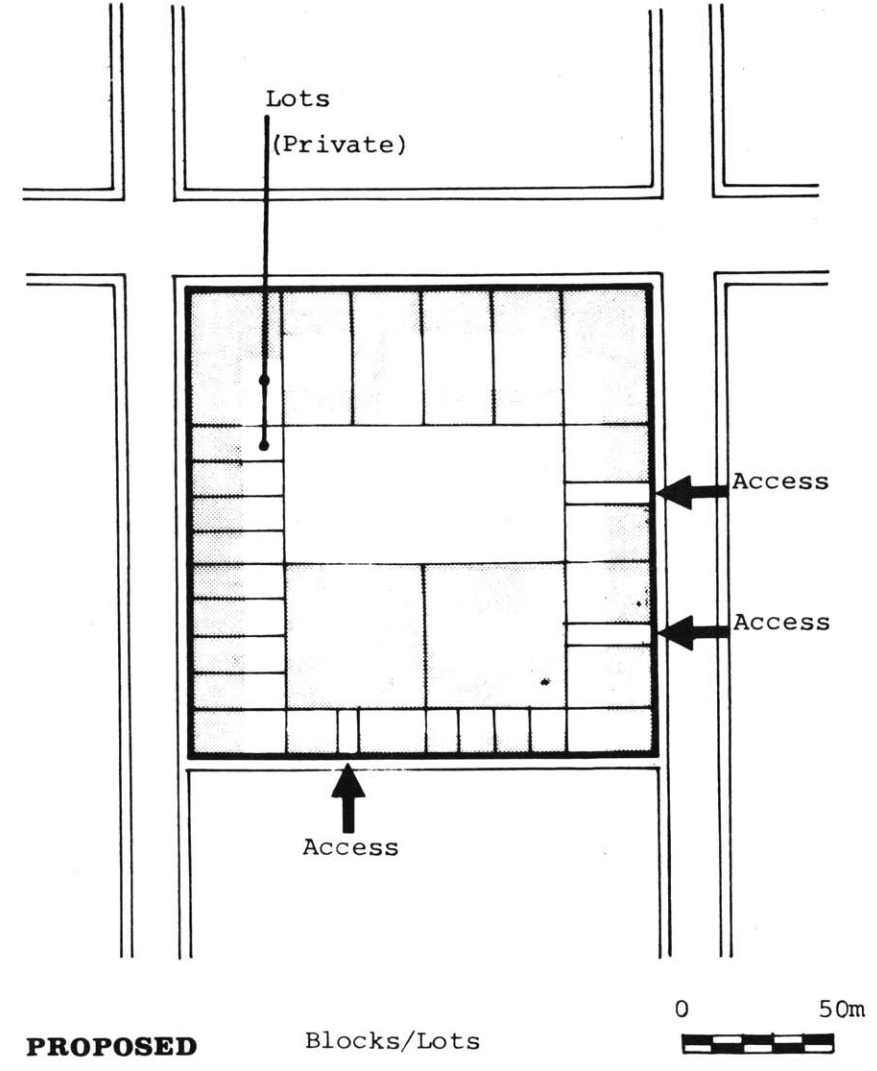
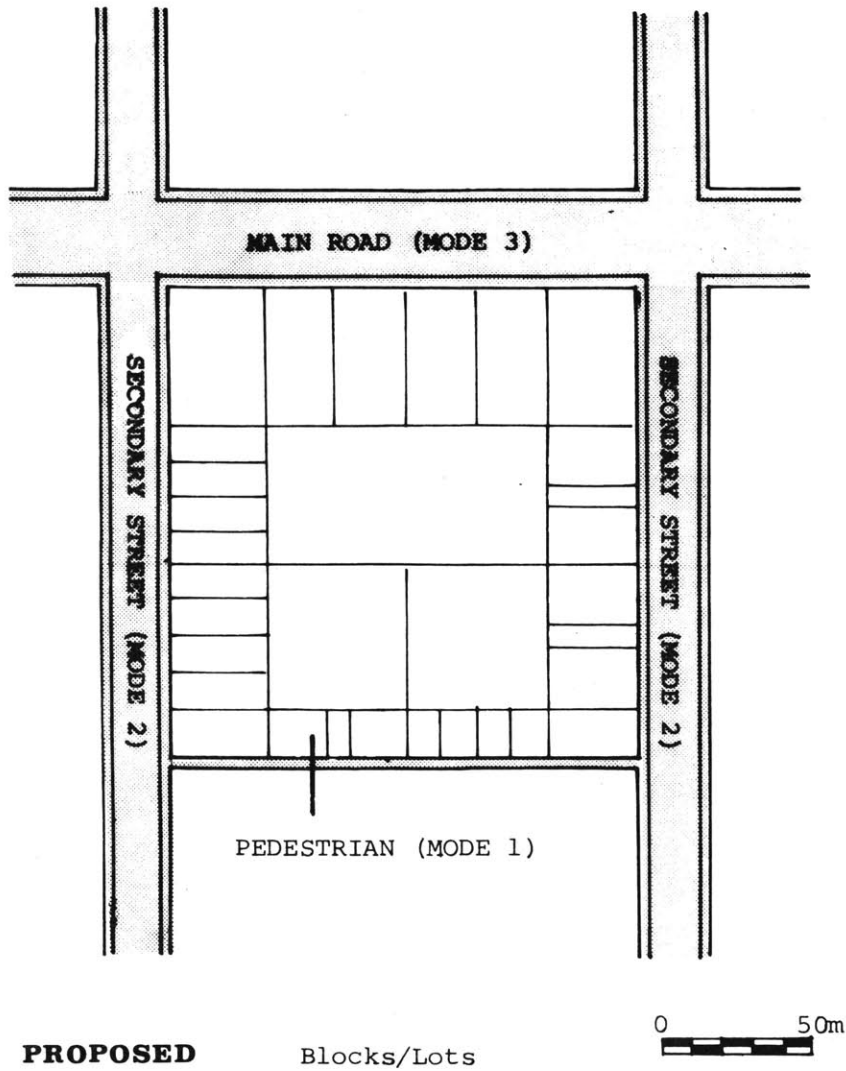
PROPOSED

Blocks/Lots



**CASE TWO CIRCULATION**

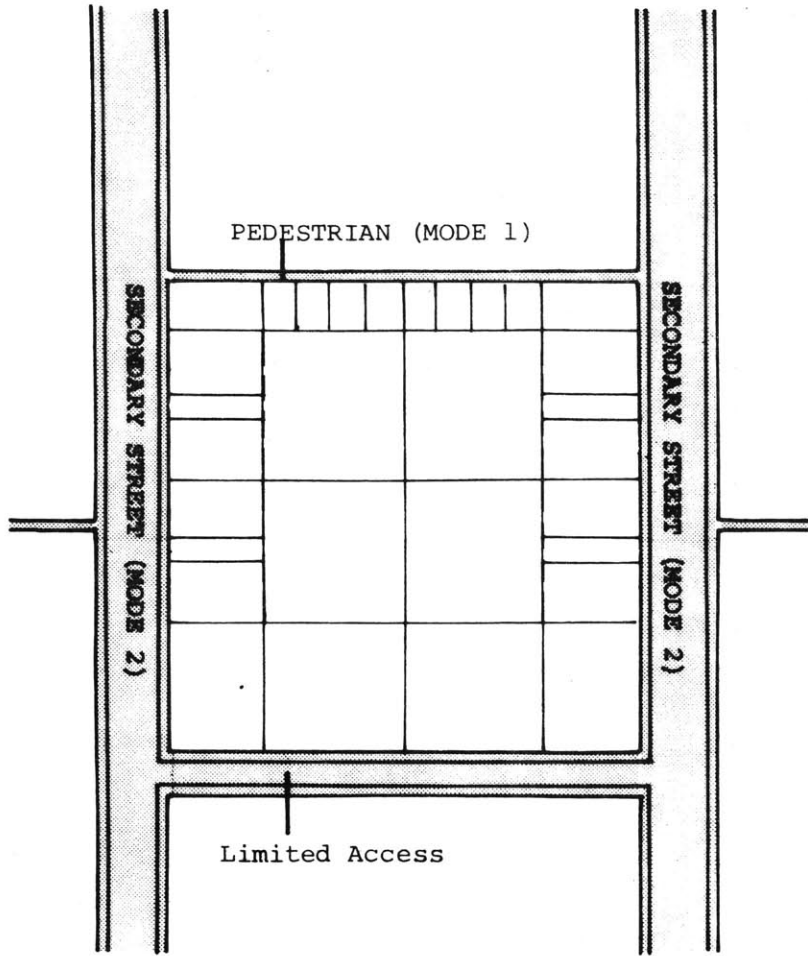
**LAND USE**



CASE THREE

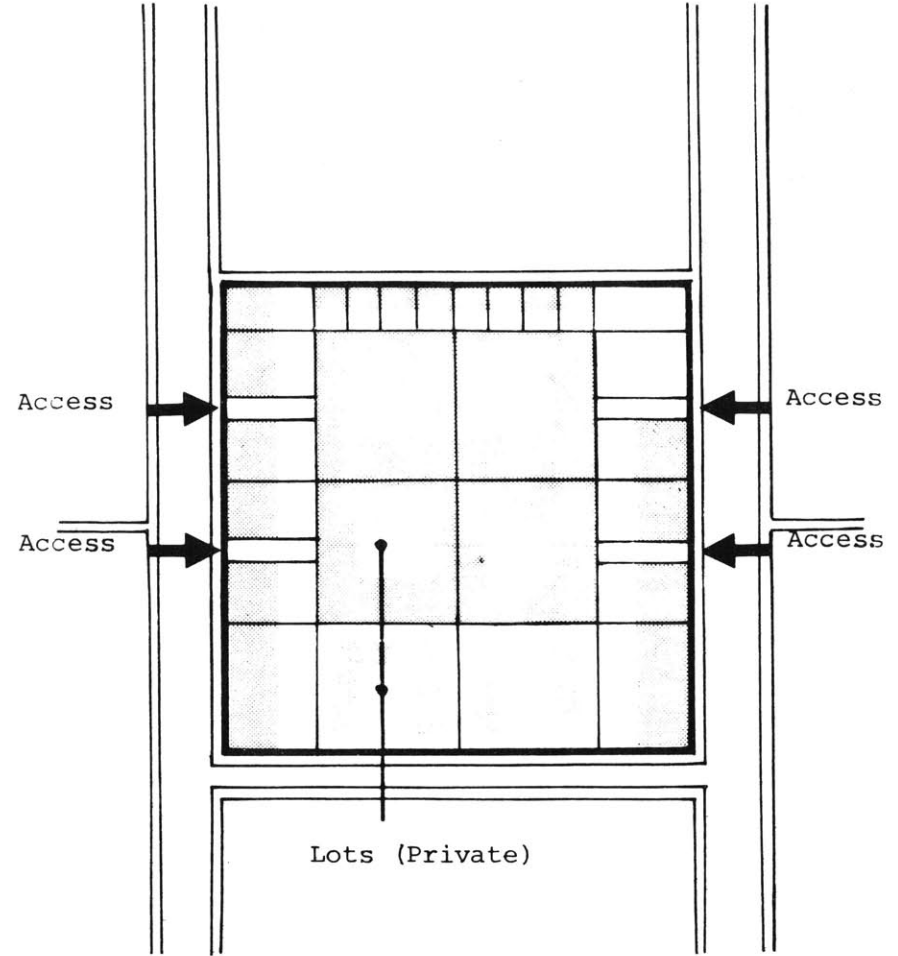
CIRCULATION

LAND USE



**PROPOSED**

Blocks/Lots



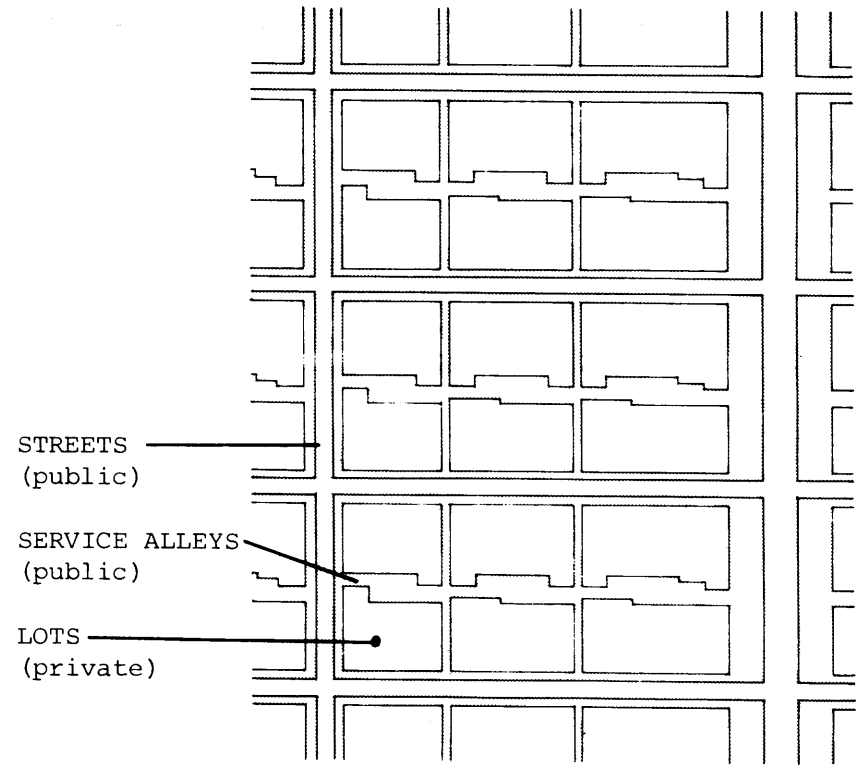
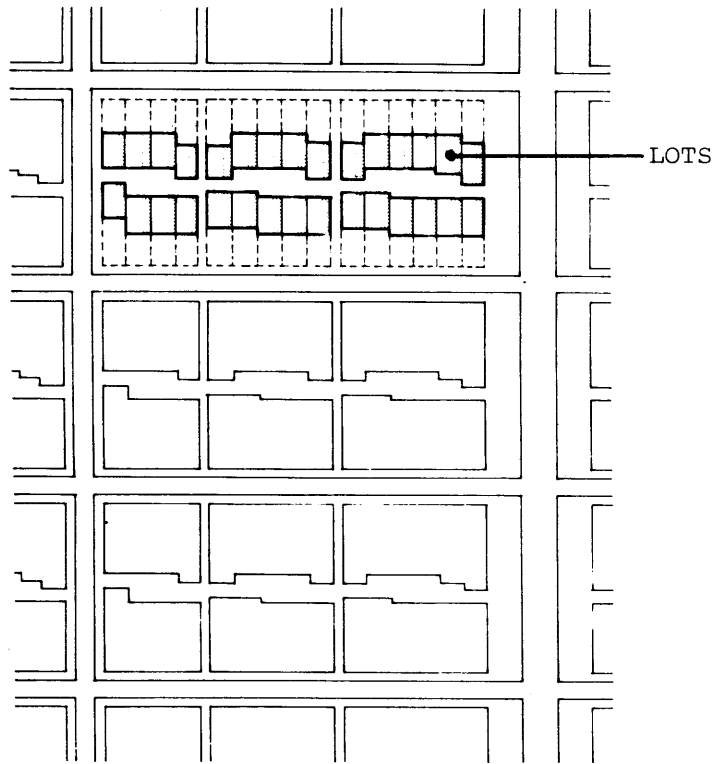
**PROPOSED**

Blocks/Lots

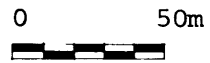


**EXISTING BLOCK CIRCULATION**

**LAND USE**



**CONVENTIONAL**



**CONVENTIONAL**

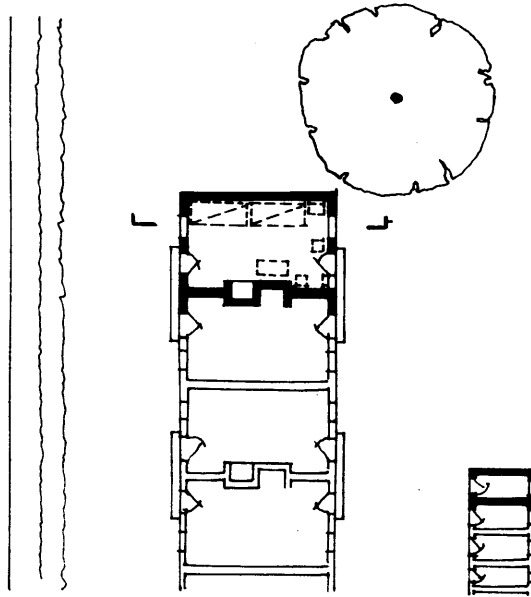
Blocks/Lots



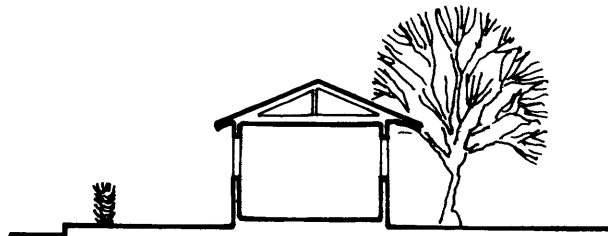


# EXITING HOUSING SUBSYSTEMS

## HOUSING SUBSYSTEM ONE



PLAN



SECTION

EXAMPLE: **BAHATI** HOUSING ESTATE  
Scale: 1;200

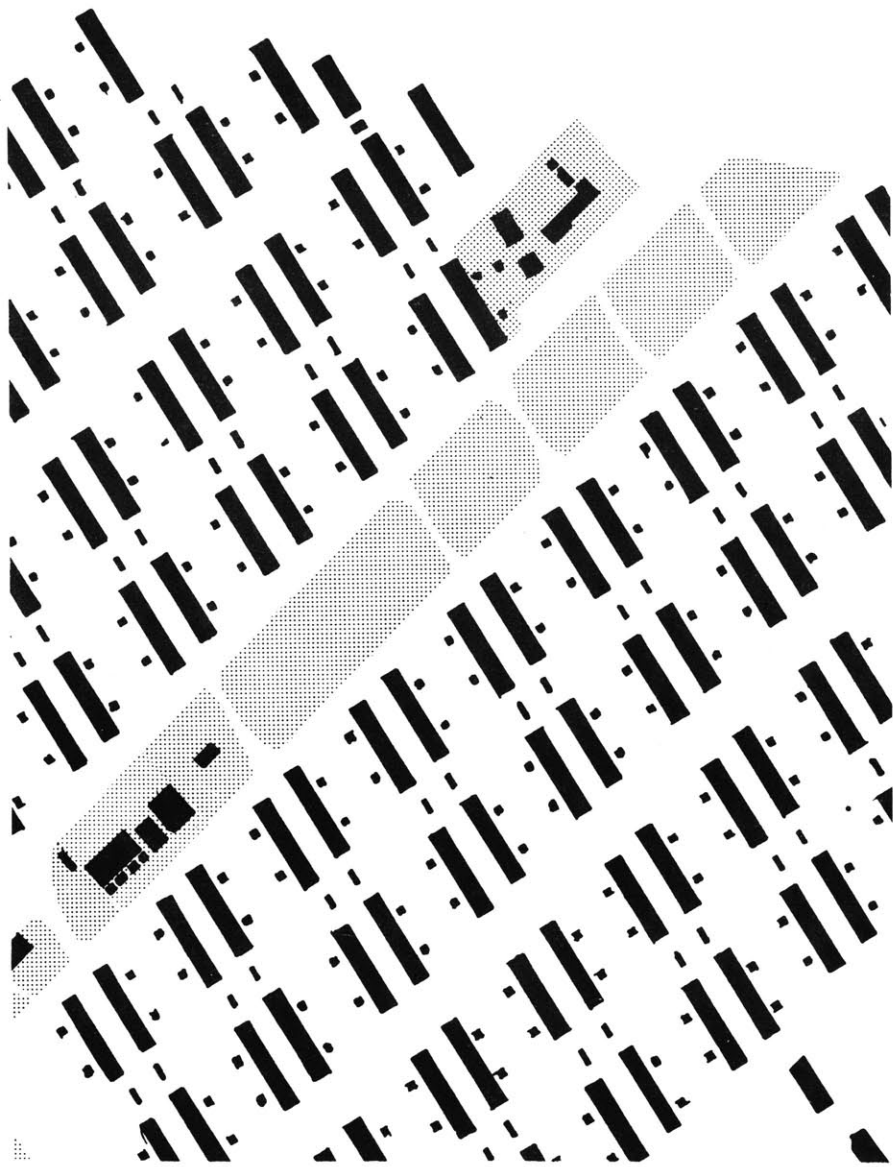
## INDUSTRIAL ROW HOUSES:

- Usually in narrow lots and of 1-2 stories.
- High densities, with uneconomic land use.
- Accessible to the low income groups.
- Subletting is a common feature.
  
- Efficiency:
 

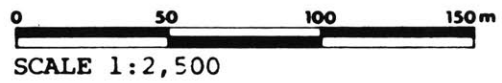
% Public-circulation	: very high
% Public-miscellaneous	: acceptable
% Private	: very low
  
- Intensity of Use:
 

Persons/Ha	: medium
Dwelling Units/Ha	: medium
% Built up-coverage	: low
  
- Layout:
 

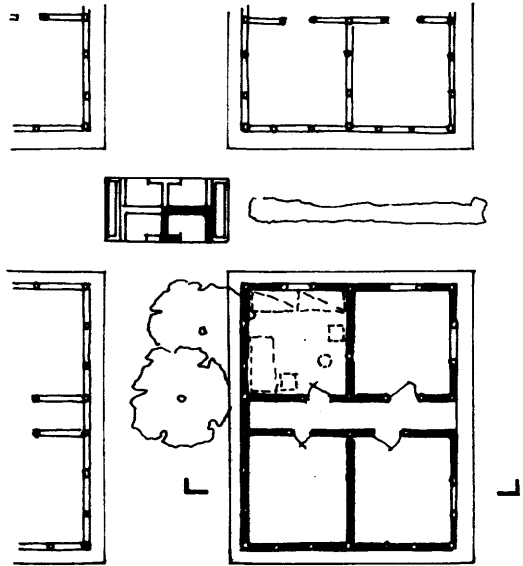
Lot areas	:
Length of circulation	: very high
Ratio	: very high
  
- Existing Examples:
  - Mathare Valley
  - Kawangware
  - Bahati
  - Makongeni



DWELLING GROUP



## HOUSING SUBSYSTEM TWO



PLAN



SECTION

## 'LABOUR CAMP' ROW/GROUP HOUSES:

- Uniformly laid out groups usually 1 story.
- Medium to high densities.
- provides collective minimal services the supervision of which is a major problem.
- Accessible to the low income groups.
- Subletting is common.
  
- Efficiency:
 

% Public-circulation	: very high
% Public-miscellaneous	: low
% Private	: low
  
- Intensity of Use:
 

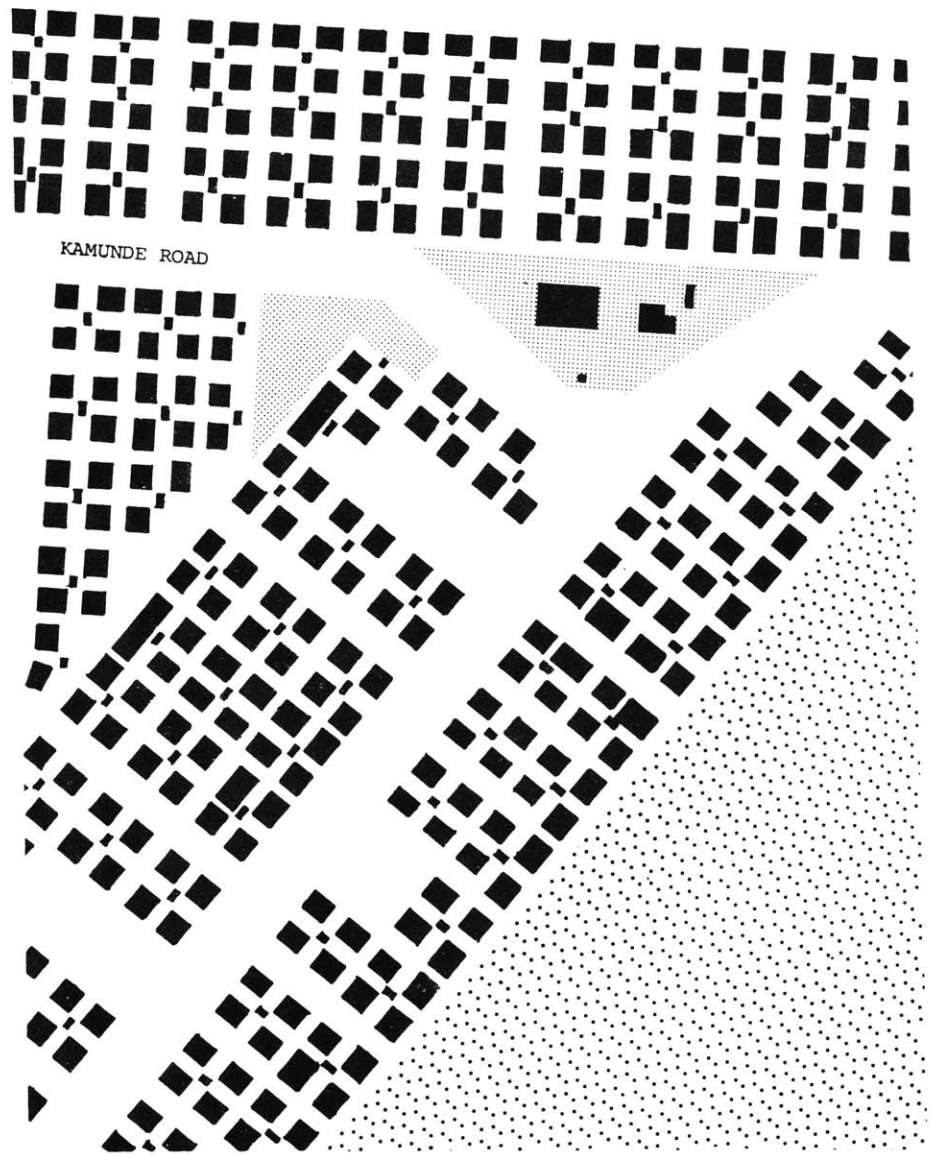
Persons/Ha	: high
Dwelling Units/Ha	: high
% Built up coverage	: high
  
- Layout:
 

Lot areas	: medium
Length of circulation	: medium
Ratio	: high
  
- Existing Examples:
 

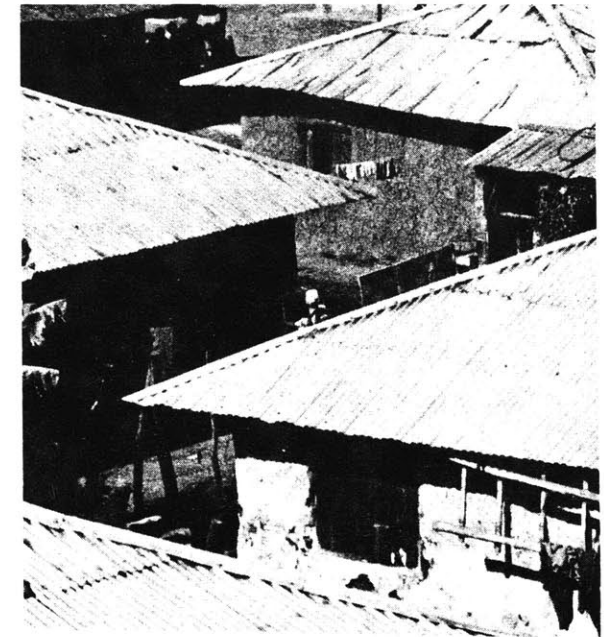
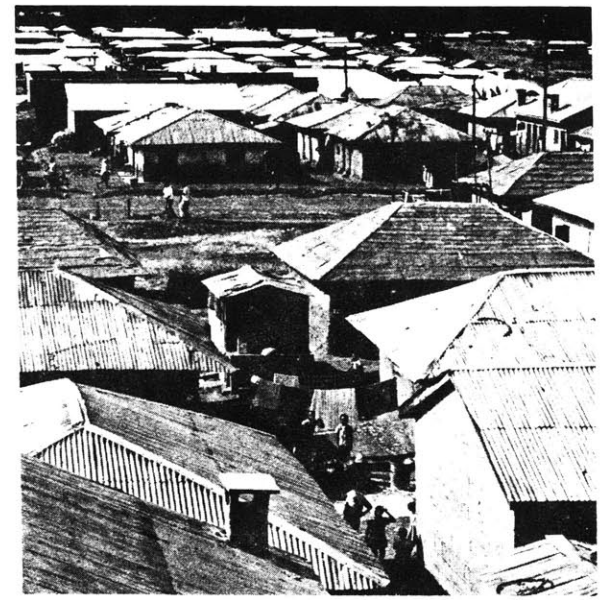
Kariobangi

EXAMPLE : KARIOBANGI SITE AND SERVICES PROJECT

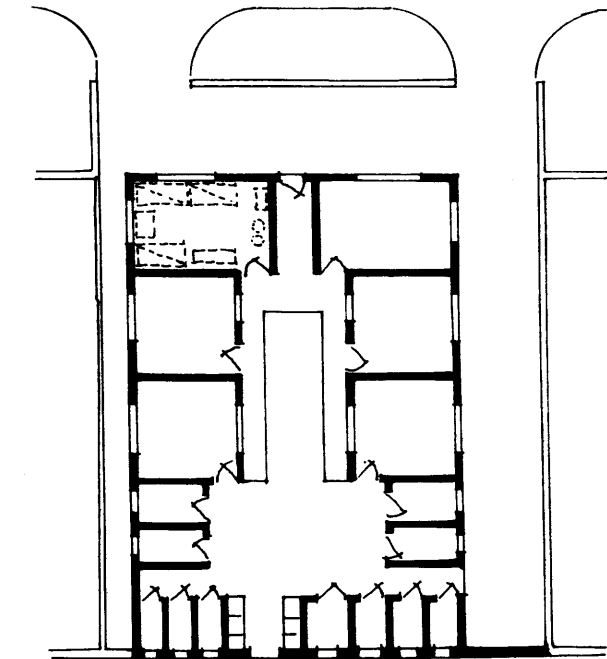
Scale : 1;200



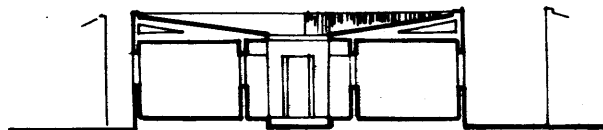
DWELLING GROUP



## HOUSING SUBSYSTEM THREE



PLAN



SECTION

## TENEMENT COURT HOUSES:

- Laid out in lots with rooms around a common court usually between 1-4 stories.
- High densities.
- Provides communal water, shower, and toilet facilities.
- Accessible to the low and moderately low income groups.
  
- Efficiency:
 

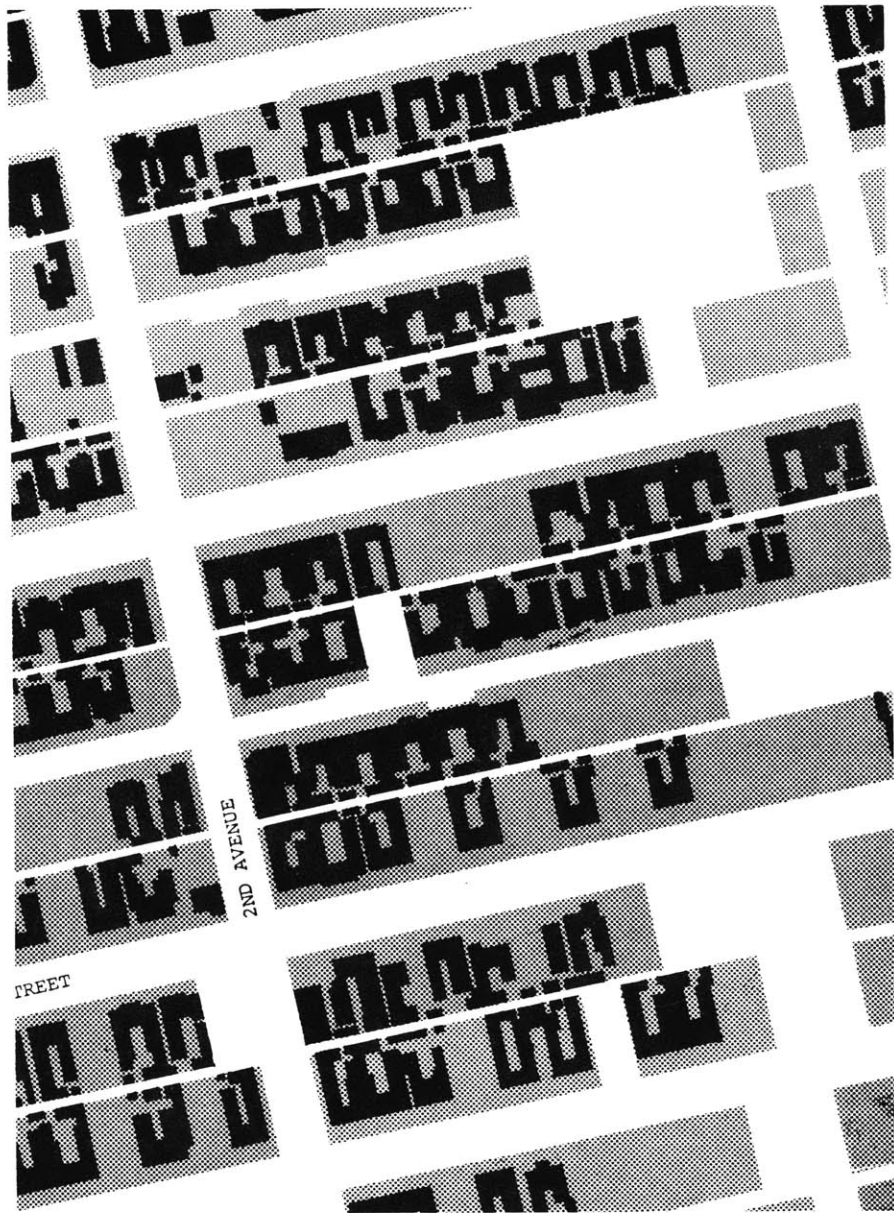
% Public-circulation	: acceptable
% Public-miscellaneous	: acceptable
% Private	: acceptable
  
- Intensity of Use:
 

Persons/Ha	: medium
Dwelling Units/Ha	: medium
% Built up coverage	: medium
  
- Layout:
 

Lot areas	: large
Length of circulation	: high
Ratio	: medium
  
- Existing Examples:
  - Eastleigh
  - River Road
  - Ngara

EXAMPLE : EASTLEIGH TENEMENTS

Scale : 1;200

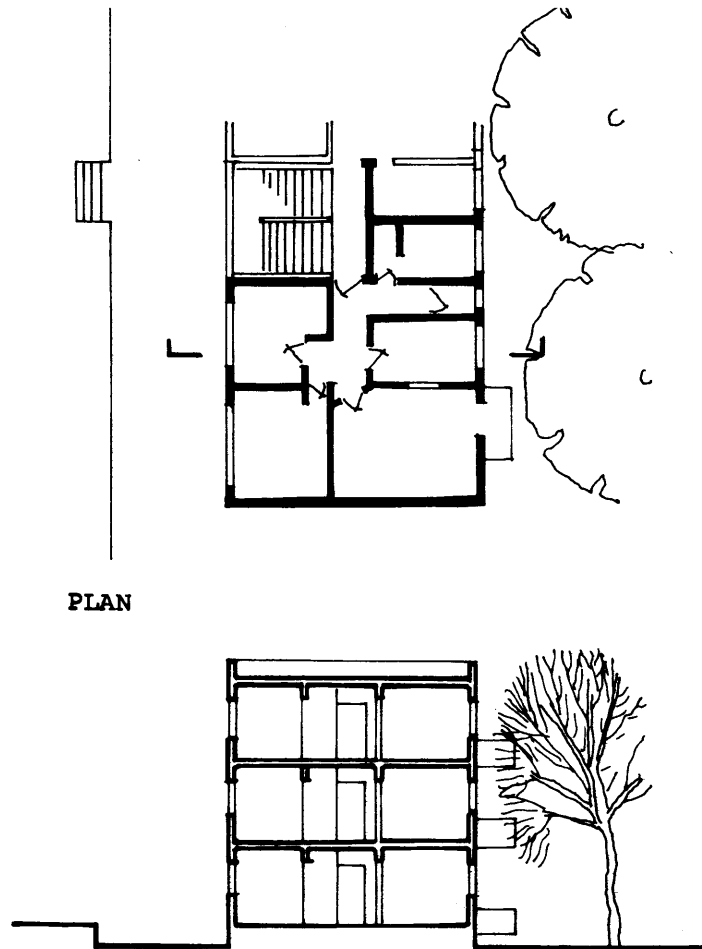


DWELLING GROUP

0 50 100 150m  
 SCALE 1:2,500



## HOUSING SUBSYSTEM FOUR



PLAN

SECTION

EXAMPLE : WESTLANDS

Scale : 1;200

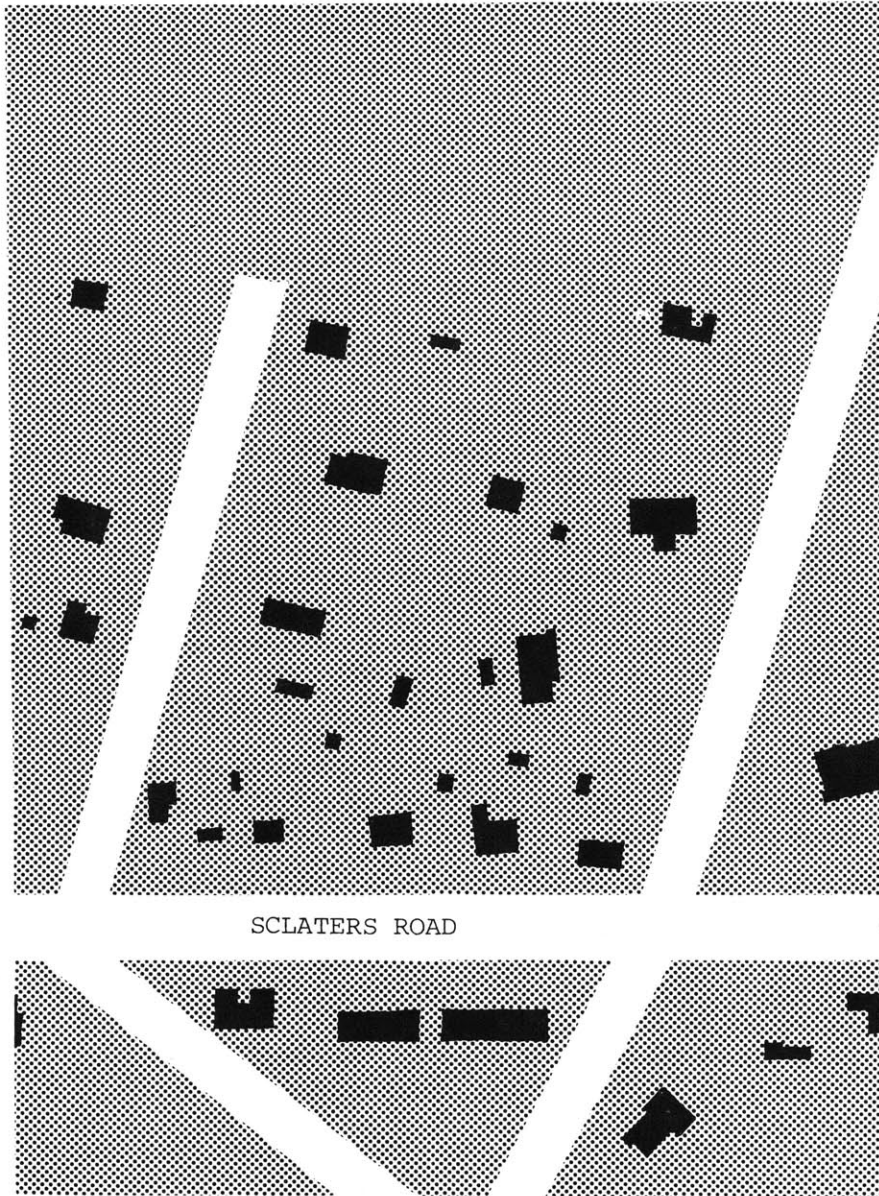
## WALK UP APARTMENTS:

- Laid out in various lot configurations and usually between 3-4 stories.
- Medium to high densities.
- Provides plots with connections for water, sewers, electricity and telephone.
- Accessible to the middle and high income groups.
- Efficiency:
 

% Public-circulation	: low
% Public-miscellaneous	: low
% Private	: medium
- Intensity of Use:
 

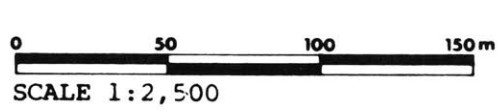
Persons/Ha	: low
Dwelling Units/Ha	: low
% Built up coverage	: medium
- Layout:
 

Lot areas	: large
Length of circulation	: low
Ratio	: low
- Existing Examples:
  - Pumwani
  - Westlands
  - Parklands



SCLATERS ROAD

DWELLING GROUP



SCALE 1:2,500





## HOUSING PROPOSED

The following subsystems are derived from studies of existing subsystems and demands. The socio-economic characteristics of the users and the physical environment are also considered. The housing subsystems on the preceding pages are some of the existing examples from which the following have been derived after analysis of the said.

### PROGRESSIVE DEVELOPMENT: ( SERVICED LOT UNITS )

- These will be grouped in lot clusters, and will be administered by the Nairobi City Council.
- Water, sewer and electricity connections are provided to individual lots.
- Users can either own, rent or lease the units and are to develop and build the dwellings.
- The uses anticipated and planned for are a) family b) family and sub-letting c) residential and or commercial/small industries and d) multi-family.
- This system will permit medium and high densities.
- It will provide private land for dwelling and semi-public for circulation.

### COMPANY OR COOPERATIVE HOUSING: ( SERVICED CLUSTER AND THE PROVISION OF TOILET, SHOWER AND COOKING FACILITIES )

- These will be grouped in lot clusters and administered by Nairobi City Council.
- Water, sewer and electricity connections will be provided to the cluster.
- The units will be developed by Housing Cooperatives on single room occupancy basis. Each unit will have water, sewer and electricity connections.
- Users can either own or rent the units or individual rooms.
- The uses anticipated and planned for are a) individuals and couples b) families and sub-letting. c) commercial.
- The Nairobi City Council administration will avoid excessive rents

### TENEMENT: ( TENEMENT DWELLING UNITS )

- Tenement units in lots will be leased and bought by private developers from the Nairobi City Council.
- Units will include lots with rental rooms and communal facilities like toilets and showers.
- Units will be offered to users for rent or ownership in condominiums.
- Dwelling uses anticipated and planned for are:
  - a) individuals or families
  - b) family sub-letting rooms
  - c) commercial and small industries.
- This system will permit medium and high densities.

### COMMERCIAL/SMALL INDUSTRIES WITH RESIDENTIAL:

#### ( COMMERCIAL, OFFICES, INDUSTRIES, APARTMENTS )

- These will be main road serviced lots and will be leased or bought by private developers from the Nairobi City Council.
- Units will be administered by the developers.
- Units will include water, sewer and electricity.
- Units will be developed by private developers or commercial companies with options 3 or 5.
- Units will be offered to the user for rent or lease.
- Dwelling uses anticipated and planned for are:
  - a) commercial, small industries, administrative
  - b) middle income apartments for renting.

### WALK UP AND HIGH RISE APARTMENTS: ( APARTMENTS FOR MEDIUM AND HIGH INCOMES )

- These will be attractively located lots for lease or ownership by private developers from the Nairobi City Council.
- Units will be administered by the developers.
- Units will include water sewer and electricity connections.
- Units will be developed by private developers and or commercial companies.
- Units will be offered to the user for rent or lease or ownership.
- Dwelling uses anticipated and planned for are:
  - a) family residential.

## HOUSING:

## INTENDED USE:

- Primary residential with the supporting commercial and community services.

## POPULATION:

- 55,000-110,000 people at saturation. This figure includes the population from the expected subletting of room units.

## ROOM UNITS:

- There will be 18,600-37,200 rooms at saturation. Since, at least initially, housing will contain only individual rooms for renting or purchase, the term 'room units' is used instead of 'dwelling unit'.

## DEVELOPMENT GOALS:

- Housing and or sites to be provided for the very low low and moderately low incomes (below 850KSh) and also some for the medium and the high income groups.
- To provide alternative housing options/types:
  - 1) Progressive Development-Serviced Lot Units.
  - 2) Company or Cooperative Housing.
  - 3) Tenement Units.
  - 4) Commercial/Industrial/Residential Units.
  - 5) Walk-up and High Rise Units.

## LAND USE:

- Private, residential, 50-53% of the area.
- Public facilities, 25-35% Of the area.
- Circulation networks, 12-15% of the area.

## PLANNING ELEMENTS:

- Provision for maximum private ownership and responsibility both in development and in maintenance.
- Flexible planning allows maximum change at any time.
- Lot sizes are of a size which provide administrative control and planning development.
- Parks and Schools are combined to act as community areas.

## HOUSING TYPES:

- Type 1 = 25%
- Type 2 = 20%
- Type 3 = 35%
- Type 4 = 15%
- Type 5 = 5%

## DEVELOPMENT:

- The development will be both public and private.
- The financing, management, and staging of development will be handled by the particular developer within the overall plan of the site, and its goals.

## EQUIVALENTS - GLOSSARY

### METRIC SYSTEM EQUIVALENTS

#### Linear Measures:

1 centimeter	= 0.3937 inches
1 meter = 100 centimeters	= 39.37 inches or 3.28 feet
1 kilometer= 1,000 meters	= 3,280.83 feet or 0.62137 miles
1 inch	= 2.54 centimeters
1 foot	= 0.3048 meters
1 mile	= 1.60935 kilometers

#### Square Measures:

1 square meter	=1,550 square inches
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#### Square Measures:

1 square meter	= 1,550 square inches or 10,7639 square feet
1 hectare =10,000 square meters	= 2.4711 acres
1 square foot	= 0.0929 square meters
1 acre	= 0.4087 hectares

#### Dollar Equivalent:

1 U.S. dollar	= 7 Kenya Shillings
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#### The selection of existing house types represent:

- Range of Population Density:  
from very low (5 persons/Ha) to very high  
(1600 persons/Ha)
- Modes of Development:  
private, public, popular.
- Range of User Income Groups:  
from very high ( over 42,000 KSh/year) to very low  
( under 2,100 KSh/year)
- Range in Control of Open Space:  
from entirely private to entirely public
- Range of Dwelling Unit Types:  
room unit, house unit

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