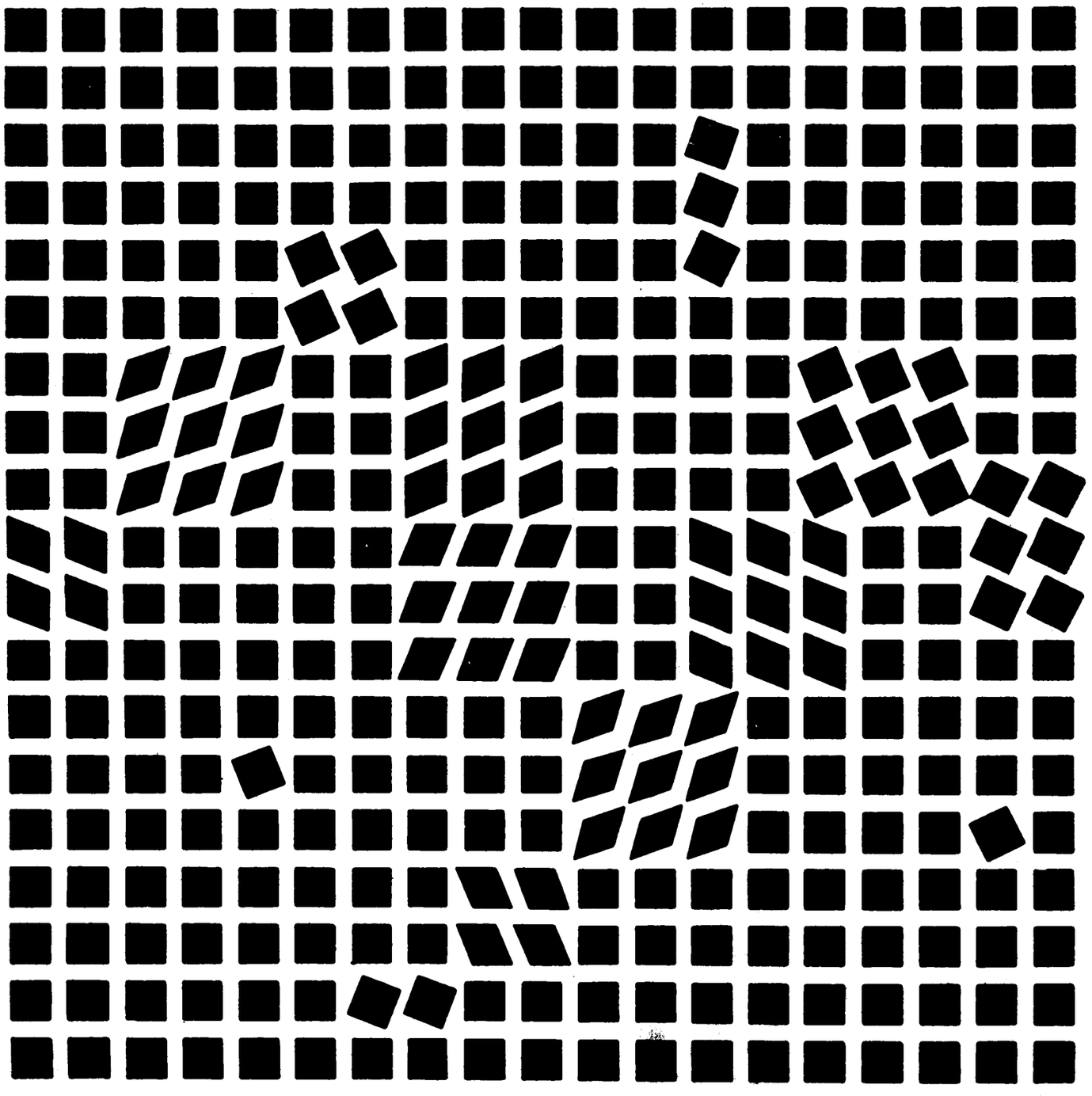
A MODEL FOR AN URBAN STRUCTURE ON THE CAPE FLATS

REVEL FOX MARCH 1969

FRONTISPIECE.

Victor Vasarely: Detail of a large composition in black and white.

Vasarely has taken the grid and infused its inherent monotony with an impelling dynamism. By calculated distortion the pattern becomes a magic carpet of interest and wonder.
The grid is technically the most efficient urban structure.
Vasarely has given us a new world of grids - a new kit of tools.



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PREFACE.

"... it is a tortuous logic to use the tragic effects of segregation as an argument for the continuation of it."
Martin Luther King.

This thesis is dedicated with affection to the Coloured people of Cape Town. They have filled the city with life and humour and have borne humiliations with dignity.

During preliminary research on this study it became clear that in order to investigate rationally any aspect of physical planning, it would be necessary to be specific about people and places.

The problem uppermost in mind was the explosion of human settlements around the growing edges of cities and the lack of attention it has received in planning circles and it was this problem that was chosen as the subject matter.

It was soon apparent that for a planning model to have any validity at this time, the problem of racial segregation with regard to land use would have to be faced.

From the standpoint of one opposed to this policy, two alternatives presented themselves. The first was to pretend no policy of segregation existed and prepare a purely hypothetical statement on this basis. This course was rejected as less than futile.

The second was to face the problem on these terms:

(i) By 1985, half a million low income working people will have to be housed, largely in rented accommodation built for them - regardless of policy or party.

(ii) As the likelihood of land segregation policies extending into the 21st century are remote, any forward looking plan should be designed for a socio-economic group and not a racial one.

(iii) Nothing prevents the specific needs of the first tenants from being catered for, provided future changes could be made.

Against the background of these assumptions, the problem assumed new dimensions and posed special challenges. On these terms then the study was pursued.

It should also be made clear that this writer firmly believes that long-settled natural communities cannot successfully be uprooted and transplanted into other areas. The complicated network of contacts and relationships does not survive this process.

Planners today recognise the need to rehabilitate houses and districts, to prune out obsolete uses to permit new growth and to revitalise and regenerate decaying areas, right where they are.

This study model then does not propose to accommodate the inhabitants of communities like District Six - who should stay where they are - but to provide for the natural increase of thousands who will find no place to settle other than on the expanding frontiers of the city.

The object is to make for these people a new environment in which the good and enduring qualities of the old will be found, but not the grim and morbid ones.

The challenge is to achieve the delight and urbanity of the Malay Quarter and District Six without their attendant failings; it is to conceive of an urban structure within which it is possible to form the basis of a good environment - A home for 'Urban Villagers'.

Palmboom House
March, 1969.

Revel Fox

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Jose Cotta, my supervisor, for his patience and good counsel.

And to Suzanne.

THESIS

THESIS.

A MODEL FOR AN URBAN STRUCTURE ON THE CAPE FLATS.

In 1966 the American Institute of Planners mounted a two year consultation to study the Next Fifty Years. Part 1 was entitled Optimum Environment with Man as the Measure.

It was this arresting theme and the papers that flowed from it (1) that became the central idea and the broad objective of the study.
The method by which this study is carried out is by means of a model for an urban structure, as a basis for a satisfactory framework for human settlement.
After due consideration a purely abstract diagram is rejected in favour of a model designed in conformity with all known criteria but theoretical in the sense that detailed topographical and locality constraints are subdued.
With this method the essential nature of the diagram is undiluted and the processes of analysis are easily grasped.

TERMS OF REFERENCE.

1. To examine the characteristics of the Coloured people as a socio-economic group in all matters that will influence their physical and spiritual needs and aspirations.
2. To examine the proposed site on the Cape Flats in order to determine the effect that its spatial and physical attributes will have on planning a human settlement.
3. To examine the structures, systems and networks at whatever scale necessary to determine the manner in which (1) and (2) are interrelated.
4. Through this process of investigation to arrive at criteria which will shape the final planning decisions.
5. To prepare a model for an urban structure as a framework for human settlement based on the foregoing criteria and related as closely as is feasible to present requirements.

(1) William R. Ewald Jr. 1966

PROCEDURE.

1. Relevant facts are reviewed which include: statistics, reports, regulations, laws, codes, draft proposals, master plans, social studies, informed attitudes, human opinions, approved and measured standards, appropriate analogies, and prophetic literature.
2. Relevant precedent is analysed embracing: ancient settlements, Utopian theories, ideal cities, visionary proposals, abstract models, past failures, successful solutions, analogous examples, current research, recent urban models and proposals for the future.
3. 1 and 2 are interrelated and from the amalgam a series of criteria are arrived at.
4. These criteria then are applied to the physical process and determine the shape and properties of the model.

METHODOLOGY.

The objective is to find an optimum structure within a given framework. It involves the questioning of existing and inherited systems in the light of present knowledge.

The Broad Context is examined:

(i) The principal elements of the existing movement structure of Cape Town are examined and tested against:
(a) Optimum traffic grids and (b) Radial corridors, and degrees of correlation observed. (Dwg 2)

(ii) A combination of (a) and (b) is developed on the basis of optimum grid sizes and the correlation to the major existing movement structure observed. (Dwg 3)

(iii) Conclusions are reached favouring the concept of a third radial corridor bisecting the existing two and reconciled with the incipient overall grid.

(iv) A preferred combination of railway and freeway grid is compared with the existing patterns and a satisfactory degree of correlation is found to occur.

The General Locality is Tested:

(i) The area proposed for the settlement of Coloured growth is examined. (Dwg. 4)

(ii) An idealised growth structure in the form of a directional grid is imposed on the existing pattern.

(iii) The spatial feasibility of the model is examined in the light of present systems and is found to conform closely.

(iv) A lineal development capable of cellular growth between terminal nodes is advanced as a broad context within which to pursue the study.

The Grid is Described:

(i) The lineal corridor is broken down into its major component, the 2-1/4 mile square directional freeway grid, bisected by a railway line.(Dwg. 5)

(ii) The movement structure is separated from the system it encloses by means of a transparent overlay.

(iii) This diagram reveals the most important single idea in the study, the integration of:-

(a) The 2 mile motor structure.
(b) The 1 mile pedestrian structure.
(c) The lineal rail structure.

(iv) The plan indicates the emergence of broad patterns of land use - schools and parks flanking major routes, contained residential zones and lineal central spines.

THE URBAN STRUCTURE.

The Model:

(i) The Model which is studied in detail is the 6000 foot sector (Dwg.6).

(ii) Overlays isolate the primary traffic and pedestrian routes indicating the significance of the station as centroid.

The Residential Zone:

(i) One option for a residential zone is illustrated (Dwg. 7). The details of the pedestrian walks, culs-de-sac and parking zone are shown on a separate sheet.

(ii) The suggested distribution of land uses integrated with the housing is analysed.

The Central Zone:

(i) The composition of the Central Zone is examined in greater detail.

(ii) A traffic overlay indicates a complex mesh of movement, integrating trains, buses, taxis, private cars, service vehicles and pedestrians.

(iii) A second layer shows the first stage of what will become an upper level deck system, connecting to garages and housing beyond.

The Structuring of Dwelling Units:

(i) The final studies describe to a larger scale the nature of the built and open space in the arrangement of dwelling units.

(ii) It indicates lengths of culs-de-sac, carrying distances, plot sizes, building lines, mixes of dwelling units and similar criteria for the grouping of dwellings.

Deductions:

The studies are discussed in the text and conclusions arrived at in the form of statements and tabulated data.

The main deductions are:-

1. Cape Town will grow eastwards over the Cape Flats absorbing whatever residential land is available.

2. A lineal corridor based on a 2-1/4 mile directional grid bisected by a railway line is a valid structure for phased expansion.

3. Such a corridor is likely to develop along the National Route to Faure and is able to accommodate the Coloured growth envisaged by 1985.

4. The commuter train will continue to be the primary transit mode for the journey to work.

5. A sector 6000 feet square structured around a railway station with compact residential zones flanking a lineal centre is a valid urban unit.

This model has been a means of arriving at certain meaningful generalisations about human settlements.
The plans are taken to the point of detail where their validity may be tested against criteria which are either permissable or economically viable.
After comparison with existing settlements they are found to have reasonable close correlation.

Caveat:
It is affirmed that the model is the study of a structure for human settlement, but is not a plan for a town.

ANALYSIS

High birth rates, big families and a tradition of compact urban living.

ANALYSIS.

The relevant data divides itself into two broad categories, both significant in establishing the measure and the range of the variables.
The first group are the generalities not specific to this hypothesis but common to many. They comprise inter alia the basic biological measurements, comfort tolerances and behavioural criteria recognised as being common to all men.
It is the survey of these facts that take into account what Dubos has referred to as the "Unchanging attributes of Homo Sapiens", who he says, "has existed as a species with a well-defined genetic endowment for some 50,000 years. On the other hand, man has continued to unfold his latent potentialities ever since that time. This ancient lineage accounts for the biological limitation of mankind and also for its immense phenotypic diversity." (1)
The recognition of these biological limitations has produced a range of standards surprisingly consistent through variations of time and space which regulate or condition man's environment.
With these are another related series of general facts which describe known physical dimensions associated with human activities and mechanical movement systems. Yet another field will shortly regulate the use of electronic systems.
The second broad categorisation of data referred to is specific. Those facts which inform us about the particular area and people that will form the basis of this thesis. Included in this family of facts must be the comparable studies in other related fields, reviews of precedent and examination of conditions in areas similar in essence but further advanced along a line of development to help predict patterns of the future.
No attempt will be made to handle these two categories independently. Indeed it is from the juxtaposition of the universal fact and the particular circumstance, that the promise of the old idea being rediscovered with a new significance lies.

(1) René Jules Dubos 1967 p.24

THE PEOPLE.

Background.

The Coloured people of South Africa came into being as a result of White settlement at the Cape of Good Hope a little over three centuries ago. Cilliers in a factual survey says:

> "Through this event and the subsequent processes of biological and cultural assimilation between slaves, aborigines and whites, coupled with a growing tendency towards social differentiation on the basis of colour, a population group with a distinct biological identity emerged gradually; a group which at the same time, as a result of its close integration into the economic, religious and political structure of the dominant white pattern of life gradually assumes also the social and cultural characteristics of the dominant white society." (1)

In this and other surveys referred to below it becomes clear that no inherent qualities separate this group from the Whites, and characteristics that appear typical can be observed in similar socio-economic groups elsewhere.

Statistics.

In the 1960 population census the Coloured population numbered 1,509,258 persons or 9.4% of the total population. Of these one quarter was found in the Greater Cape Town region of which 60% live in urban areas.
The Coloureds have a high birth rate (47.9) which is balanced by a high death rate and an unusually high infant mortality, which is attributable to poverty, ignorance and their consequences. Notwithstanding this the rate of natural increase remains double that of the White group.
Expectation of life at birth for the male is about 45 years and for the female about 48 and this falls below the standards of most developed countries. This, together with the high birth rate, means that well over half the population are under 21 years, putting a high burden of dependants on the adult population.
The Coloureds are known to be keenly class conscious.

(1) S.P. Cilliers 1963 p.13

Careful provision should be made for the aged, to maintain a balance in young settlements. Life expectancy at birth is 48 years.

"Although the Coloured population is, viewed as a whole, a generally underprivileged urban and rural working class, their heterogeneous background, their almost complete westernization and their marginal position in the general class structure, have combined to make for the development of sharp class distinctions among themselves." (1)

Here it should be added: and between other racial groups, in particular the Bantu.

Standard of Living.

In general the Coloured is poor. Most surveys indicate that about half the families live below a minimum needs level. (2)

Watts in a valuable survey of the housing requirements of the Coloured says:

"The relative economic status of the average Coloured household is low, and there can be no doubt that a large section of the Coloured in the region are in serious poverty." He goes on to add "The poverty of the Coloured - and probably of other racial groups in the Republic - seems basically the same as the poverty which plagued Western Europe about half a century and more ago. The solutions to the problem will probably prove to be in the end the same solutions as those worked out in Europe." (3)

Health.

The standard of health of the Coloured people is low. In most cases comparable with similarly placed working populations elsewhere. The most significant statistic is the very high incidence of tuberculosis, particularly among urban dwellers, and directly attributable to social conditions and living standards. The level of mental health was found in a recent survey to coincide with conditions elsewhere. Facilities for treatment were found to be inadequate. The research revealed a correlation between psychiatric illness and poor social conditions, in particular overcrowding.

(1) S.P. Cilliers 1963 p.26
(2) E. Batson 1955
(3) H. L. Watts 1962 p.15

The survey also investigated the incidence of alcoholism among the Coloureds.

"With regard to alcoholism the situation is alarming. At a conservative estimate 4% of the population or more than 8000 persons over the age of 20 in the Cape Peninsular are addictive alcoholics. These are mostly men (85%) of whom only a few are Malays (5%) ..... In all therefore 22% of Coloured men could be called excessive drinkers, and of these about a third were addictive alcoholics ..... Women are particularly abstemious, 73.8% of all adult women being abstainees and most of the remainder are social drinkers. Less than 20% were excessive drinkers. There is therefore a very characteristic pattern: much excessive drinking and a very high rate of alcoholism amongst the men, and many abstainers amongst the women." (1)

In its conclusions the report calls for medical and psychiatric treatment. It also associates alcoholism with adverse social conditions and points to a connection between family and social disorganisation. The real remedies are related to root causes, and better conditions of education, employment and housing are seen as necessary. Finally it was felt that changes in family structure should occur which would result in the male assuming more responsibility and gaining status.

Family Life.

Characteristics:

In this area generalisations can be misleading due to a considerable social stratification and socio-economic heterogeneity. In line with what has been said of their close conformity with the White group, the Coloured are monogomous and mostly have Christian marriages. In lower industrial and rural classes, official registration of marriage is postponed or does not occur in many cases, resulting in a high incidence of children born out of wedlock. High birth rates usually result from ignorance or negative attitudes towards birth control. In a study (2) carried out in 1961, 90% of the spouses of the labourer class were found not to believe in birth control.

(1) L. S. Gillis 1965 p.p. 2 - 4
(2) A. F. Steyn 1961

Gregarious by nature; but an alarming incidence of excessive drinking and alcoholism among the men.

Matriarchies:

Cilliers (1) has indicated that significant differences exist between classes of Coloureds.

> "This difference relates in the first instance to power and authority. Mother centred and/or mother dominated families exist amongst the lower classes in contrast to a more father dominated egalitarian family pattern amongst the higher social classes."

There are many studies which indicate that the matri-linear situation is a characteristic of lower working class families elsewhere. A study in Liverpool reported:

> "Both Jamaica and Ship Street are flourishing matriarchies. In both a certain amount of lip service is paid to the male, but the chief female in the family is the pivot and the boss ..... In Ship Street the majority of women after marriage live either with their Mum, or as near as possible in the same street or just in the next street." (2)

A further study on working class families in Acton reports:

> "The grandmothers, especially the maternal grandmother, played an important part in the lives of many of the families ..... They were the child minders for their married daughters who went out to work; they were called in to help with confinements or illnesses and they were consulted on the upbringing of children." (3)

Multi-Family Households:

It is clear that some form of extended family structure is prevalent among the Coloured which is associated with social disorganisation, alcoholism, working mothers, and related effects of poverty. In many ways the family has taken over the social welfare aspects of the community and absorbs the parentless, the aged and those in need of care.

This phenomenon has led to a relatively high incidence of multi-family households. Watts' survey (4) revealed a ration of four-fifths one-family households to one-fifth multi-family households containing one or more extra households. A total of just over one quarter of the households contained the basic family plus relatives only. Non-relatives living with families were found to occur in only 5% of the cases.

His research indicated:

> "The mean size of Coloured household studied 5.0 persons per household. Single person households were excluded as being outside the scope of the survey. More than half of the households contained six or more people, while but one-fifth consisted of only 2 or 3 persons. Thus the Coloured household is large." (1)

Uprooting and After:

The impact of the provision of adequate housing on family life and kinship among working classes in London has been examined by Young & Willmott. They look at before and after conditions of families that have been resettled in new housing areas in accommodation of an approved standard.

There was much evidence of the strengthening of the nuclear family and the role of the father as its head. Loneliness and a degree of isolation brought husband and wife closer together. The advantages for the children was universally recognised and sacrifices were made to maintain higher living standards and pay for the television, telephone and increased transport costs that were usually associated with the move.

> "Many of the husbands gave up drinking, a change made all the easier by the absence of pubs. 'I was a heavy drinker before' said Mr. Minton, 'I'm a teetotaller now.' Others said the same: 'Well, if you're going to put your children first you can't spend your money on drinking and smoking.' " (2)

Although the correlation is tenuous and the inference optimistic, observers have confirmed similar experiences amongst reaccommodated Coloured at the Cape although no research conclusively supports this view.

(1) S. P. Cilliers 1963 p.26
(2) M. Kerr 1957
(3) L. A. Shaw 1957
(4) H. L. Watts 1962 p.p. 4 - 6

(1) H. L. Watts 1962 p.5.
(2) Michael Young & Peter Willmott 1957

Most men are skilled or unskilled manual workers and there is a fine craft tradition in the building industry.

Kinship and Ties:

Further evidence may be found in the work of Gans in a Boston working class neighbourhood called the West End among the Americans of Italian parentage who live there.

> "West End households are nuclear with two qualifications. Married daughters often retain close ties with their mothers and try to settle near them. They do not share the same apartment, because however close the ties, there are differences between the generations - or at least between husband and mother-in-law - that are likely to cause conflict." (1) As a corollary to this he adds "Since rents are low in the West End unmarried siblings often had their own apartments", a clear indication not only of low rentals but also of availability.

Employment:

The Coloured male is usually a worker. He is employed in manual labour of an unskilled or semi-skilled grade. In the greater Cape Town region this group is mainly concentrated in the agricultural, manufacturing and service functions.
In a population study (2) prepared last year it was found that the proportion of farmer/fishermen, and productive service workers is high in contrast with the low incidence of professional/technical, administrative/executive, clerical and sales.
Half the Coloured male population is economically active (49.18%) as compared with a little less than a quarter of the females. (23.60%) Cilliers (3) reports that although agriculture still constitutes the main source of employment for Coloured males, that this source together with building construction show a relative decrease whereas manufacturing and commerce and electricity are growing as a source of Coloured employment.
More than half the economically active females are employed in the service industry with a spectacular increase in the small number employed in commerce. Manufacturing is the other large source of labour for females and accounts for about one-fifth of the workers.
The tendency is for fewer women to be engaged in service with an increasing number moving to manufacturing and more recently to commerce. These figures apply particularly to Cape Town and are not necessarily the same in all parts of the Republic.

(1) Herbert J. Gans 1962 p.45
(2) Greater Cape Town Region Plan Report No. 2. 1968 p.17
(3) S.P. Cilliers 1963 p.p. 41 - 42

Income.

The earning capacity of the Coloured is low although the urban worker earns more than twice as much as his rural cousin. The Coloured median income of about R200 is only one-seventh of the median income for Whites. There are indications that better education and an increasing demand for Coloured labour in higher paid employment will raise their income level progressively. There is nevertheless widespread poverty. Watts finds that:

> "The income of the man and the wife is frequently insufficient to meet the cost of the theoretical minimum requirements for healthy survival. It is estimated that 53% of the Coloured households at the time of the survey were below the secondary poverty datum line." (1)

The problem of poverty is directly associated with low earning capacity or low income. An aggravating factor is the high birth rate and the number of dependants. Increased wages due to a labour shortage and progress in family planning are both capable of improving the situation substantially.

Education.

No basic differences exist between the educational requirements of the Coloured group and those of the Whites, and it is assumed that the same provisions with regard to syllabus, facilities and recreation will be made.
Coloured education, until recently largely the concern of Church and Missionary organisations, is now under the auspices of the Department of Coloured Affairs.

(1) H. L. Watts 1962 (vi)

The Eoan Group has a consistently high level of attainment.
A 'Degas' study in a dressing room.

Although significant increases in school attendances among the Coloured have occurred in recent years, there are still far too few scholars completing secondary schooling and specialised technical or professional training.
Cilliers gives these figures:

> "Of approximately 280,000 Coloured children at school in the Cape in 1961 only 4.6% were in the higher standards V11 - X, while 38% were in sub-standards A and B ..... There were only 962 candidates for the Senior Certificate, of whom only 39 obtained first class passes (4%) and 487 (50.6%) second class passes. Thus almost half the candidates failed the examination." (1)

This low standard of attainment represents substantial advances over past years. In a report carried out between 1953 and 1956 various reasons were given for low attainments and retardation of pupils. The causes were found to be related to the poverty and rapid growth of the population group. Overcrowded classrooms, insufficient training of teachers, inadequate libraries and shortages of text-books being contributing factors. Correlation was found between school results and the socio-economic conditions at home. The status of the head of the family, the housing conditions and the incidence of working mothers are particularly referred to. (2)

Training Facilities:

Coloured students are permitted to enrol at certain White universities in order to attend faculties which are not catered for in their own training institutions, in particular this applies to the professions. A University College for Coloured students has been established at Bellville. In its initial stages it will concentrate on the training of teachers for secondary schools. A Technical College for Coloured pupils has been built at Athlone. Some technical training is also being provided at Trade Schools and provision is being made for training in agriculture at a college instituted for this purpose.
Extra-mural and adult education in music, drama and the dance will be provided at the Eoan Group Cultural Centre which is under construction at Athlone.

(1) S. P. Cilliers 1963 p.55
(2) Cape Provincial Administration: Report of the Coloured Education Commission 1953 - 1956

Space for Schools:

In a government manual (1) of requirements for master plans the criteria for schools are laid down. In it a Primary School site of 3 morgen is to be provided for every 3000 persons on the assumption that the school does not accommodate more than 800 pupils. More recent data recommends provision for 4 morgen sites for every 4000 persons in an attempt to cope with the numbers of school entrants in larger schools.
High School sites of 7 morgen are required for every 7,500 persons. Sites for creches or nursery schools one morgen in extent are to be provided for every 1,500 persons. Fewer larger sites are permitted with the proviso that children should not have far to walk to reach them. It is intended that school sites be integrated into the housing structure whereas universities, training centres and specialised institutions be at centrally located situations on designated sites.

Population Growth.

It has already been stated that the Coloured group have a high rate of increase (3.7% per annum). In a preliminary report (2) on the Cape Flats the population of the Metropolitan Area of Cape Town for 1965 was given at 501,593, which was expected to grow to 1,041,000 by 1985 and 1,800,716 by the year 2000.
This growth figure is high, even when set against world population figures which are expected to double by the end of the century. Extrapolation for parts of Asia, Africa and Latin America predict that population will increase approximately six times in the same period.
Seen in relation to such figures the Coloured growth rate here at the Cape is not exceptional. Whatever the errors in prediction of changes of growth rate, it is clear that a large and rapidly growing number of people, many of whom are poor, will be living in metropolitan Cape Town during the next thirty years.
Attendant on the problem of growth is the related backlog in housing and services and enormous efforts needed to close this gap.
The problem of growth and the greater number is the universal lot of large cities. Ways will have to be found to accommodate it or the whole urban mechanism will collapse as a result.

(1) Manual of Standard Requirements for Master Plans and Township Layouts for Indian & Coloured Communities 1967 p.7
(2) Cape Flats: Joint Town Planning Committee of the Cape & Stellenbosch March, 1967

Of the 280,000 children at school in 1961, 526 finished.

THE PLACE.

Spatial Characteristics.

The choice of the place at the south-eastern edge of the Cape Flats was a natural one, given the aim of the thesis to examine the structure of urban growth at the outer edges of the city. For it is on these sandy plains east of the city that the overspill will be housed.

Information Sources:

The Cape Flats have been fully described in various reports, among them:

Report of a Committee of Enquiry appointed to enquire into conditions existing on the Cape Flats and similarly affected areas in the Cape Division, 1942, (Government Printer, Pretoria 1943).

Preliminary Report of the Cape Flats Sub-Committee March, 1967.

Joint Town Planning Committee of the Cape and Stellenbosch.

Falling as it does within greater Cape Town aspects of the area have been dealt with as a part of the whole in the:

Greater Cape Town Region, Planning Reports No's 1 - 5 Cape Provincial Administration 1967.

The basic physical survey material has been well set out in sufficient detail in the above documents to serve the purposes of this thesis and no attempt will be made to reproduce them extensively here.

The Limits defined:

The facts are accepted and adopted as a framework for design, for it is the study of the planning problem and not a collection of factual material that is the main concern. It is consequently only those factors having the most direct relevance to the thesis that are assembled, more as a stimulus to the production of the idea than a rehearsal of statistics.

> "The Cape Flats are the plains ..... which extend eastward and northward from the foot of the mountain range of the Cape Peninsula and which is co-extensive with the sandy isthmus linking the Peninsula to the mainland ..... The extent of the area defined is approximately 700 square miles." (1)

(1) Cape Flats Committee of Enquiry. 1942 p.1.

The study area falls within part of the Cape Flats proposed for the settlement of the Coloured group. Broadly described this space lies within a box bounded on the west by the Mutual-Southfield-Muizenberg railway line, on the north and east by the Mutual-Bellville-Strand railway line and on the south by False Bay. To this statement must be added that within that general area lie other land uses which fall outside the Coloured Group Area, in particular industrial and agricultural areas, the D.F. Malan Airport and land allocated to other racial groups. However, the image will not be unduly distorted by these factors.

The Study Area:

The part of this zone which has been selected as an area suitable for investigation is that area falling in what is referred to as Planning Districts J, (Macassar Dunes), K (Eersterivier Forest Reserve South), L (Mitchells Plain), M (Swartklip Road) and O (Eisleben) in the Cape Flats Report 1967. (1) In this Report the abovementioned planning Districts are suggested as potential growth areas for the Coloured group where 586,977 persons could be housed by 1985.

The Surface:

A brief physical description of factors relating to the study area which affect development is listed.

The topography is level; there are no slopes in excess of 1:20. It is low-lying most of the area being at altitudes between 100' and 200' above sea level. The entire area is drift-sand and parts of it have a wave formation probably due to wind erosion, which runs in narrow parallel mounds from south-east to north-west.

The Edges:

The area is flanked (a) on the west by a large belt which has been set aside for agriculture and which has in it extensive deposits of high grade silica sand suitable for glass-making; (b) on the north by a zone containing a Bantu group area, a large industrial zone, the D.F. Malan Airport and other land allotted for social welfare and nuclear research; (c) to the south lies the coastline and (d) on the east a White Group Area, and an agricultural district.

(1) Cape Flats Report 1967 p.10

Climate - Ecology:

The climate is typical of the Cape winter rainfall area, except that at its eastern edge only 14 - 17 inches of rain fall by comparison with averages of 64 inches at the Newlands reservoir.

Lying between the two oceans and exposed to the sea, temperatures will seldom rise above 90°F but the prevailing south-east summer wind will blow hard and frequently.

Problems of a high water table, poor drainage and shifting sand formations are common and difficulty has been experienced in growing large trees for shade and wind breaks.

Before the natural ecology of the area was disturbed it was well covered with natural vegetation and the efforts of agriculturalists prove that in many parts good conditions exist for development of parks and gardens.

Access:

The study zone has the advantages of accessibility to open space and the coast beyond on the one hand and industry and major facilities on the other. If adequately linked by transportation routes, it is capable of direct connection to either the main centre in Cape Town or such sub-centres as may develop at points between.

THE MOVEMENT STRUCTURE.

"The motor vehicle is here to stay; numbers may increase three or four times by the end of the century and half the total increase is likely to come within ten years." Colin Buchanan (1).

"Eventually says McLuhan ..... they will work at home, connected to the corporation, the boss, not by roads and railroads, but by television. They will relay information by closed circuit two-way T.V. and by computer systems. The great massive American rush hour flow over all that asphalt surface, going to and from work every day will be over ..... The only cars left will be playthings, sports cars. They'll be just like horses are today, a sport .."
(2) Tom Wolfe

(1) Colin Buchanan 1964 p.247
(2) Tom Wolfe 1968 p. 46

Kinetic Patterns:

From its inception the Cape developed on radial lines. The first settlements along the southern route to the anchorage at Simonstown were constrained by the topography to a lineal pattern. Later development west to Bellville and Kuilsrivier developed strong lineal characteristics. The building of all-weather roads, then railways and finally freeways has cemented these radial corridors in their present form.

Without the constraint of a primary functional route or a mountain edge, growth over the Cape Flats has been amorphous and the routes characteristically, in grid form, giving evenly distributed accessibility in all directions.

The introduction of a major national route diagonally across the centre of the Cape Flats from Cape Town to Faure occurred much later than the northern and southern routes but is nevertheless destined to have profound effects on the development of the area between them. It is in fact the beginning of a third major radial corridor converging on the city having along it a linear pattern of settlement not unlike the two that preceded it.

From the Draft Proposals this pattern can be seen emerging. (1) This thesis is largely an attempt to analyse this pattern and suggest models as ideas for the settlements it will contain.

Draft Proposals:

Rail proposals linking Athlone with the southern end of the Nyanga line and extending on in the direction of Macassar generally run parallel with the freeway and are flanked by other routes all strongly emphasizing the lineal or 'corridor' nature of the settlement pattern.

The railway links the corridor with sub-centres along its route and with the main centre at Cape Town in an ascending hierarchy of amenity. In addition to the main radial systems proposals are shown for strengthening the grid formation giving necessary access to spaces between the corridors and to the amenities that develop there. Particular reference is made to an unbroken route from Maitland to Strandfontein on the north-south axis and in the opposite direction to an east-west arterial road, linking three freeways between Wynberg and the Swartklip interchange.

(1) Cape Flats Joint Town Planning Committee 1967

The Motor-Car.

Car Ownership among the Coloureds is low and relates to the income level. It is however rising rapidly with the standard of living and is likely to follow the characteristic growth of the White group. There are indications that as soon as, or even before, a household can afford to own a car, it acquires one. Evidence of sharing and joint ownership are common. Although the primary use is the work journey, there is an increasing tendency towards supermarket shopping, usually in a White area and near the place of work.
The paucity and inaccessibility of recreation areas is another strong factor influencing the growing car ownership.
The economics of bulk purchases and the absence of delivery systems encourage the luse of private transport for this purpose.

The Swing Away from Public Transport:
There is no difficulty in finding reasons for a swing away from public transport for those who can afford to run their own car. Among the Coloureds there are additional or aggravated causes. The following are widely held opinions on the subject which are not, as far as is known, supported by research.
Segregation on buses which relegate "Non-Whites" collectively to the back seats involves conflicts, humiliations and inconveniences in practice which cause many of the higher income Coloureds to avoid this mode of travel. The move towards separate buses may influence this attitude.
The absence of segregation between the Bantu and the Coloured on public transport, in particular on the trains, is unpopular with many Coloureds.

The Rail System.

The Modal Split:
The traditional development of the city's radial form has been condusive to the continued use of the line-haul rail system inherited from the 19th Century. Contributing factors are the confining limits of the central city area, the conveniently located central commuter station and until recently the efficiency of the carrier service.

It is considered that Cape Town is fortunate in having an urban form structure well-related to an independent rapid transit system. Many will travel by car in the future, but according to Buchanan:

> "There will always be a sizeable block of the population needing some kind of public transport services." (1)

By way of illustration 75% of those travelling into New York to work do so by public transport, and in London the figure for people travelling to work by public transport in 1959 was as high as 93%. (2)
John Kain has found a direct correlation between higher incomes and the decline of the use of public transport. It must be assumed by present standards that a large number of the Coloured population will continue to earn low incomes during the period under review.

New Movement:
Although it is believed possible to develop an efficient city based entirely on private car transport, forty American cities are at present attempting to develop new public transport facilities.
Many different developments are under consideration. Nearly all involve large carriers moving on lines independent from other traffic. The rail system and commuter train is widely used in many variations. Here Gillespie describes one in characteristic terms.

> "Intra-urban rapid transit, or urban R.T. for short, describes a system serving the city, connecting the major central business district of the city with satellite centres, and with densely populated dormitory communities. The maximum length of trip would be about 10 or 15 miles, such a trip to be made in no more than 30 minutes ..... an average speed of 30 m.p.h. can only be achieved if station stops are limited in number and duration, in this case an average of one stop per mile and 30 seconds per stop." (3)

(1) Colin Buchanan & Partners 1966
(2) John Tetlow and Anthony Goss 1965 p.75
(3) Phillip Gillespie 1968 p.p. 74 - 75

He also describes the familiar urban-suburban rapid transit associated with cities larger than Cape Town, usually having long corridors of suburban settlement. The Bay Area Rapid Transit is such a system. In order to achieve low travel times over much greater distances than 15 miles, station spacing moves to 2.3 miles apart and average speeds to 50 m.p.h. Commensurately higher comfort standards are recommended.

Linked Systems:

In his lectures to planning students at the University of Cape Town, J.F.M. Zoutendyk, an authority on railway engineering questions

> "the best means of handling commuter passenger traffic in and out of cities, bearing in mind that one eleven-coach train can carry a maximum of 1600 passengers with an average of 800 over the peak period ....
>
> Possibly the answer is the combined use of:
>
> (a) Bus and private motor-car feeders to suburban railway stations,
>
> (b) Fast and frequent trains or other forms of rapid transit into the cities,
>
> (c) Bus feeders and conveyor belts within the cities."

Movement Patterns as Urban Structure.

Rapid changes in modes of transport and the very fast spread of the motor-car have left most cities and their planners much concerned with running repairs and remedial measures to keep traffic moving and systems functioning and it is consequently only recently that the movement system became fully recognised as the structure upon which urban form would largely depend. There were, however, visionaries and thinkers who saw clearly the implications of this new technology and many theories of lineal development associated with the train and railway emerged, including those of Soria y Mata, Jean Raymond, Gonzalez del Castillo, Edgar Chambles, Le Corbusier and many others. (1) Their application and relevance to this study will be discussed elsewhere.

(1) George R. Collins 1965 p.p. 204 - 217

The Bus System.

Changing Morphology:

The bus has been mentioned as a sub-system of the commuter network. Its significance must be seen against the background of the changing city structure. The initial radial development of Cape Town broke down here as elsewhere with the patterns created by the motor-car. The choice of direction and a consequent equalisation of route significance demands an overall mesh or grid rather than a line. This need is reflected in the proto-grid that has superimposed itself over older settlement patterns with the increase of motor traffic and is most evident on the Cape Flats where level terrain and open land permitted planning to conform more closely to forces shaping the road network.

Line Haul and Feeders:

The effect of the break up of the lineal pattern led in Cape Town as elsewhere to the need for feeder bus routes to connect the spaces between the radial corridors with the existing transit system.

For people dependant upon public transport it usually led to changing and double fares as well as an increase in travelling time.

This effect is noticeable in the case of the "resettlement areas" that have so far developed on the Cape Flats, where the greatest number of peak period commuters travel eastward by bus to Mowbray Station and then change to a train serving the C.B.D. and vicinity. In many cases the feeder bus journey is as great a distance as the subsequent rail journey.

The bus system in Cape Town operates primarily for the lower income group section of the population and the link-up between bus and rail services involves 55% of non-White passengers. "Many bus services originating in predominantly White areas are a combination of collector and line-haul type services and they travel directly to the city." (1) This however is not the case in the settled areas of the Cape Flats.

(1) Planning Report No. 3 Greater Cape Town Region 1968 p.5.

The work journey is usually slow and costly. More than half must use bus and train. Changes are tedious.

Costs Compared:

The findings of the report quoted indicate that bus fares are generally cheaper than first class train fares but more expensive than third class fares. Buses are also slower and prone to delays in congested traffic at peak hours.
They have the obvious advantages of flexibility of routes and can be directed to special short or long term needs where no rail service exists.

Future Trends:

Richards in discussing the future use of buses in urban transportation, says:

> "For a commuter bus system to be efficient, excellent roads are essential, the equivalent to a track in a rail system ..... Where no urban motorways exist bus lanes or bus-only roads have been tried in some cities with success.... Washington D.C. is now successfully running a mini-bus system carrying 18 seated and 12 standing passengers, which runs at 2 minute intervals over a 2 mile square area at a charge of 5 cents. Ideally a new type of vehicle to give both facilities (feeder and line haul) would be an advantage - one with the ability to run on ordinary roads, to collect and distribute, and yet run at high speed along a minimum track, possibly elevated right into the central areas ... Another one using electronic guidance has been tested for possible use by the Chicago Transit Authority to run along the median strip of a new expressway." (1)

Innovations suggested by Meyer,Kain & Wohl (2) for increasing the efficiency of a bus system include: automatic guidance on bus line-hauls to permit closer headways at higher speeds; the allocation of more highway space to buses during peak hours; centralised fare collection systems and high speed high capacity bus stations.

Future Modes:

In planning for the future no generalised patterns emerge. Some American cities are planning for 50% of commuters to use public transport and we have seen one case where the present figure exceeds 90%. The balance is established by many factors not the least of them being the level of comfort, convenience, accessibility and cost of the public transport proposed.
It is a fair assumption that topography and inherited patterns will largely affect future movement structures.

(1) Brian Richards 1966 p.p. 89 - 91
(2) J. R. Meyer, J. F. Kain & M. Wohl p.p. 318 - 319

The Pedestrians.

Who will walk?

The journey to work in the resettled areas of the Cape Flats usually begins with a walk from home to bus stop or station. School children frequently walk long distances to school or to the railway and pedestrian movement is at present usually along pavements adjoining motor roads. The large incidence of poverty among the Coloureds is a strong inducement to walk wherever time and distance permit, particularly as their travelling expenses per capita are extremely high relative to their incomes.
At this time therefore it can be assumed that a very large percentage of the population will or must go on foot to whatever destinations reasonably permit it.

The Case for Walking:

The arguments for a pedestrian scale of movement set in a sympathetic environment are hardly necessary to emphasize.
Ritter (1) has pointed out that the most inured motorist walks long distances without complaint in areas removed from traffic and cites the case of large university campuses and major shopping centres. He underlines the medical evidence in support of walking and describes the delights of the pedestrian-scaled traffic-free precincts, quoting Farehoe and Browne from the Architectural Review (no reference) as saying:

> "Once one plans for a purely human environment, the designer can attune far more sensitively to the individual need and character of each path, lane, square, court, piazza, alley, parade, bridge, underpass, avenue, precinct, green, row, back, twitten, gannel, snicket and vennel."

(1) Paul Ritter 1964 p.p. 31

Hanover Street has a lively mix of commercial uses and a strong city image, but the barrows have gone.

The Pedestrian Street:

In a comparative study between living patterns on a street and a traffic free path Ritter records some significant findings. He concludes:

> "Thus it is clear that statistics indicate to planner and architect that households along paths gain sociologically speaking to an extent that is quite decisive." (1)

An observation of the habits of the Coloureds particularly in more densely populated zones indicate a high degree of neighbouring with the street or front stoep as a venue. The incidence of children using the streets as playgrounds is as high as in similar working class zones all over the world. In long established communities the street market, the social parade, and the extensive use of squares or open spaces are well established facts. Living in a temperate Mediterranean climate the Coloured urban dweller of the Malay Quarter and District Six displays life styles closely conforming in many respects to his socio-economic counterpart around the Mediterranean shores.

Accidents:

The most decisive argument in favour of the pedestrian environment, free from the interference of motor traffic, is the incidence of accidents that occur at conflict-points between the two.

The cost in loss of life, injury compensation and repairs is staggering. In 1961 an estimated £230 million was spent on administrative costs, repairs and compensation associated with traffic accidents. (2)

The effects of intelligent planning for man and vehicle is borne out by the experiences in Cumbernauld where accidents involving injury to pedestrians have been found to be negligible.

Finally no one familiar with the streets of Venice, Mykonos, Santorini or even the Halen housing estate near Berne (1961) will need convincing of the environmental advantage flowing from space made with "man as the measure".

(1) Paul Ritter 1964 p.p. 38 - 39
(2) Colin Buchanan 1963 p.24

THE LAND USES.

Residential.

The Background:

The Land Use Report on the Greater Cape Town Region describes the growth of housing on the Cape Flats:

> "On the Cape Flats large housing estates ... spread along the south side of the Goodwood-Bellville line from Elsie's River to Bellville South, and the Cape Flats Railway Line from Athlone to Grassy Park ... Coloured housing continues to expand across the Cape Flats on both sides of the new National Road to Somerset West. Industrialisation and the consequent influx of population led to the erection of shanties by those non-Whites unable, or too poor to obtain accommodation. Some of the new housing replaces these shanties, and some caters for population growth, but much has been necessitated by group area legislation. Hence the term 'resettlement areas' applied to the growing residential areas on the Cape Flats.' (1)

Too many, too fast:

The problem of trying to house an indigent fast-growing population is by now a familiar phenomenon. It is a world wide condition that shows no sign of either being solved or even held at bay. In Latin America half the population of many cities are squatters and in Calcutta 600,000 are completely homeless. Principal cities are growing at a rate of more than 100,000 people a week. Demographers predict the world population of 3.2 billion will reach a total of 7 billion by the year 2000 with by far the greater majority settling in existing and new cities.

> "Major A.Z. Berman chairman of the Health and Housing Committee, said at a meeting of the Cape Town City Council yesterday that the Coloured housing position in the city was worse now than ever before" ... Council closed its eyes to the fact that 70% of the houses in the Coloured housing schemes had sub-tenants in contravention of the lease conditions. If it did not, thousands of people would be thrown out on the streets." (2)

(1) Greater Cape Town Region Planning Report No. 4 1968 p.83
(2) Report in the Cape Times. 28th Feb., 1969

Inches from the wheels of passing traffic, a child draws pictures on the tar.

The facts are, that notwithstanding an energetic building programme and a full awareness of the present and future needs, funds and resources have not been sufficient to cope with problems of resettlement, natural increase and replacing obsolescent or inadequate housing stock.

The Site.

Broad proposals for the allocation of land on the Cape Flats have been outlined in a preliminary Report (1) referred to in this thesis and no attempt is made to reposition or re-allocate uses except in the microcosm of the scale at which the study sector occurs.

The selection of the site was conditioned by the fact that it formed an appropriate context within which to effect this study. It is broadly speaking a corridor of residential development adjoining a main freeway and flanking a rail spine which links it to the main centres of employment. Along the north side of the corridor is a line of mixed uses including industry, an airport, social welfare, defense and nuclear research and on the south side recreation in the form of open space and the shore of False Bay.

Based on densities of 40 persons per gross acre the whole corridor from Eisleben to Macassar Dunes is expected to accommodate Coloured residential growth by the horizon 1985.

On the question of retail services and ancillary facilities:

> "In the central areas of the Cape Flats especially along the main radial from Athlone to Macassar it would however be economically feasible for intermediate retail centres serving only Coloured Communities to develop .... Apart from retail services and ancillary facilities provision must also be made for entertainment, cultural activities, professional services and other social needs. These invariably group themselves in or around the central business district or a strong intermediate retail centre." (2)

(1) Cape Flats Report 1967
(2) Cape Flats Report 1967

Densities.

> "Man is no longer subject to natural or cultural restrictions upon the increase of his numbers which is why the population explosion is the most serious threat to his continued existence .... There can be no doubt that man, also, is a territorial animal. Even in circumstances so far removed from the primitive as a contemporary Western civilisation, the countryside is demarcated by fences and hedges many of which carry notices stating that 'Trespassers will be prosecuted'." (1)

Density Defined and Described:

The most significant single factor concerning the use of land for residential settlement is density. Gross density is defined as: "The number of persons per acre exclusive of national parks, metropolitan open spaces, the upper slopes of Table Mountain and permanent vleis. It does not exclude roads even if arterial in character."

Planners examined 104 planning districts and found 6 had a gross density of over 50 persons per acre. They are:

District Six (P.D. 13)	approx	120	persons	per	acre
Malay Quarter (P.D. 4)	"	65	"	"	"
Langa (P.D. 74)	"	60	"	"	"
Wynberg East (P.D. 37)	"	59	"	"	"
Nyanga (P.D. 39)	"	56	"	"	"
Claremont Central (P.D. 35)	"	50	"	"	" (2)

On the basis of this study and observation of areas at various densities, the Joint Town Planning Committee of the Cape and Stellenbosch arrived at a maximum gross density figure for new developments of 40 persons per gross acre. This figure which results in nett residential densities of up to 100 persons per acre is found to accord closely with current attitudes to densities in Britain, in comparable circumstances.

(1) Anthony Storr 1968 p.33
(2) Cape Flats Report 1967

The Street as a place: Row housing and thronging pedestrians in Helliger Lane.

A Review of Current Attitudes:

The basic decision concerning the number of people that can or should be settled on an acre of land is probably the most important single choice in land use planning. It will be profitable to review some facts and opinions on the subject. Influencing factors include man's biological needs, changing patterns of living, tolerances of noise and privacy and aesthetic attitudes to open space.

"I shall therefore leap at this point, feet firmly together to the solution: Here is a fragment of a residential neighbourhood in the Radiant City. The population density is 1000 per hectare (slightly less than $2\frac{1}{2}$ acres)." (1)

"While we cannot pick out anything as typical we think the future demand will be for the proportion of dwellings with gardens at relatively low densities to be considerably higher ... than has been common in recent developments in Britain." (2)

"Between ten and twenty dwellings to the acre yields a kind of semi-suburb, consisting either of detached or two-family houses on handkerchief plots or else of generously sized row houses with relatively generous gardens or greens." (3)

"The large metal animals can be absorbed in very low density areas - plenty of trees to conceal and muffle, as well as space, but at normal garden city densities of 30 - 40 persons per acre the usual Levittown, New Town house types need some adaptation if they are not to be overrun especially with regard to noise intrusion." (4)

"We cannot expect people to live at high densities just because it has certain social benefits. The low density of suburban tracts is not due to chance; it has been created by a number of insatiable demands ... These demands are so basic and play such a basic role in the urban land market that low residential density is a universal feature of emerging metropolitan areas throughout the world." (5)

(1) Le Corbusier 1933 p.107
(2) South Hampshire Study 1966
(3) Jane Jacobs 1962 p.209
(4) Alison & Peter Smithson 1968 p.43
(5) Christopher Alexander 1967 p.100

"... We find our nett population densities to be 45 for detached houses, 121 for the terraced houses and 166 persons per nett residential acre in the 5 storey layout. These figures are not very high when we consider Hillbrow, Johannesburg, with about 600 persons per acre or the resettlement tenements in Hong Kong with 2,000 persons per acre." (1)

"A healthy average density for urban low-rise housing lies around 200-300 persons or 50-75 dwellings per hectare (80 - 120 persons in 20 to 30 dwellings per acre) but densities up to 200 persons per acre are quite feasible with two storey housing and on undulating ground, even with single storey housing." (2)

"The suburb fails to be countryside because it is too dense. It fails to be a city because it is not dense enough, or organised enough. Countless scattered houses dropped like stones in neat rows of development lots do not create an order nor generate a community." (3)

"With densities of only one hundred persons to the acre the tall slab block and tower have to seek their justification in the sphere of visual and architectural considerations ..." (4)

"Typical densities in persons per nett acre illustrating broad categories of low level compact housing for comparative purposes could be taken as: detached single family houses in a suburban sub-division 15, row housing with front and rear gardens 35; single storey L shaped court houses with pedestrian access 50; narrow frontage multi-storey row housing on hillside (Siedlung-Halen) 70; two storey row housing with single garden and pedestrian access 120." (5)

(1) D. M. Calderwood 1964 p.51
(2) Hubert Hoffman 1967 p.22
(3) Serge Chermayeff & Christopher Alexander 1966 p.63
(4) Walter Segal 1967 p.431
(5) Jonas Lehrman 1966 p.83

Housing.

> "It seems to us that the house, that is the dwelling in direct contact with the ground, is a concept that C.I.A.M. has never taken sufficiently seriously as a possible element of the city. The lack of basic thinking by researching architects in this field has meant that while the multi-level block is now established as an urban concept, the twentieth century has not yet produced a city or part of a city made of houses; it has produced suburbs, dormitory villages and Broadacre, all latter-day children of the romantic movement, but not a Polis ... Above all ... houses must be grouped into a significant order, to create a satisfying environment for families of all sizes and children of all ages; in other words there must be a statement of ideal human habitat." (1)

High, Low, Medium and Mixed:

Much has been written recently about criteria for housing, both as dwelling units and as elements of the environment. The facts relevant to this study divide themselves into the present and future needs of the community to be housed and what methods might be considered for meeting these needs. These methods might be examined in the light of similar problems elsewhere and at other times. A survey of current writing reveals a swing away from accommodating child-rearing families in high-rise housing. Social surveys, consumer demands and opportunity to observe the effects of completed housing schemes have had a sobering effect on many 'tower in the park' protagonists.

Attempts at mixing high and low rise development in a logical attempt to achieve heterogeneity have also been criticised (2) and it has been shown that unless the high-rise has been built to create more shared open space, it has neither raised densities much nor solved compatibility problems such as overlooking and overshadowing.

The arguments now put forward in favour of compact low and medium-rise housing are relevant in this context. The dense one to four storey types are appropriate precedent in a study where lift technology is likely to be ruled out on economic grounds.

(1) Howell Killick & Partridge Feb. 1966 p.80
(2) Walter Segal Sept. 1967 p.430

The Scarce Commodity:

The population explosion referred to earlier is sufficient reason for all urban land to be seriously regarded as a scarce resource. Even in countries up till now considered underpopulated, there is no longer enough of the right land in the right place to be found. A typical example is the mounting concern about the disappearance of arable land for vegetable and other table crops in the winter rainfall area of the South Western Cape.

H. G. Wells, Melvin Webber, Marshall McLuhan (1) and others have predicted that telecommunications will enable us to travel less and that the mediaeval concept of working at home will apply to increasing numbers, in years to come. If this occurs, it will have a profound influence both on the design of our homes and on the patterns of our settlements. In the meanwhile the 30 minutes time/distance radius from the main centres of activity will impose limits to the "spread or sprawl" on the outer fringe of the city.

Within these limits land will always be a potentially scarce commodity and as housing is the biggest single use to be accommodated, the economic and appropriate allocation of land for housing is vital to the efficient functioning of the city.

Gardens in the Air:

Compact low-rise housing is the response to demands for both high densities and a garden of one's own in which to raise children. In countries with acute shortages of land, artificial sites have been proposed (and developed), having open space and even gardens above ground.

> "By definition: A support is a structure in which a number of dwellings can be assembled, which each separately - independently of the other dwellings in it - can be built and altered or demolished ..... I have suggested that supports are building sites in the air." (2)

Le Corbusier as early as 1924 made proposals for double-volume open spaces adjoining his high rise apartments and giving at least as big a garden as some contemporary housing.

In Hoffman's (3) excellent study he illustrates several examples of gardens on artificial sites above ground, usually expensive and sophisticated solutions to particular problems of topography or location.

(1) Marshall McLuhan 1968 quoted
(2) N. J. Habraken 1961
(3) Hubert Hoffman p.p. 166 - 173 1967

The wide verges become playgrounds for children, and pedestrians share the street with traffic. But it is the openness that somehow makes it desolate.

Cost Analysis:

In low-cost housing simpler solutions usually have to be found and nothing compares with building on the ground. Lift technology is usually ruled out when the budget is tight and this limits development to three or, under some circumstances, a maximum of four storeys.

In Dr. Calderwood's study he found building costs in South Africa at present and with existing technology to favour single storey dwellings and to rise steeply with the height of the building. He also found that row houses were substantially cheaper than detached dwellings.

> "The information shown in the final graph indicates that until the land cost rises above ± £5,000 (R10,000) per acre, single storey development is the most economical; above this figure and up to £10,000 (R20,000) the most economical is two storey development, with other types of development best suited to land costing more. The economy of row houses or terrace houses is clearly seen." (1)

On the subject of land values, mention should be made of the unreliability of 'estimating' where large scale statutory allocations are made under Group Areas legislation.

Terraced Houses and Flats:

Row or terrace houses find support among protagonists of higher densities without flats. The common South African solution to higher densities is to put small houses on top of each other in a 2 or 3 tier stack, divorcing the two upper units from contact with private gardens and making for poor conditions of privacy and access.

The earlier Victorian developments which abound in Table Valley are now found to be much better solutions. Usually narrow fronted and two storey, they provide the amenities of small yards and gardens for all units, on very much the same amount of land. Those familiar with the better examples of urban terraces built in Britain over the last two centuries will concur.

> "The similarities of requirement between types of housing, say old people's flats, houses for small and large families, housing for special groups such as students, are more striking than the differences, which are mainly of size and detail. A system such as eighteenth century terrace housing which can cater to all types with only minimal and essential differences in form even between large and the small solves the problem without difficulty." (1)

Tastes and Needs:

The Coloured's aspirations in taste and style of dwelling have been tested in a study by Mabin (2) and a detailed survey of the housing requirements of Coloureds has been referred to (3). These two documents provide valuable guide lines for anyone investigating this field.

Planning is however a process oriented to the future and both the tastes and the stated requirements of people in housing are strongly conditioned by past experience. In providing for future generations, changing life styles and taste patterns bear close consideration.

It is probable that the optimum environment which is planned for a new generation for 1985 and beyond, will bear little relationship to preferences based on inherited values. It is nevertheless valuable to attempt to deduce from stated opinions and attitudes what the real needs are and how they might be met within the economic framework.

'The Silver Cloud Gap':

The economic framework for Coloured housing is in no way less of a problem than elsewhere.

Roger Starr describes the dilemma:

> "A city family needs a home that must be heated in winter, and well ventilated in summer. The dwelling must be strong enough to keep out the winds and the rain, the snow and perhaps an earthquake to say nothing of wild beasts and burglars. If the city is large, the house must be so designed that it can be put along-side or even over or under another house without

(1) D. M. Calderwood 1964 p.57

(1) Neave Brown Sept. 1967 p.433
(2) D. S. Mabin 1968
(3) H. L. Watts 1962

Small internal courtyards and vines are associated with housing at higher densities throughout urban history.

danger to both. The modern city must be so well served by water and other utilities that the neighbourhood will not be swept again, as so often in the past, by plague and fire ..... Any product made to these specifications must be the most expensive single product by far put to the exclusive use of a single customer. In New York, Chicago, San Francisco such a home, including land, costs £20,000 today. It should be obvious even to the man on the subway that if a new barely minimum enclosed place for him and his family costs more than a new Rolls Royce Silver Cloud Saloon with white-wall tyres and a built-in walnut bar, he will have a problem buying or renting it for his personal and exclusive use." (1)

Parker-Morris Report:

In 1961 the Ministry of Housing & Local Government published a report (2) which "set the guide-lines for the future" and which has become recognised as a valuable standard against which to measure levels of housing. Following upon this a white paper entitled 'A National Building Agency', 1963, resulted in a bulletin being published which translated into diagrams with commendable thoroughness the user requirements applied to two and three storey houses. The plans flow from recommendations of the Parker-Morris Report (3) and is an extensive analysis of dwellings within their term of reference.

The problem is no longer an ignorance of needs or standards but how to meet them or close what Starr calls "The Silver Cloud Gap". (quoted)

Although no similar document exists in South Africa much data is available in published form and officials in all public authorities connected with the provision of housing are co-operative and valuable sources of information.

(1) Roger Starr 1966 p.70
(2) Homes for Today and Tomorrow 1961
(3) Generic Plans: Two and three storey Houses 1963

Urban Housing in the U.S.:

On the much wider front of urban planning a reader was produced in the United States in 1966 which dealt with a range of related topics by the nation's authorities. The standards and goals set are high, but the assessment of the current dilemma has a familiar sound.

"The housing problem is an inevitable feature of our modern civilisation and does not tend to solve itself. Supply and demand do not reach it, because the cost of new housing and the distribution of income are such that approximately two-thirds of the population cannot present an effective demand for new housing." (1)

The Squatter City:

In fact, so universal is this pattern that the positive statement when uttered, has an arresting freshness. Turner and others have analysed the positive aspects of the squatter cities of Peru and find significant changes emerging over a lapse of time. As the settlement becomes permanently established and its inhabitants better off, housing and amenity improve and real cities begin to emerge from the camps. The key would appear to be in principles of land tenure and self-help.

"The outstanding difference between the barriada and orthodox modern housing is between the ways in which they are built: the squatter when his tenure is secure enough to risk investment in permanent structures, builds by stages, in accordance with his priorities and budget; the modern housing development is completed to 'minimum standards' at least, before it is occupied .... That the mass of the urban poor in cities like Lima are able to seek and find improvement through house ownership (or de facto possession) when they are still very poor by modern standards, is the main reason for their optimism." (2)

The squatter settlement is an important analogy to our own low cost housing problems, because it represents one approach to the problem of a mushrooming population of urban poor. The concept of alloting a 20'-30' x 60'-80' plot to each participant family on

(1) Edith Elmer Wood: 1966 p.1.
(2) John Turner Aug. 1968 p.306

condition that they occupy it permanently, is the peg on which the whole system hangs. Services, permanent structures, amenities and all that goes to make a city, follow in an order of priority. The world undoubtedly has a lesson to learn from the squatter city, a fact borne out by funds made available by the Olivetti Foundation to the Joint Center for Urban Studies of M.I.T. and Harvard Universities, for this purpose.

Statistics:

In Watts' survey (1) of six western Cape towns not including Cape Town, he found 35% of the households in shanties, 73% overcrowded, 51% unable to afford the likely economic rent of even the barest minimum-standard one-room dwelling. About a fifth of the households own or are paying for their own house and the remainder live in rented dwellings, with the exception of the very few who are given free accommodation.

The high incidence of overcrowding referred to, is a problem which must receive consideration. It occurs as the result of poverty or housing shortages, or both combined.

Overcrowding:

Overcrowding is often confused with high densities, but is in fact quite different. Many uncrowded dwellings per acre produce high densities while a few houses in acres of open land can be badly overcrowded. The distinction is not always appreciated by non-spatial urbanists and confusions on the subject is common. The baneful effects of overcrowding are not only felt in the dwelling unit alone. They influence the whole urban structure from schools through to public transit. The effect of one or two extra people in 75% of the households increases the whole population of the area by 15-20% or even more and puts a strain on all facilities and sub-systems. Overcrowding cannot easily be either planned for or ignored. By its nature it is temporary and self-correcting, but it is necessary to come to terms with it in some realistic manner.

(1) H. L. Watts 1962 p.p. 5 - 10

Compact Housing:

A great deal has been written about compact housing in an urban context. The interest derives from attempts to reintroduce low rise ground-contact dwellings into the city proper, or to find ways of making city-like environments - with many of the attendant advantages - even in a low density rural context. In this regard the Siedlung Halen near Berne (illustrated) and some of the British Span Developments are instructive.

Community and Privacy:

Chermayeff and Alexander (1) have done research into criteria applicable to compact single storey housing built in communal clusters to form a single unit. This concept is not unlike the large scale vertical development in that it involves communal facilities and clearly defined limits of public and private space.

They list what they call thirty-three detailed pressures which are user requirements and criteria related to this housing type. These are considered sufficiently cogent to include in an appendix.(2)

These guide-lines are in fact the rules for an attempt at structuring the "City of Houses" referred to by Howell Killick & Partridge (quoted). The forms which evolve are reminiscent of other housing systems, comprising court houses and pathways which have occurred over a wide span of time, in particular on the Mediterranean shores. (3) (See Tell el Amarna)

Dwelling Types.

In an interview with Housing Officials at the Cape Town City Council, the following facts emerged:

The present patterns of dwelling types in the 'resettlement areas' of the Cape Flats is almost equally divided between economic and sub-economic. The figures for 1967 of all housing built on the Cape Flats by the City of Cape Town were as follows:

Sub-economic	11,275
Economic	11,573

(1) Serge Chermayeff and Christopher Alexander 1966 p.p. 154-156
(2) Appendix 1
(3) Bruno Munari 1965 p.79

There is a far greater demand to rent dwellings than to buy them.

The current waiting list indicates:

Applications to rent	11,000
Applications to purchase	2,000

At present approximately 5% of the plots in a layout (20 in 400) are set aside for sale for people to build their own homes.

A ratio which is considered representative was:

Sub-economic	40%
Economic	45%
Elite and home ownership	15%

Economics and Rents.

The details of income qualifications, rents and space allocations are fully outlined in the Housing Code and will not be reprinted here. The watershed figure is an income of R60 per month for the main wage earners.

Below this figure is the sub-economic bracket and above it, the economic.

The smallest of the home ownership houses sell for R3,500 - R4,000 with ground, or rent for R5 - R6 per week.

There is a choice of 23 house designs in the home ownership bracket.

Watts' survey (1) suggests a slightly different breakdown resulting from housing studies in six towns excluding Cape Town.

(i)	A low cost minimum standard dwelling	60%
(ii)	A dwelling intended for economic rentals, with a level of design and finish more elaborate than the minimum standard	11% increasing
(iii)	A dwelling intended specifically for the home ownership market	28%

Under (iii) he adds that the figure of 28% is based on the fact that nearly this amount at present occupy their own homes. This is a figure substantially higher than indicated by the demand for home-ownership in schemes built by the City of Cape Town.

It is presumed that private home-ownership schemes help adjust this discrepancy.

(1) H. L. Watts 1962 p.23

Numbers of storeys.

All houses built so far are single storey but flat buildings have been put up at 2 and 3 storeys high in newer schemes.

Experiments with maisonette type development is proposed.

Calderwood's (1) research favours this form as being the lowest priced dwelling if land values are high. On low cost land single storey row houses are the cheapest.

The type of dwelling gaining ground in Britain at present is a family maisonette at ground level with a single storey or duplex unit above it for childless families, served by deck access. It has the advantage of putting up densities, raising building heights to 3 or 4 storeys and maintaining most families in contact with the ground.

Flexibility.

Two methods of providing for low incomes that are rising fast are:

(i) To build small units that can be readily expanded.

(ii) To build normal size units which have sub-standard finishes and equipment which may be improved upon later.

(iii) Combinations of both.

These are valid methods in common use depending on the details, circumstances and house types. Flexibility in some form is, however, necessary.

Urban Structure.

'The Non-Place Realm':

> "The spatial patterns of American urban settlements are going to be considerably more dispersed, varied, and space consuming than they ever were in the past - whatever metropolitan planners or anyone else may try to do about it." (2)

The nature of the form that urban settlements will take in the future is a subject so basic and so important to planners that a considerable amount of recent literature has been devoted to the subject. The choice of the title for the current Architects' Year Book (12) is an indication of the importance the editors attach to the problem. (3)

(1) D. M. Calderwood 1964 p.57 (See Fig. 1)
(2) Melvin M. Webber 1963 p.23
(3) Urban Structure. Architects Year Book 1968

'The Future Urban Complex':

In a review of much of the reading, Catherine Bauer Wurster's classic essay (1) remains the fullest and sanest analysis of the alternatives that present themselves. She reduces them to four:

1. Present trends projected.
2. Towards general dispersion.
3. Towards a concentrated super-city.
4. Towards a constellation of relatively diversified and integrated cities.

And in her evaluation she includes the possibility of combinations of all four.

The conflicting forces of concentration and dispersal lie at the root of the problem and the merits and demerits of each form an endless dialogue, particularly in American academic literature.

Centrifugal - Centripetal:

The debate has in recent years tended to become regional with the West Coast dispersalists holding out Los Angeles as the basis of a working model, against the East Coast argument favouring the concentration, diversity and opportunity offered by the large central place, with Manhattan cited as prototype. An example of more direct relevance to Cape Town is San Francisco and the Bay Region. It is a city with a fine aesthetic setting, a heritage of some good traditional building, a heterogeneous population offering interest and diversity in city life styles, a sense of style and dignity often associated with parochial pride, and a strong civic consciousness about the city itself.

The reintroduction of a line-haul commuter system (BART) is a conscious attempt to maintain the city as a central place without inhibiting the increasing numbers who wish to use it.

When the space needs of the motor-car in that city, both in roads and parking reached the point where they threatened to destroy the scale of the environment, public protest intervened and the rapid transit idea gained ground.

It is felt that the facts relative to the problem of San Francisco are relevant to the future development of Cape Town.

(1) Catherine Bauer Wurster 1963 p.p. 73 - 101

'The City is Obsolete':

There are many of course who have (or had) no belief in the city as a central place and saw it rather as the source of all social ills. Many Utopians, in particular Frank Lloyd Wright, were of this view. (1)

More recently the exponents of an homogeneous urban realm with mobility and dispersal (2) have advanced strong arguments. The last word, of course, comes from McLuhan himself.

> "Whole cities and especially New York, will end too, just like cars, no longer vital to the nation but just playthings. People will come to New York solely to amuse themselves, do things, not marvel at the magnitude of the city or its riches but just eat in restaurants, go to discotheques, browse through the galleries ..." (3)

The significance of McLuhan's assertion is that if it is right or even half right, then it is the potential 'play cities' that are likely to become the great central places of the future. This is another encouraging inference for Cape Town which already offers so much historical, scenic and recreational attractions, enough, it is felt, to ensure its continued and increasing role of cityness and centrality, at least within the time-scale envisaged for this study.

Central and Radial:

This thesis anticipates the strengthening of Cape Town as a central place fed by three strongly defined radial corridors. The corridors are and will continue to be linear structures formed by line haul rapid transit spines, flanked by motorways. Along the line will develop centres in a hierarchy related to space, function, nodality, confluence of routes and unpredictable aspects of the market mechanism such as entrepeneurship.

In the 'urban realm' between the radial fingers are land uses and subsystems serving the corridor, the city and the region.

These spaces and land uses will be served not so much by inner and outer concentric ring-routes as is common in radial development, as by the already evident major grid of motor ways over the whole region grafted on to the radials, and giving free choice of route direction.

(1) Frank Lloyd Wright 1945 p.10
(2) Melvin Webber (quoted)
(3) Tom Wolfe 1968 p.46

Leish's $2\frac{1}{2}$ mile grid:

Leish at a traffic seminar in Stellenbosch earlier this year gave strong evidence of the emergence of a typical grid of freeway subdivision which is narrowing down to a predictable dimension irrespective of differences of land use, population density and types of location.

The model suggested is a pattern of very wide movement corridors spaced approximately $2\frac{1}{2}$ miles apart in both directions with various grades of service interchange linking the instersection.

The corridors are planned to be big enough to contain all modes of transport that may be required including the neutral zones on either side of them. This coarse grained grid of $2\frac{1}{2}$ mile square superblocks is then a movement structure which flows directly from the needs and geometrics of the traffic engineers to cope with all the land use options that urban developments may require.

Studies carried out to examine the correlation between this model and present and planned freeway patterns in the Metropolitan region of Cape Town, reveal a close correlation despite the compromise between linear and grid form developments.

"The Pedestrian Field":

For urban structure to succeed it must offer opportunity for the rational development of all movement, culminating in what may well be the most important one: pedestrian movement.

Doxiadis has been responsible for exhaustive research into the form that cities have assumed when they responded to only one form of movement - walking. He examined a wide variety of pre-industrial cities in many countries and conditions and found that (with the exception of the artificially enlarged cities such as the Capitals), all natural settlements have a close conformity in physical size and shape.

> "... Systems of kinetic fields, based on man's walking field led to the growth of a very specific kind of city which was for thousands of years, in all civilisations, almost the only type of urban settlements ... Such cities had the following characteristics in common: They were compact urban settlements; the area they occupied was no larger than 2 x 2 kilometres; (1-1/4 x 1-1/4 miles); they had no more than 50,000 inhabitants. The kinetic fields set them maximum physical limits." (1)

(1) C.A. Doxiadis October 1968 p.328

This evidence is based on the distance man walks in 10 minutes and the 'measure of man' becomes a dimension based on this time-movement scale. It is a universal dimension so widely recognised as to require no further argument. One condition also has a bearing on the value of time measured either in money or in substituting activities. If in our society the time-cost of walking were quantified, it has an influence on decisions, depending on the amount of leisure available, the value attached to walking as exercise and the money available for alternative modes of movement.

Summing up:

By way of summary, two important facts emerge. An ideal spacing of corridors for traffic movement according to Leish is on the basis of a $2\frac{1}{2}$ mile grid. The ideal size of a settlement in which pedestrian movement is the only limiting factor, is 1-1/4 miles according to Doxiadis.

Other traffic information to set against this use is that the minimum distance between intra-urban rapid transit commuter trains is one mile (see Gillespie) and that the minimum distance between stops of an express bus on a separate road is also one mile. (1)

Communities.

Assembling either general or specific facts on the subject of social grouping is complicated by the wide divergence of opinions of authorities and the paucity of reliable research.

The range of attitudes stretches from Gans' (2) 'Urban Villagers' to McLuhan's (3) 'Global Villagers' with many permutations in between.

Shadrach Woods said at a Winter School at the University of Natal in 1966 "When you step out of your front door you're in the city, that's all there is to it."

(1) Brian Richards 1966 p.94

(2) Herbert J. Gans 1962

(3) Marshall McLuhan 1967 p.67

Neighbourhood Unit Formulas:

Most authorities lay down formulas if not for neighbourhoods then for ratios in terms of space and numbers that relate to amenities. Such a system is the neighbourhood unit formula published in Vol. 7 of the Regional Survey of New York and its environs.

The criteria relate to size (as required for one elementary school) boundaries, open spaces, institution sites, local shops and the nature of the internal street system. (1) The elementary school is, in fact, the most commonly observed index to which a neighbourhood is related and this is supposedly quite satisfactory, unless schools in adjoining neighbourhoods produce vastly different levels of attainment or unless for any other reason, neighbourhoods and schools develop incompatibilities.

Against Defined Boundaries:

Ruth Glass, a reliable critic of shortcomings in New Towns, writes:

> "Self-contained boundaries do not exist. The boundaries of neighbourhood life vary for different activities. Secondly there are also varied neighbourhood boundaries for members of different age groups. School areas for instance differ considerably from those of adult clubs even when the school and the adult club are next to each other. Consequently the school would not appear to be the natural focus of the neighbourhood. (2)

and Louis Wirth confirms that:

> "It has been found that the settlement of human beings, the patterning of social institutions, the incidence of social problems, and the intricate network of social inter-relationships does not, except by accident, conform to arbitrary areas and that hence administrative areas only rarely coincide with the ecological or natural areas." (3)

(1) Clarence Perry 1966 p.96
(2) Ruth Glass 1945
(3) Louis Wirth 1945 p.485

The 'Elementary Cell':

To set against this are numerous counter arguments defending the closed parochial neighbourhood. The problem is more complex than to decide whether or not there should be neighbourhoods which are firmly defined spatially or not; much more important is to examine the way space can be allocated to permit the freedom of choice to occur. It is to find what sort of structure will permit a complicated web of overlapping fields of interaction to develop unobstructed. It is to find a system which can be scaled to the intimate life style of the infant making his first independent journey on the one hand, yet which would not insulate or isolate the mother from a satisfying range of contacts and stimuli, on the other.

In searching for an ideal model, at least two thinkers arrived at what they felt was the right unit.

> "For Fourier and Considerant the 'Palace of man's earthly royalty' was the Phalanstery; for Le Corbusier it was the Unite d'Habitation. The type of problem as defined by Considerant seems very similar in both. 'To find the architectural conditions most appropriate to the needs of individual and social life, and to construct according to these conditions the type of habitation for a population of 1600 persons ..... that is to say the elementary cell in the great social beehive ....'. It is not hard to see how such a conception relates generally to the idea of the Unite d'Habitation, a largely autonomous social unit composed of approximately 1600 persons, set in verdant countryside and served with communal services." (1)

The Case for 4000:

The size of the 'elementary cell' as we have seen, is more often related to the elementary school and lies between three and four thousand persons. In discussion with an urban geographer doing research on the staff of Doxiadis, mention was made of studies carried out in Athens which sought to measure the natural size of communities that formed within the city and define their boundaries. The figure of about 4000 persons has been found to occur in a significant number of cases.

(1) Anthony Vidler 1968 p.p. 231 - 234

The Street as a room: a complex web of intimate neighbouring patterns must be capable of developing.

In the planning of Hook the size of residential units was a compromise between the number of people (4000 - 5000) that related to a school, the 1/4 mile walking distance for primary scholars and the space that 5000 people need at 70 persons per acre. As a spatial structure this would seem appropriate, provided that options and choices are kept in mind.
The essential problem with neighbourhoods or communities is to decide at what point they become closed systems, if at all, between the discrete family cell and the city as a whole.

Tribal Urbanites:
Morris on the subject examined primitive biological legacies:

> "We did not evolve of course to live in huge agglomerations of thousands of individuals. Our behaviour is designed to operate in small tribal groups, probably numbering well under a hundred individuals. In such situations every member of the tribe will be well known to every other member as is the case with other species of apes and monkeys today.
>
> In a massive city the situation is much more stressful. Every day exposes the urbanite to sudden contacts with countless strangers, a situation unheard of in any other primitive species. It is impossible to enter into personal hierarchy relationships with them although this would be the natural tendency .... Anti-contact behaviour enables us to keep our numbers down to the correct level for our species. If you require confirmation, take the address or phone books of a hundred widely different types of city dwellers and count up the number of personal acquaintances listed there. You will find that nearly all of them know well about the same number of individuals and that this number approximates to what we would think of as a small tribal group." (1)

(1) Desmond Morris p.p. 185 - 186

In consideration of this view there are consistent measures that apply to contacts, although the spatial zone of the "neighbourhood" must vary with affluence, mobility and telecommunication. At certain levels contacts are maintained on an international level (vide Christmas card lists as against phone books) and at other levels described by Gans, Young and Willmott the entire realm of association is confined to a territory a couple of acres in size.

Neighbourhoods of Necessity:
Pahl (1) says, however car-borne our society becomes, we mustn't underestimate local ties. Not everyone is mobile all the time. Indications are that the Coloured group are generally at a level when strong local ties and neighbouring habits develop unless prevented by circumstances that intervene. Particularly in older dense settlements contacts are close, although across-the-fence conflicts are as common as in all other societies, Dagwood Bumstead and Herb Woodly as the All-American prototype.(2)
We know that working mothers' children are cared for by neighbours or relatives who live near enough and there is considerable mutual help in illness and confinements. Social contacts are made in the local shop or at the hawker's van and children are a common way of bringing mothers together (or in some cases keeping them apart).
Closer neighbouring ties are a function of poverty, which encourages co-operation as a means of survival. As long as income levels remain low, close local ties will remain. Whether it continues with affluence will depend on a number of factors, including whether the environment is condusive and whether suitable generators of contact can develop.

(1) R. E. Pahl 1968 p.p. 46 - 48
(2) Chic Young 1969 At random

EVALUATION

EVALUATION.

"To assess priorities, to pass judgement, to evaluate: if one does this one is driven back, whether one likes it or not to ethics and Aristotle: to the oldest, and still the ultimate civilised question - what is the good life?"

E.W.N. Mallows (1)

Introduction.

In the preceding analysis some facts, statistics and informed opinions were assembled. Some were directly related to the people, the place chosen to study, and the interaction between them. Others again were simply universal denominators common to men (or systems) anywhere.

From the examples selected and references quoted, direction and purpose has become clarified. What remains is to arrange the data into meaningful relationships and so establish priorities.

Aims.

We return to the original stimulus: the visionary theme - Optimum Environment with Man as the Measure.(2) By this stage the theme has suffered at the hands of the demographers, economists and housing experts, but the purpose is unchanged, only tempered by the emerging realities.

It has become:

To investigate, within the limitations imposed by present conditions, a physical and social structure that will offer the best choices possible under prevailing circumstances.

Standards of Values.

The opportunities for achieving Aristotle's good life by whatever definition, seem remote indeed but the tenor of this thesis is optimistic and the future holds the promise for improvement.

(1) E. W. N. Mallows 1965 p.24
(2) Harland Batholomew 1966 p. viii

The real and lasting values are not to be found in good or bad housing but in rights and freedoms and in opportunites and choices of the widest scope. Bertrand Russell made statements in the Reith Lectures in 1948 which are no less pertinent now than they were then. Commenting on the evils men inflict upon each other he remarked that fear is a dominant motive in many lives. On a hopeful note he added that:

"Greed of possession will grow less when there is no fear of destitution. Love of power can be satisfied in many ways that involve no injury to others .... Energy and the wish to be effective are beneficent if they can find the right outlet, and harmful if not - like steam which either can drive the train or bursts the boiler." (1)

The People.

"I can never be what I ought to be until you are what you ought to be."
Martin Luther King.

The Coloured people today can be regarded as being poor, unhealthy, socially deprived, disenfranchised, discriminated against, dispossessed of property, discredited and despairing.

There can also be seen to be growth in numbers, in wealth, in education levels, in opportunities for work, in standards of health and welfare and by an inexorable logic of events, ultimately full instatement.

The mid 20th. Century sees the Coloured as a marginal 10% minority group. The 21st Century may well find the world homogenized socially, economically and racially and the Coloured race the major component of the world's population. There is both present evidence and informed prediction to support the theory.

Political Vicissitudes.

No attempt is made here to forecast the future of racial segregation - a dominant factor in land use allocation. Instead the argument is advanced that the housing stock that is built today will certainly need to accommodate more affluent people in the future. It is also likely that settlements built for Coloureds may be occupied by other races or all races in the future. Much local precedent supports this view.

(1) Bertrand Russell 1949 p.93

Statistics Assessed.
The facts relevant to the model sector are examined. At this point data will be reviewed only in order to isolate and diagnose problems directly related to its final social and physical structure.

Effects of Population on Planning.
High birth rates, large families and a high percentage of the population under the age of 21 have drastic effects on new settlements. In order to attempt to maintain some balance of age groups, careful provision should be made for the mature and aged in allocating accommodation.
The most significant characteristics of the Coloured pyramid are the bulges or "wave crests" which will produce heavy demands on firstly primary education, then secondary and subsequently, employment. This imbalance imposes a further need for flexibility in community services and systems.

Extended Families.
Kinship patterns indicate that encouragement should be given to certain types of family extension. This calls for larger houses but permits child-minding by grandparents.
As about half the mothers are obliged to work anyway it may also reduce the incidence of neglected children.
The justification to build more large dwelling units is that it will reduce the amount of obsolescence as incomes rise.
The degree and duration of overcrowding suggests that larger dwellings for the poor are always intensively used.

Poverty and Affluence.
The large number of people who cannot pay economic rents will mean that assisted schemes, subsidisation and minimum cost dwellings are needed for nearly half of the households.
At the other end of the scale there is an important wealthy minority who can buy good sites in desirable locations and put up comfortable homes. The better this minority is catered to, the more rapidly it will grow, pulling the whole social structure up with it.
In the middle zone are people getting wealthier with growing families and needing all the space consuming impedimenta of contemporary life.

Social Strata.
The great differentiation in income levels and consequently education and life styles requires careful consideration in settlements to avoid unnecessary friction and stress. Mixing of social strata must occur but not across a party fence and not between the top and the bottom of the pyramid. We have read of sharp distinctions between income groups which cannot be disregarded.

Neighbouring.
Complex webs of association are seen to occur in long standing communities. The environment must be made condusive to the formation of such networks and renting authorities should attempt to achieve broad compatibilities in tenant placing.
Living at higher densities in compact housing puts a greater strain on human relations until adjustments of life styles occur. The role of the street as the main generator of contact and interaction is again emphasized.

Physical and Mental Health and Alcoholism.
Arguments emerging from this data affirm that stress is aggravated by overcrowding and family life defeated by poverty. Physical environments can only help in a small way to repair the effects of social disorders. To the extent that proper homes, convenient facilities for recreation and amusement can be designed to alleviate these problems, they certainly should be.
The effects of poverty however, are removed only by overcoming the poverty.

Employment and the Work Journey.
Not many of the population are likely to be employed in the model other than those engaged in retail, service and business activities in the central area; and the teachers and clergymen. As a consequence the journey to and from work is one of the most important factors in the planning and should be given the closest scrutiny.
Local sources of employment will increase and should be encouraged and nearby industrial belts may draw workers from close at hand, but the bulk of commuters will move out of the area by train.

A small but significant percentage have comfortable homes and good standards of living.

General Siting.

The site is flat, featureless, sandy, poorly drained, windswept, rather far from town and isolated from other settlements.
It is also sunny, healthy, quite near the False Bay beaches and convenient to some industries.
By its nature it is well suited to low cost housing. By its topography it is appropriate to the study of spatial models uncomplicated by diverse criteria. (Analogies spring to mind of Christaller's (1) experiments in space on the southern plains of Germany).
Most important, it is the place of greatest accessibility to the city, the most appropriate area to accommodate an overspill of half a million people.

Ecology.

Early disregard for the ecological balance of the Flats destroyed the natural plant life. It is important to understand the natural environment to ensure optimum conditions, for human as well as plant ecology.
Long hours of sunlight and strong prevailing winds suggest a pattern of development condusive to compact housing, sheltered intimate public spaces and the use of natural and built objects as windbreaks.
A thorough ecological investigation was carried out with good effect in a condominium of leisure homes in California (2) which could serve as a model for the study of bioclimatic criteria in the Cape Flats.

Movement.

Rail:

The great majority of commuters travel at least part of the way by train. Much evidence supports the continued use of a line-haul system for the journey to work. The commuter train at present provides the quickest and cheapest service and should have no difficulty in maintaining this advantage. Improvements in service will be necessary to check the swing to private transport. From the point of view of the city as a central place, the continued use of the railway is considered most beneficial. (see Fig. 1)

(1) Walter Christaller 1933
(2) Ecological Architecture: Planning the Organic Environment: Progressive Architecture, May 1966

Buses:

Single mode journeys to work should ideally be possible for the greatest number. Changes intensify space frictions and cost time and money.
Line-haul buses are not seen to be a solution unless they have their own separate routes, as they are subject to peak hour congestion.
Feeder buses will still be needed but they should be an alternative choice to walking rather than a necessary part of the journey.

Motor-Cars:

Car ownership in England is expected to double in the next ten years. Comparable growth rates can be anticipated with the Coloured group. Under present conditions car ownership means a new freedom from conflicts on public transport, a wider choice of places to work, the opportunity for bulk shopping at discount centres and a new world of recreation. Owning a car has strong attractions for those who can afford it.
The effects of this growth will be seen in a need for more garages or shelters for private cars. There will be an increasing demand for public parking near rail stations and all points of concentration, particularly the central business and shopping zones. A real problem is to plan efficiently for very little initial parking and still find room for a substantial increase later.
Growing motor-car ownership requires an expanding road capacity or an initial structure overscaled to cope with growth.
Real conflicts are likely with large child populations unless traffic is carefully controlled. Too many cars may erode the rapid transit system unless the latter keeps pace in terms of performance.
Finally a road system must be built which keeps traffic flowing smoothly at all times and which provides sufficient space for stationary vehicles. It should also provide adequately for buses, service vehicles and emergency vehicles.

Pedestrians:

Most people walk wherever possible because they are poor and transport networks are understandably limited in low density zones.

Pedestrian routes are scaled to motor traffic and integrated with it. The inefficiency and dangers of this system suggest that a separate pedestrian movement structure should be provided. A direct pedestrian route as part of the journey to work is seen to be necessary. Easy walking access to all amenities and in particular business, shopping and schools is essential in the income group under consideration.

Important considerations are directness of route, safety, variety and visual interest.

If the pedestrian network is not convenient and efficient, it will not draw people away from traffic areas.

Uses of Land in the Area.

Existing Land Uses:

While the corridor area is considered large enough to take most of the Coloured growth anticipated by the year 1985, it can only do so if land is economically allocated. All indications are to the effect that land is already a scarce resource on the Cape Flats.

The whole area defined is available for development except for privately owned limestone-bearing land. Dispossession and compensation would depend upon detailed metropolitan resource studies. It is assumed here that residential land uses would gain precedence over other uses.

The False Bay coastline offers a potential for large open spaces, for picnicing, camping, recreation and leisure activities.

Industrial areas at Philippi fall in or near the study zone and are taken into account as potentially good employment areas.

The present agricultural land to the west has the promise of future industries which may provide an additional source of local employment.

Proposed Land Uses:

Residential:

By far the most land will be used for dwellings.

Statistics on house types give clear indications of the patterns that plans should follow. Evidence points to compact housing, low and medium rise, with narrow frontages and the majority of them linked in rows. There is a conclusive consensus about densities which are in line with current proposals by the City of Cape Town. (A maximum of 40 persons per gross acre in family-oriented housing).

The preponderance of child-rearing families suggests that a high ratio of dwellings with gardens and play space is needed - and that ideally a large proportion of households be at ground level.

In the Hook (1) study, 'New Town' age group peaks in the 0 - 5 year and 20 - 30 year groups, resulted in a proportion of households at ground level of 76%. With the Coloured birth rate and age pyramid, figures of between 80% and 85% are considered desirable.

Play Areas:

Private gardens are seen to be manageable only when very small, but paved play yards are likely to be intensively used. Playlots for small children near to housing and reached independently of motor routes are essential. Junior and adult play areas and larger open spaces should be easily accessible, flexible, and not too far removed from supervision. The space allocation recommended by public authorities is considered more than adequate if large natural open spaces are also accessible.

(1) London County Council 1961 p.44

Business and Shopping:

Local shops in the existing settlements concentrate on lower orders of goods, in particular food and perishables (1). General dealers also survive but are threatened by large decentralised discount houses. Those who can, shop by car at supermarkets or near their place of work. Many factors will affect the success of large local retail outlets within the model and flexibility to the responses of the market must finally shape development.

The catchment of the sector is large enough to support a large retail outlet provided it is located at a point of high concentration and accessibility and is able to compete with prices.

Administrative, Municipal, Government:

It is considered desirable to locate as many activities in the central zone as possible, provided that it falls within a 10 minute walking distance from most homes. The quality of 'cityness' is achieved in no other way.

If uses concentrate, it facilitates one stop expeditions for harassed wives.

If most services are on the commuter's route to work, it assists him in attending to his routine business requirements.

Education:

The required ratios (2) of people to schools is accepted as a working hypothesis. The figures bear a close relationship to those in Britain and the United States. No evidence suggests that they be discarded, particularly if the large playing fields can be more intensively used than they are at present.

The age group bulge has already been mentioned. It will undoubtedly affect the demand for facilities with the heavy load at nursery and primary school level moving gradually up the scale to secondary and technical school level and ultimately to the universities.

(1) See Appendix 2.
(2) Department of Community Development 1967 p.7

Planning must make provision in its allocation for as much flexibility within its systems as is reasonable.

Contiguity of space and interchangeable accommodation is found to be one method of achieving this.

Summing up.

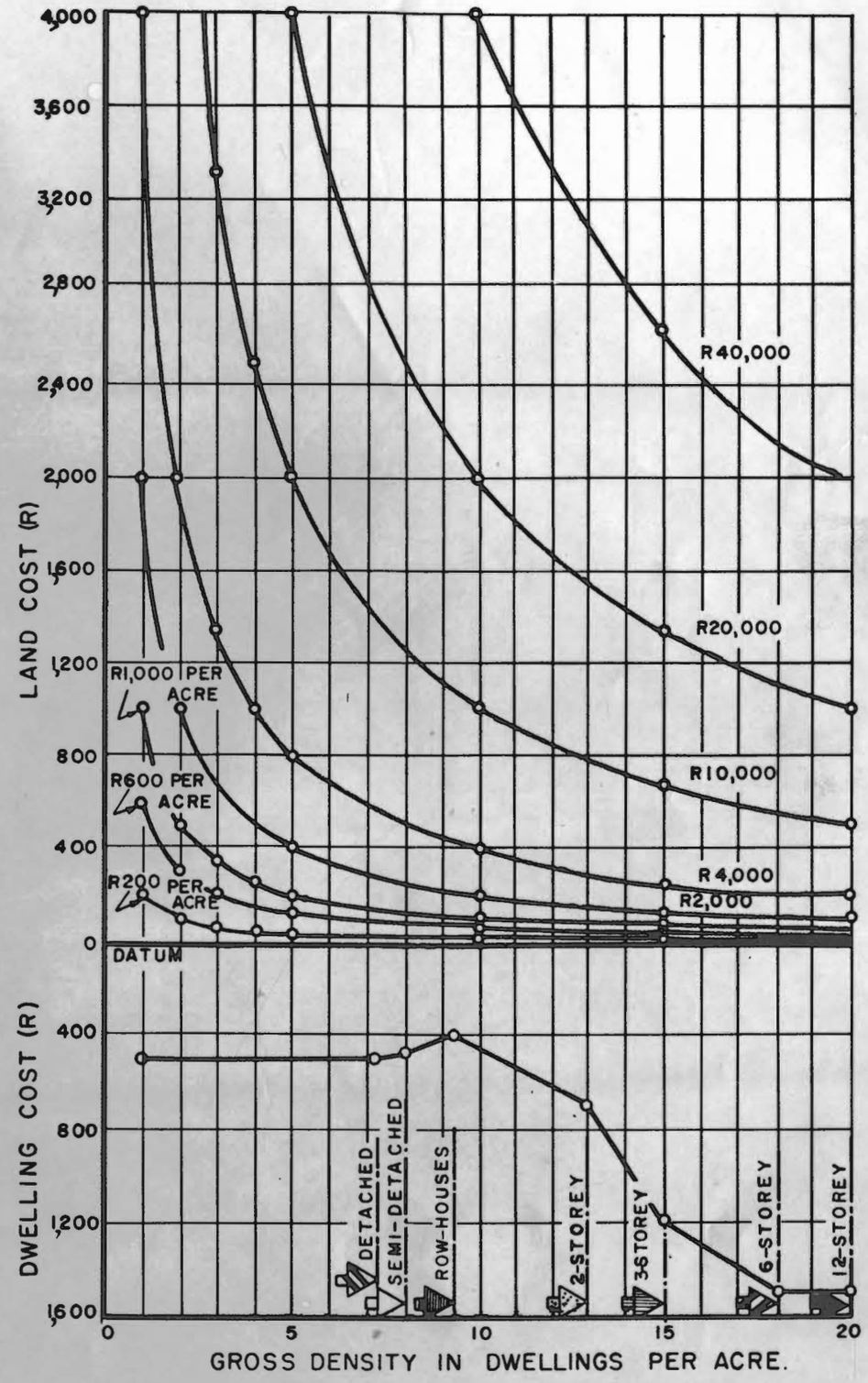
An attempt at evaluating the data and comparing relative indices has led to the point where various patterns have emerged. It is now left to apply these values to the model and to describe the resulting structure.

Good teachers are the key to the future - but there are far too few of them .

fig.1

Graph showing:

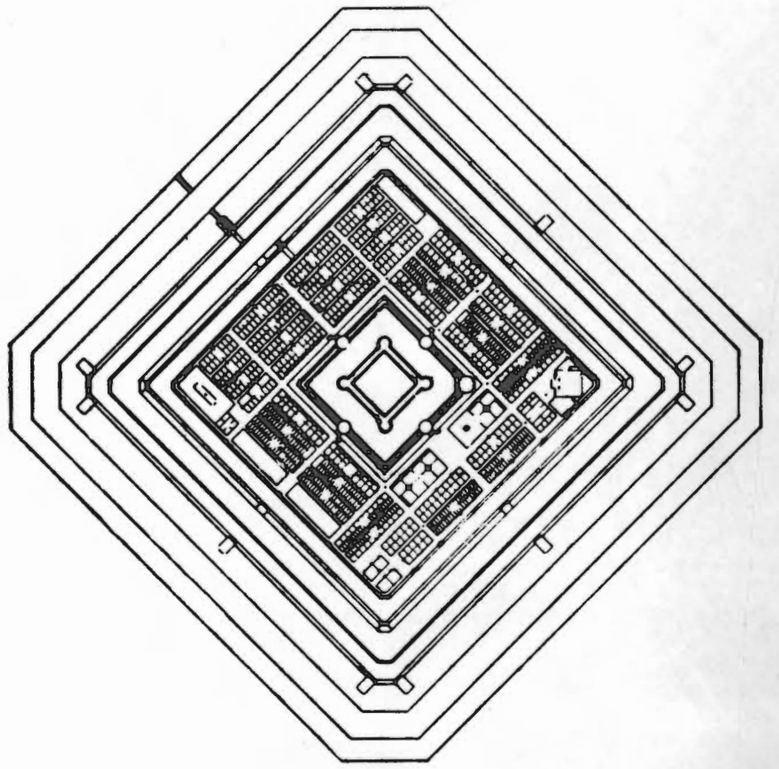
Land and Building costs related to gross density.

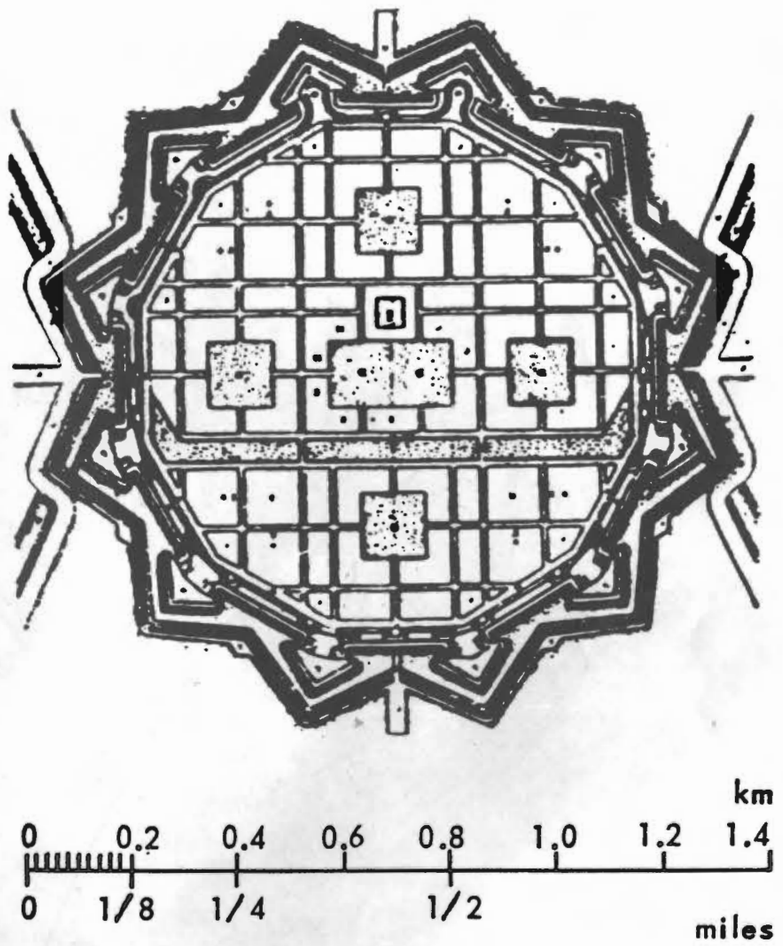


(a) Ideal City by Dürer, A.D. 1527

(b) Ideal City by Scamozzi, A.D. 1615

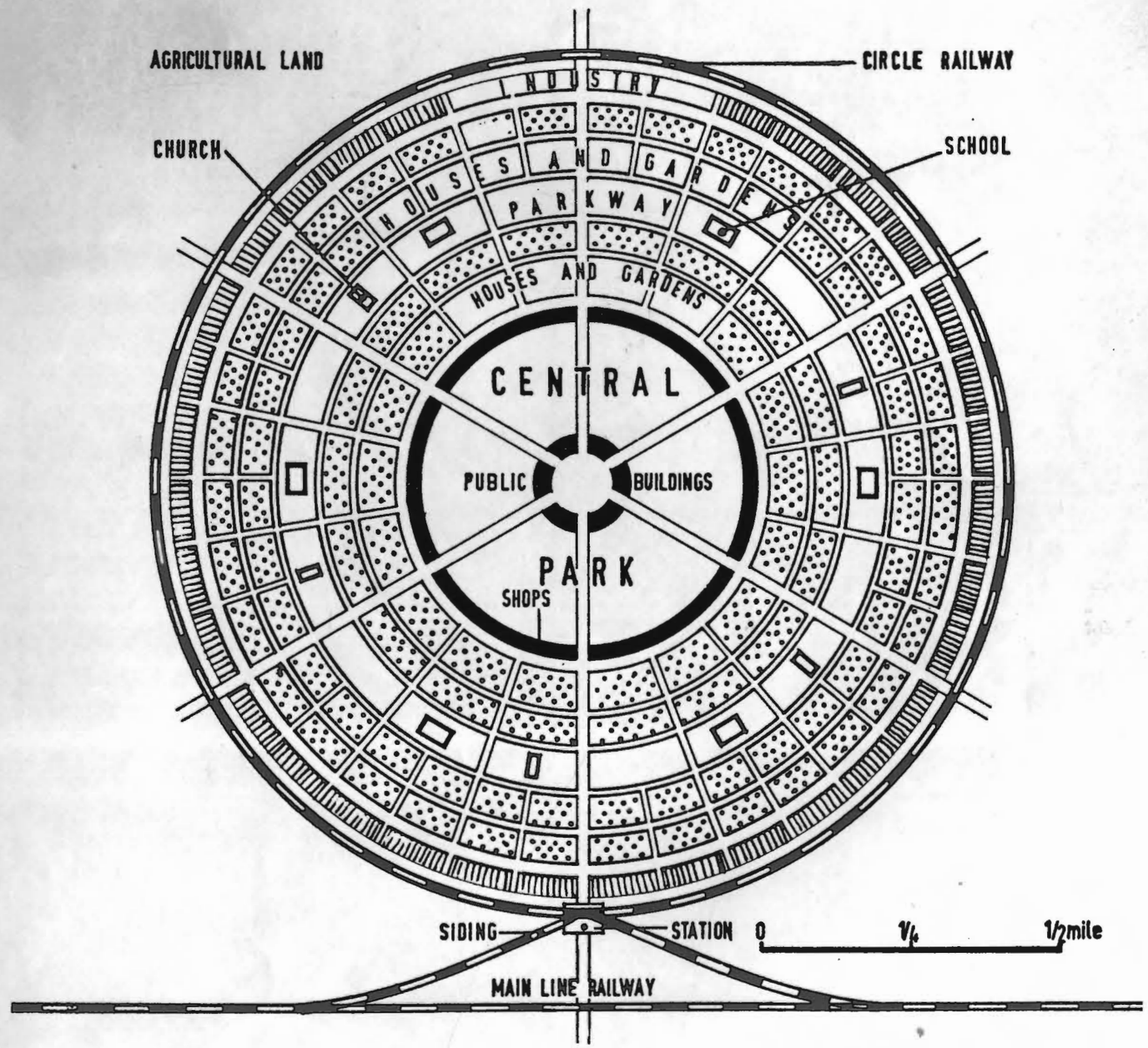
Many attempts have been made to conceive of an ideal city plan, particularly in the great eras of Greek and Renaissance planning. Here are two which conform closely in size to a 10 minute walking limit.





Garden Cities: Ebenezer Howard, 1898.

Da Vinci proposed to abate the congestion and squalor of Milan by building a group of ten cities ..... limited to thirty thousand inhabitants each, cities which in another place he proposed to design with a complete separation of pedestrian and horse traffic and with gardens attached to a municipal irrigation system." Lewis Mumford
Much later Ebenezer Howard sought to reconcile the advantages of town and country in his own model.
"A Garden City is a town designed for healthy living and industry: of a size that makes possible a full measure of social life but not larger, surrounded by a rural belt."

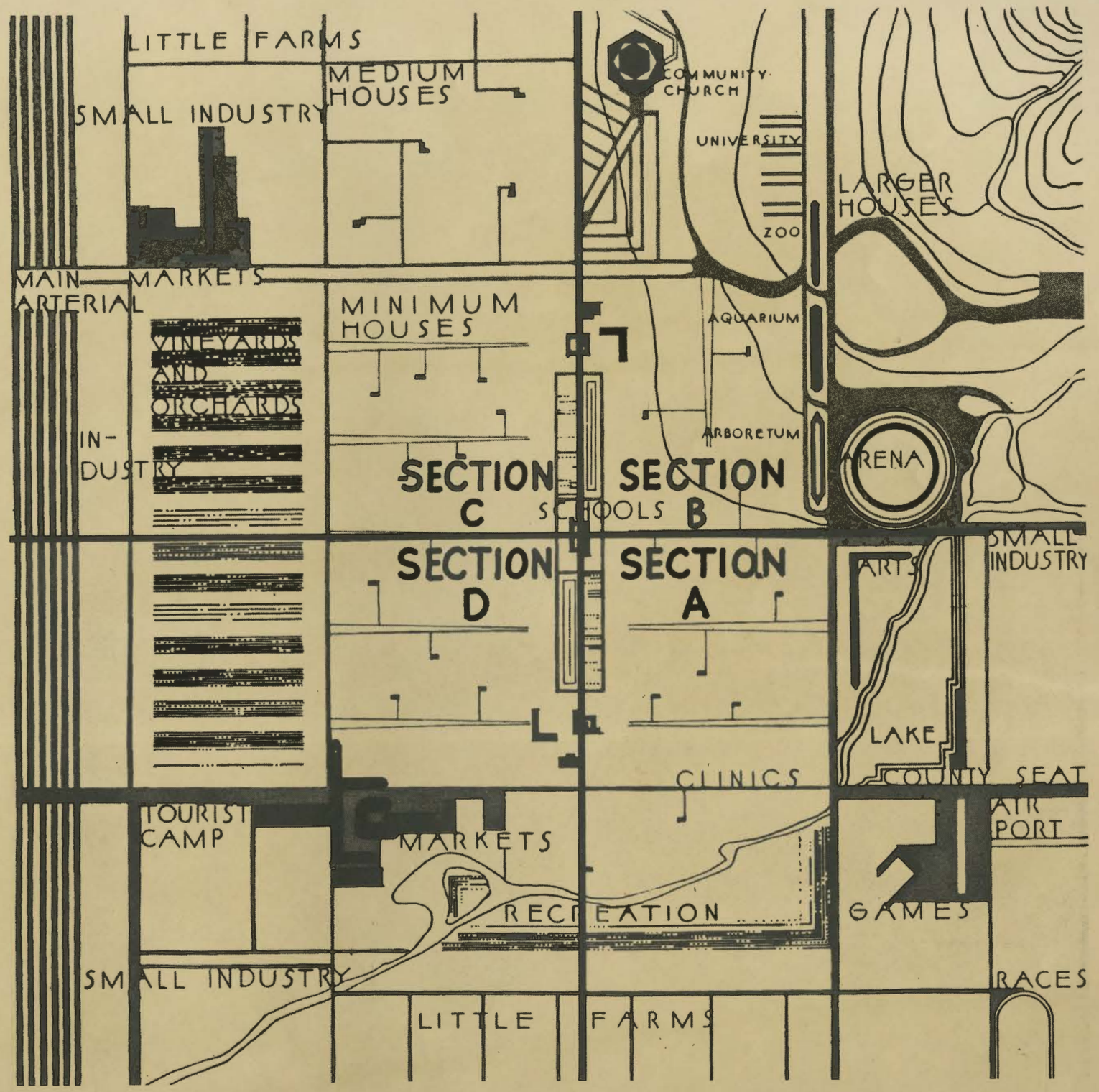


Broadacre City: Frank Lloyd Wright, 1944.

A model for a Usonian America, on the broad basis of an acre or more per individual "These great ways unite and separate .... passing by farm units, roadside markets, garden schools, dwelling places, each on its acres of individually adorned and cultivated ground and developed homes, all places for pleasure in work and leisure."

Frank Lloyd Wright, 1945. p.60

Melvin Webber and current Californian attitudes to decentralisation have given strong credence to the Broadacre concept despite its implausible and Utopian character.

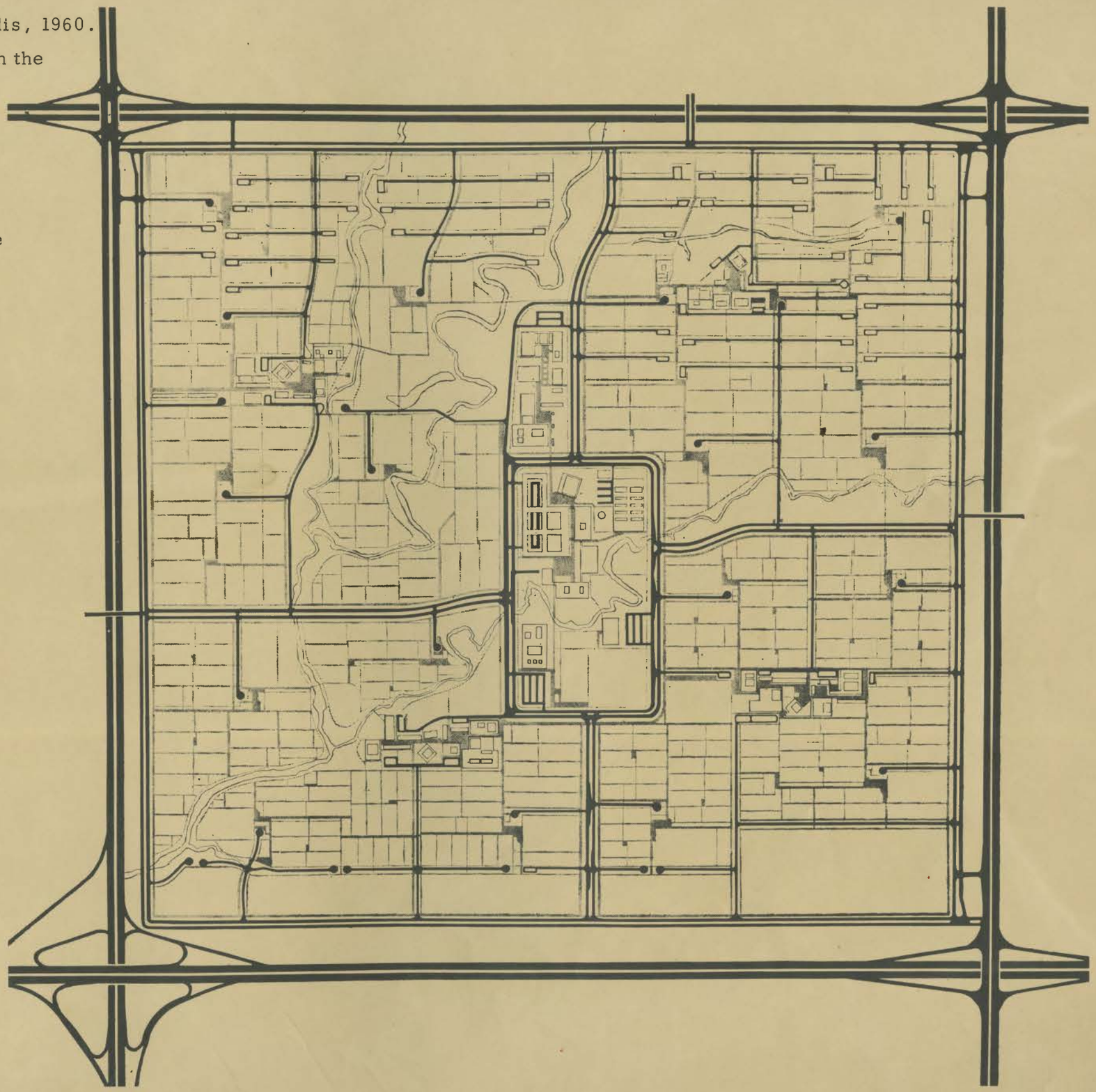


The Static Sector: Islamabad, Pakistan. C.A. Doxiadis, 1960.

"By removing the main circulation networks from within the cells, we can help the latter to remain static and consequently much more directly related to the growth of natural phenomena."

He also talks of "Creating as many facilities at crucial locations of the sector in order to orient people towards them ... Creating facilities and functions with isolating qualities along the border line .... by the creation of schools, sports grounds and parks around the border line of the sector."

p.358



Runcorn New Town: Model for a Community Structure:
Arthur Ling, 1966.

The diagram shows the communities of eight thousand people grouped into four neighbourhoods, each around a primary school and sharing a local centre. Significant factors are the position of the local centre in relation to rapid transit, the parallel transit and freeway routes and the surrounding parks and playing fields.

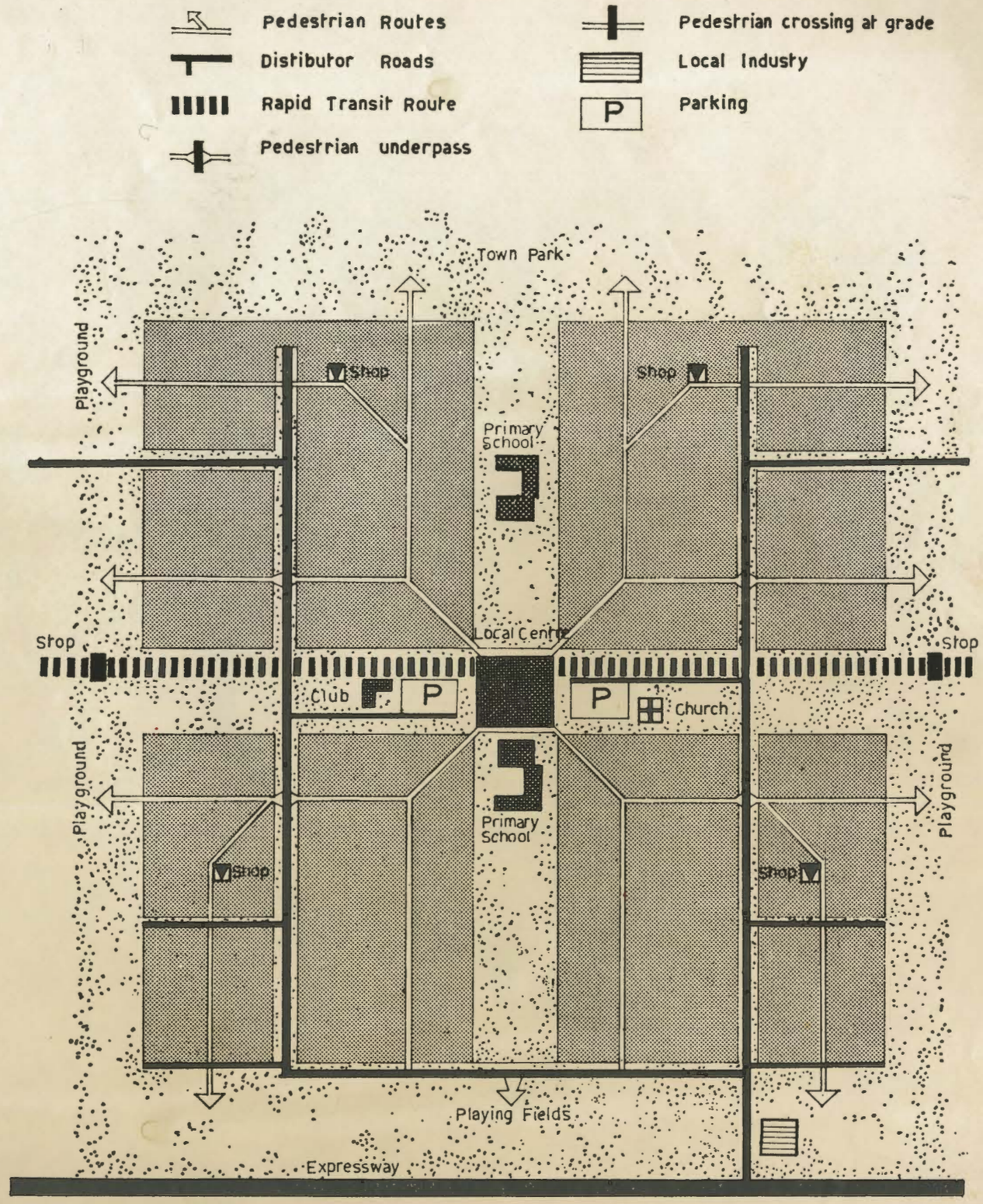


fig.7

Diagram for a Stem: Candilis, Josic & Woods, 1963.

This deceptively simple cartoon represents the ideas for a highly developed urban structure.

"The line itself was chosen as the organisational principle and to this linear system, the 'stem' were connected the dwelling units -the stem itself serves only pedestrians". (1)

In an essay on urban design Woods says: "Our first approach was to consider two families of components - Dwellings and Ancilleries - and to organise these on a linear system .... All the servants of the dwellings were to be organised into a system of activities and services to which dwellings might attach themselves. The stem would correspond to a pedestrian street not a road - composed of commercial, social, educational and leisure activities and including those elements of administration and industry whose size and character would allow them to be closely associated with the dwellings." (2)

(1) Candilis, Josic & Woods 1968 p.15
(2) AYB 11 (quoted) 1965 p.185

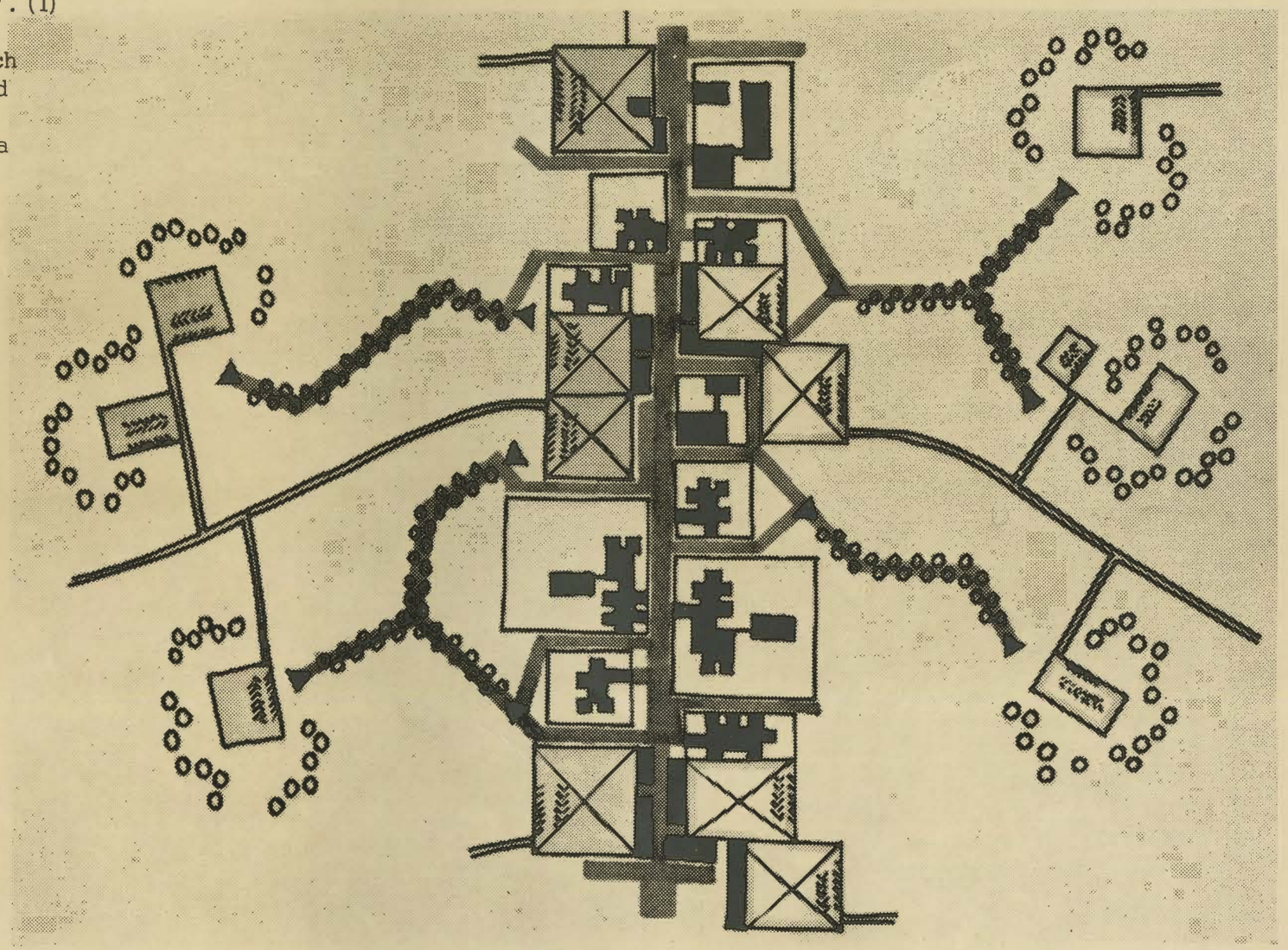
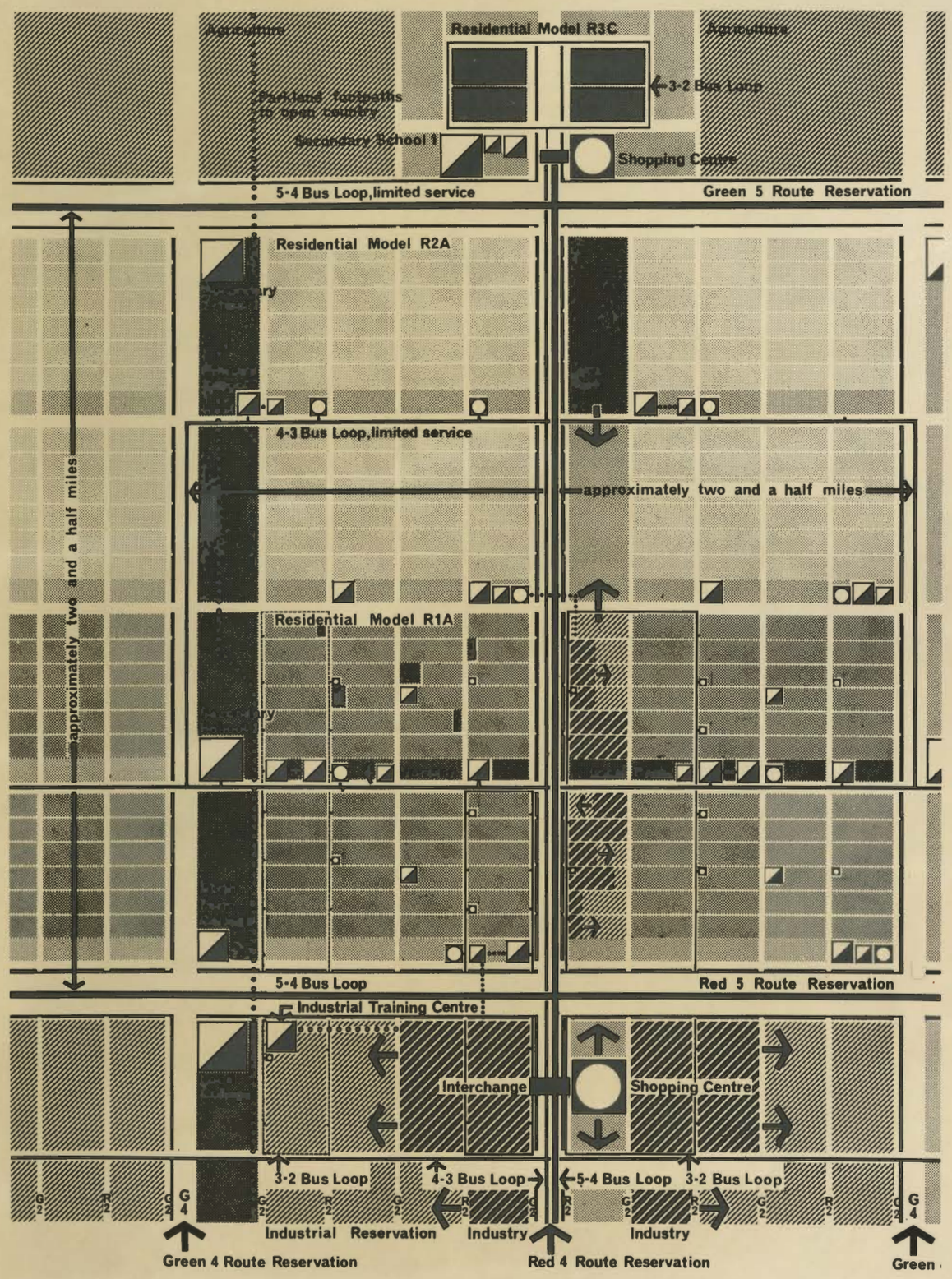


fig.8

South Hampshire Study: Colin Buchanan & Partners, 1967.

A diagram indicating the theory of an urban structure.

This is a complex movement system based on a hierarchy of 6 routeways (see Chandigarh) and is structured so that any route is always at right angles to the route above or below it in importance. The major routes are about $2\frac{1}{2}$ miles apart. An important contribution is the "structuring' of facilities and services in a fixed order of hierarchy related to the routes. Buchanan's warning that a model such as this requires considerable modification should be borne in mind.



Chandigarh, Punjab, India: Le Corbusier, 1951.

Plan of the new town and regional capital.

"In March 1951 Le Corbusier established the master plan for Chandigarh upon an entirely new modern basis, a city composed of sectors each measuring 2600' x 4000'. He had created the principle of the 7v, the fruit of meditation on modern transportation permitting the resolution of all problems of road transportation that could arise."

Le Corbusier 1957-65 Vol. 7
L'Oeuvre complete;
Les Editions d'Architecture
Zurich. p.68

The $\frac{1}{2}$ mile by 3/4 mile sectors are planned to house from about 7000 to 1500 people. They contain an open space in the middle intended for schools, playing fields and other community facilities.

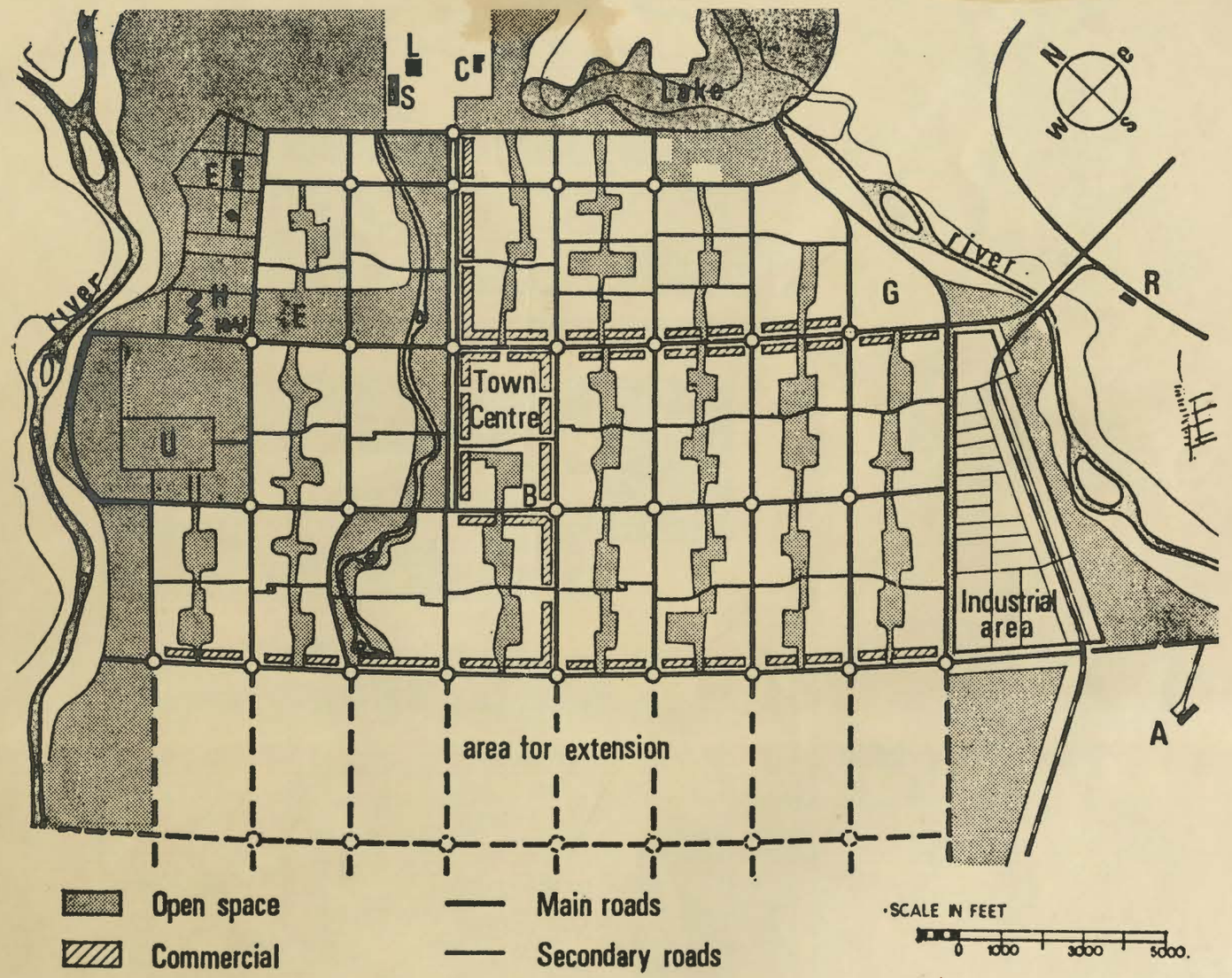


fig. 10

The Linear City:

All rational mobility is lineal. With increased movement since the 19th century, the line has become the most insistant structural form. Some examples are illustrated:-

(a) Tractorstoi, Stalingrad: N.A. Miliutin, 1930.
A lineal complex of industrial towns based on a parallel arrangement of elements separated by strips of green space.

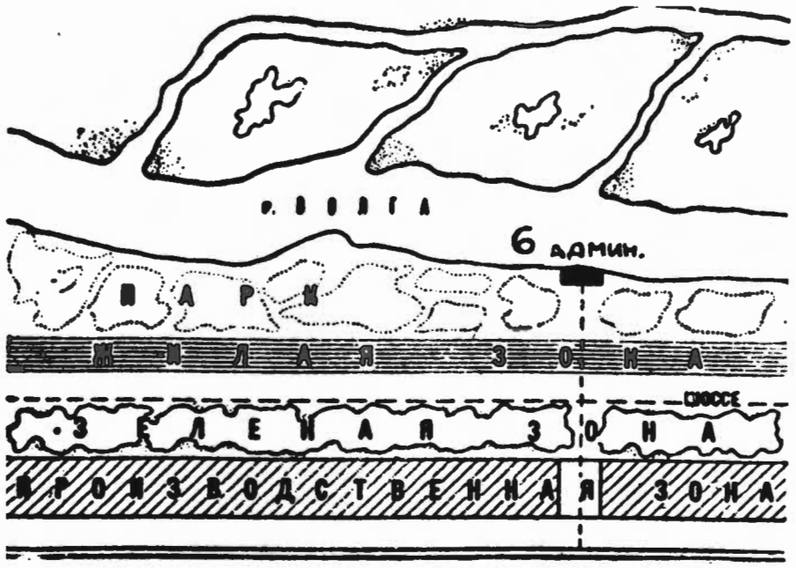
(b) Belgian Linear City: Gonsalez del Castillo 1919.
A central zone of residential and administrative uses flanked by industrial zones and beyond them agriculture.

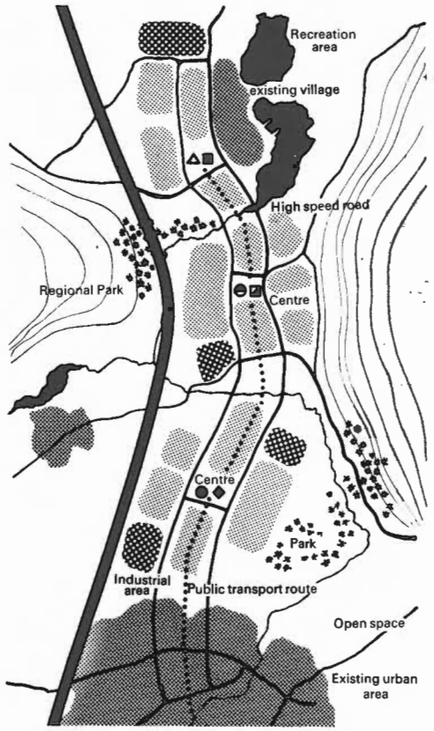
(c) A Residential unit for 5000: Buckinghamshire County Council, 1966.
One unit of a series on a lineal system structured along a monorail.

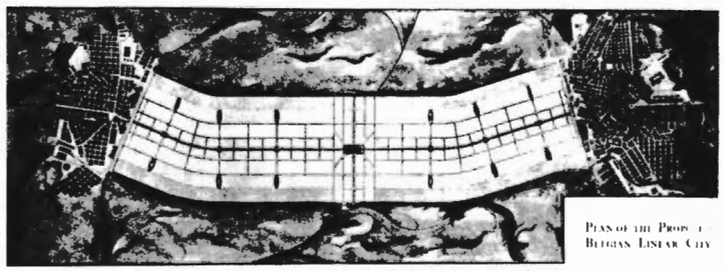
(d) Central Lancashire Study: Stirrat, Johnson-Marshall and Andrew Derbyshire, 1967.
The Leylan-Chorley Preston corridor is typical of many Mark 111 studies in Britain.

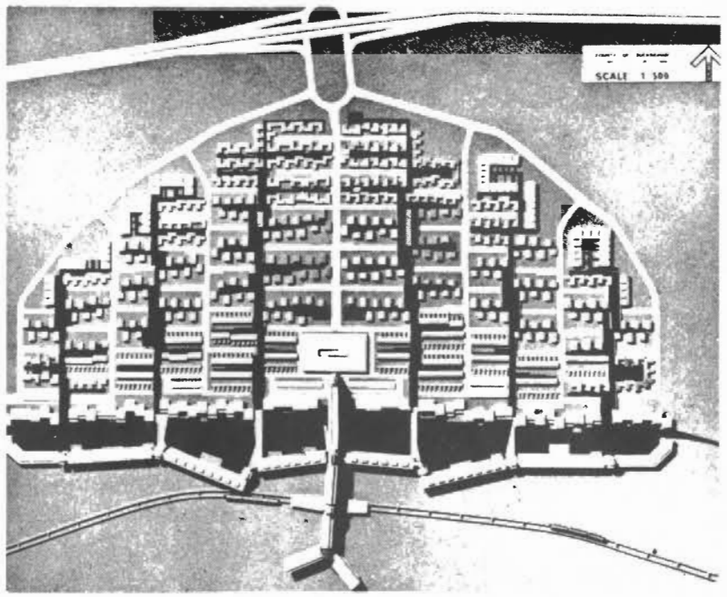
"A chain of townships linked by two parallel urban motorways with a fast public transport route running down the spine of the city connecting the centres of the townships."

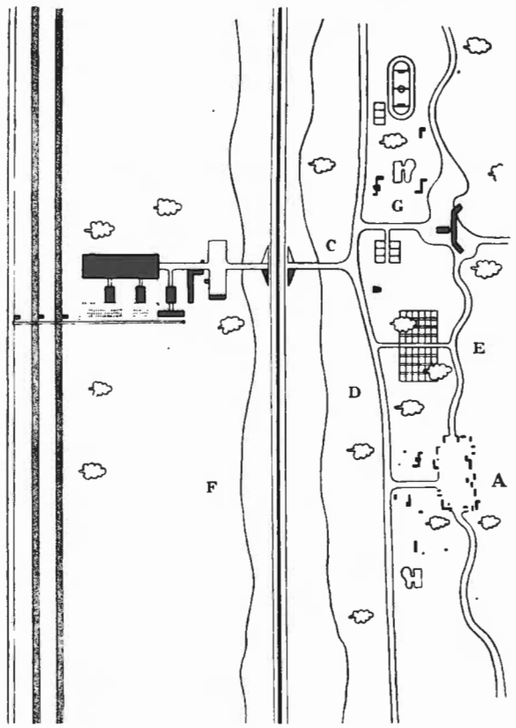
(e) Cite Lineaire Industrielle: Le Corbusier, about 1942.
A line of industrial cells connected to a system of parallel routes. It is connected by a pedestrian structure to residential areas which are buffered from industry by a motor parkway.







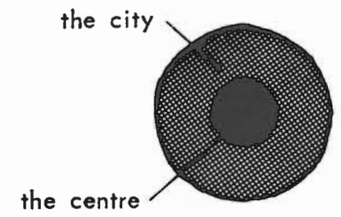




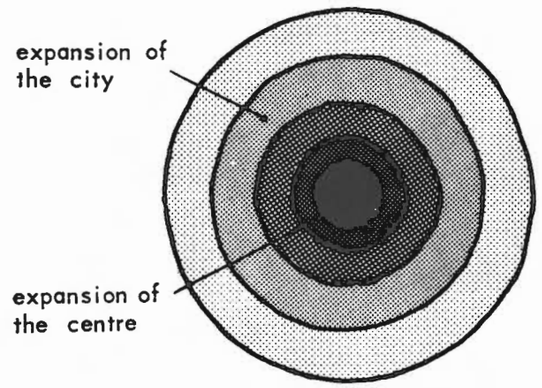
Dynapolis: C.A. Doxiadis

The diagram is self-explanatory. Doxiadis believes that growth should be centric and lineal. The urban area gets progressively bigger as time/distance radii enlarge due to faster movement systems.
The resulting form is parabolic.

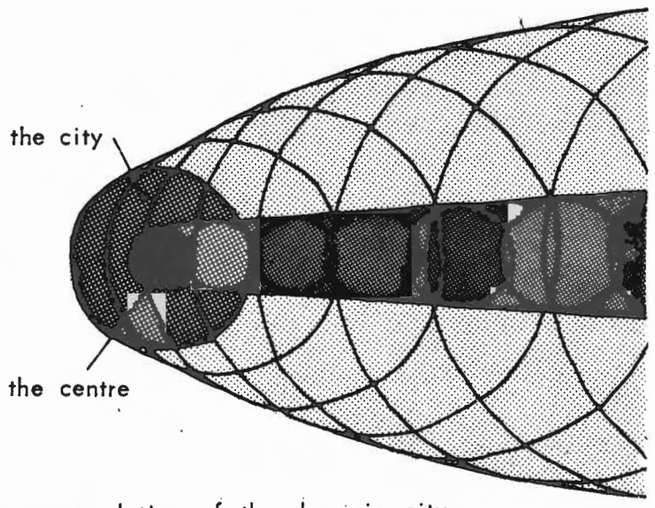
from the static city to the ideal Dynapolis



a. the static city of the past



b. the static city which now grows into a Dynapolis



c. proper evolution of the dynamic city
the ideal Dynapolis is a parabolic settlement with uni - directional growth.

fig. 12

Tell el Amarna, Egypt:

An early plan form based on the gridiron concept - probably inherited from the austere and formalized cities of the dead such as Saggarah, according to Mumford. (1)

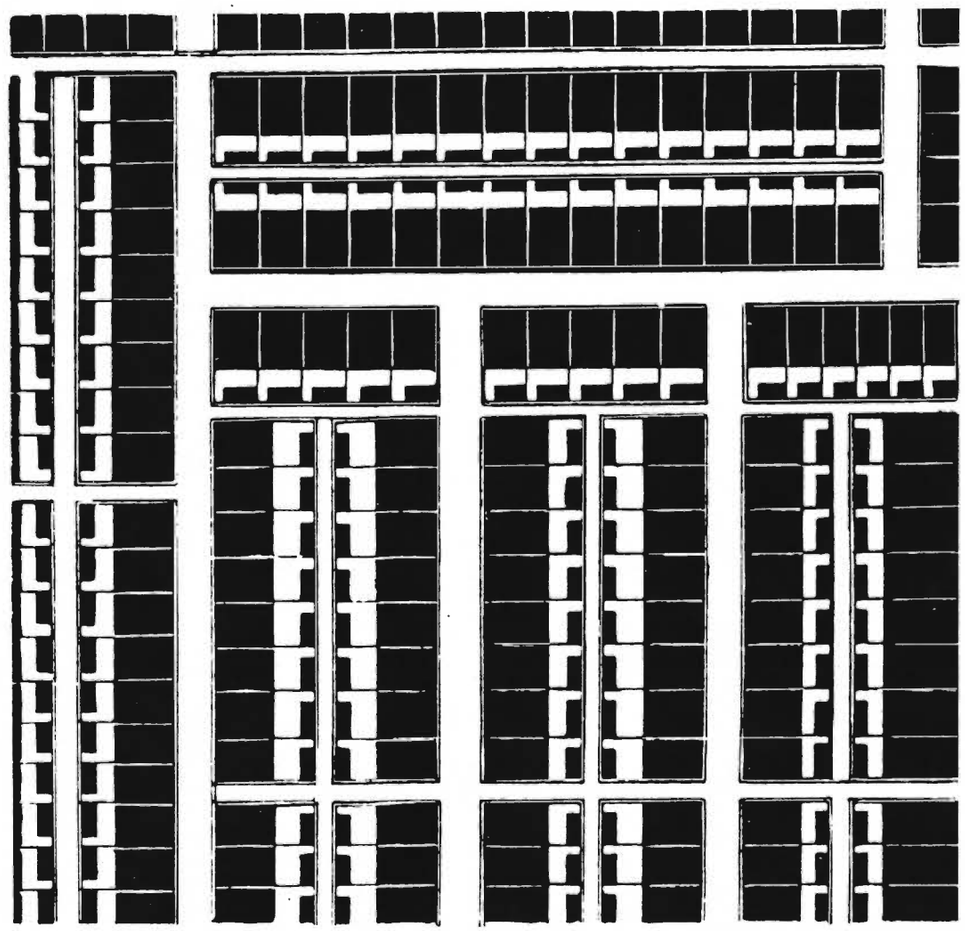
The seminal features are: the scale of the streets, the compactness of the housing relative to the size of the plot and the use of party walls and internal court-yards.

The rationalisation of the basic house plans into standard units which have minor variations is an object lesson.

(1) Lewis Mumford 1961 p.86

British Workers Housing: late 19th Century.

The trouble with 19th Century English working class housing was not so much that it was too dense. It was the monotony, the absence of relief and the lack of amenities which condemned it. The diagram indicates unrelieved concentration at 40 houses to the acre.

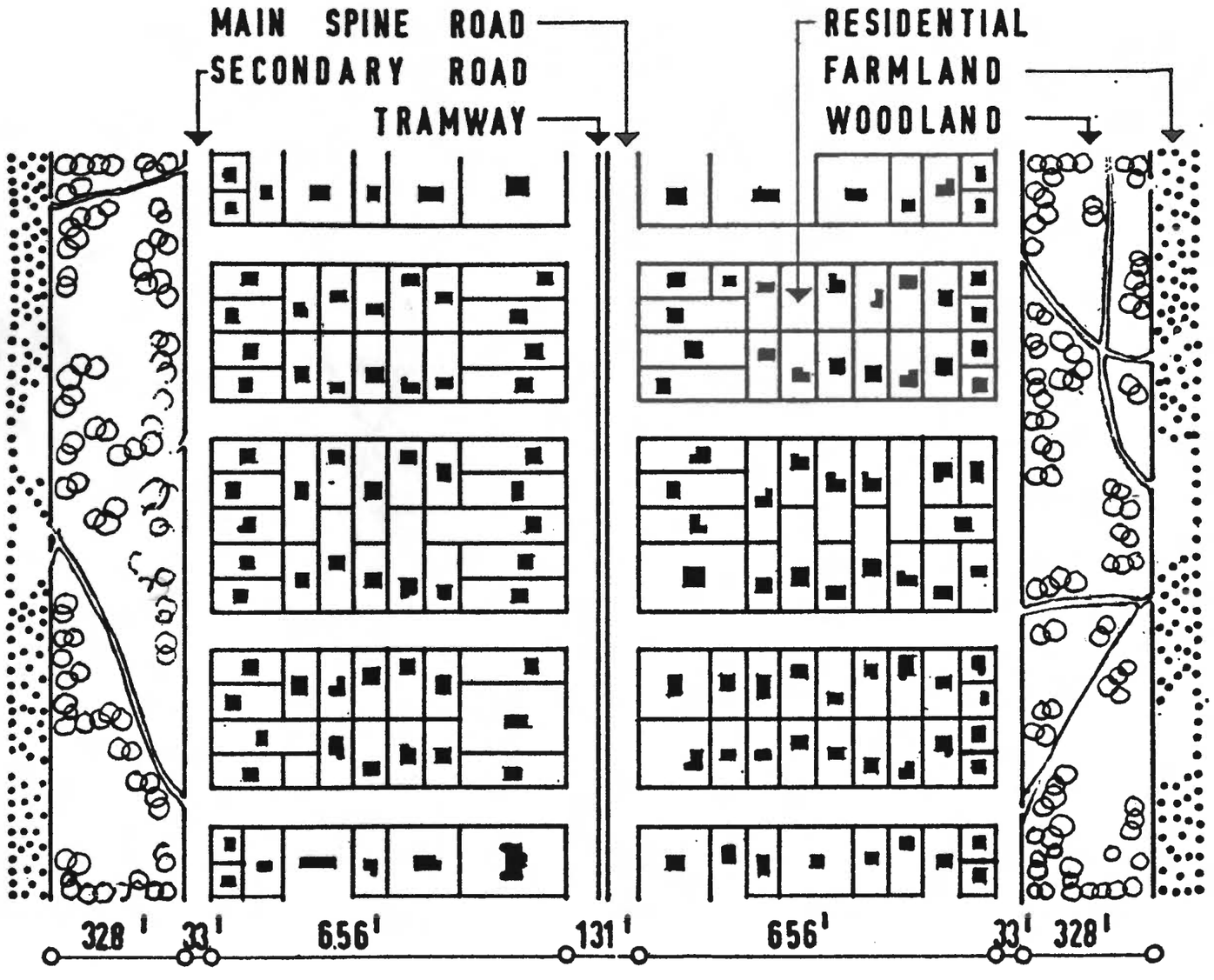


Ciudad Lineal: Arturo Soria y Mata, 1882.

A structure for a linear city.

"A single street of 500 metre width and of the length that may be necessary - such will be the city of the future, whose extremities may be Cadiz and St. Petersburg or Peking and Brussels. Put in the centre of this trains and trams, conduits for water, gas and electricity, reservoirs, gardens, and at intervals buildings for different municipal services - fire, sanitation, health, police etc. - and there would be resolved at once all the complex problems that are produced by the massive populations of urban life."

The concept was simple and clear - too simple for the degree of complexity that typifies the necessary structure of contemporary cities (see Le Corbusier and Miliutin for the scope and complexity of movement structure needed today).

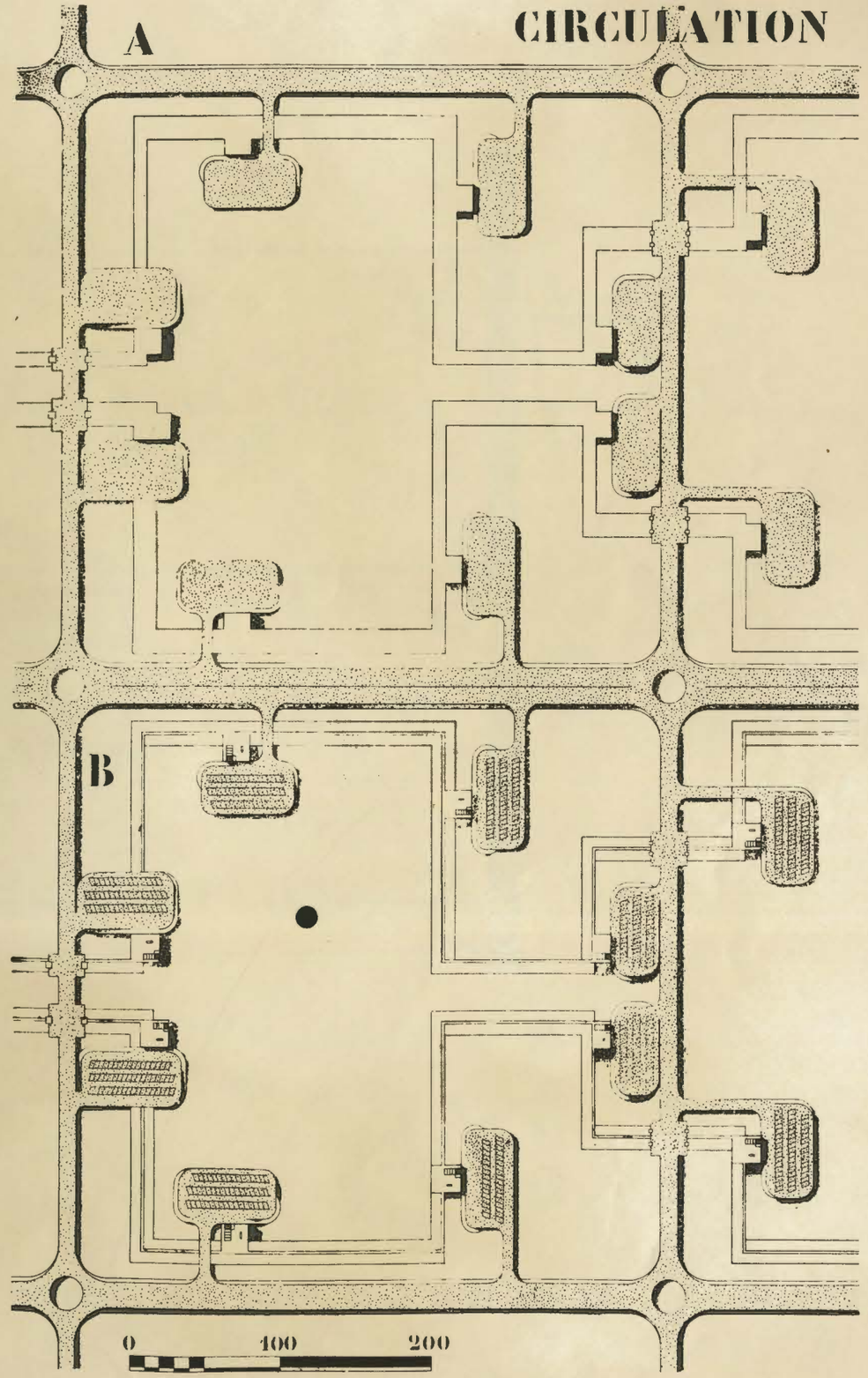


The Radiant City: Le Corbusier, about 1930.

Traffic Network:

A highway system based on a two-way grid at 400 meters, raised 5 meters in the air with the whole surface of the ground given over to pedestrian use. The cars park in autoports at the entrance to the apartment buildings.
Adjoining the autoports are service and loading bays.
At ground level two pedestrian systems one diagonal and one orthogonal give direct access to all points in the sector. The centre of the block is used for social recreational and welfare purposes related to the apartments.

This familiar model is by now well known and is after 35 years becoming much closer to realisation in part or at least in concept. The high density housing and uncompromised grade separation of all modes of transport are recognised now as inevitable components of the future city.

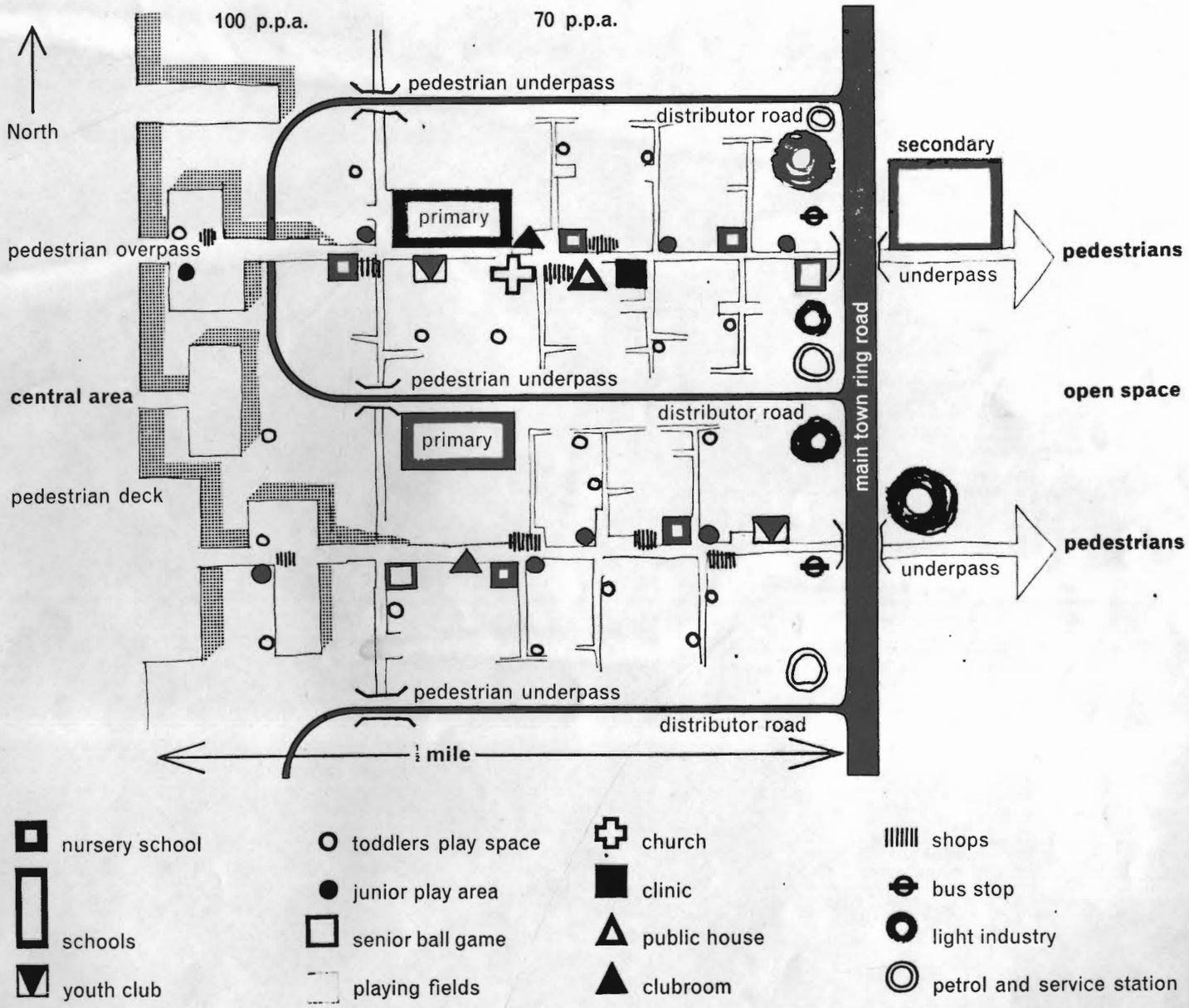


Hook New Town: London County Council, 1961.

This residential area embodies many principles of Mark 11 new towns. In particular the ½ mile limit from the centre to the main distributors with culs-de-sac or loops feeding towards the spine, and a pedestrian structure linked to a central deck above services and parking.

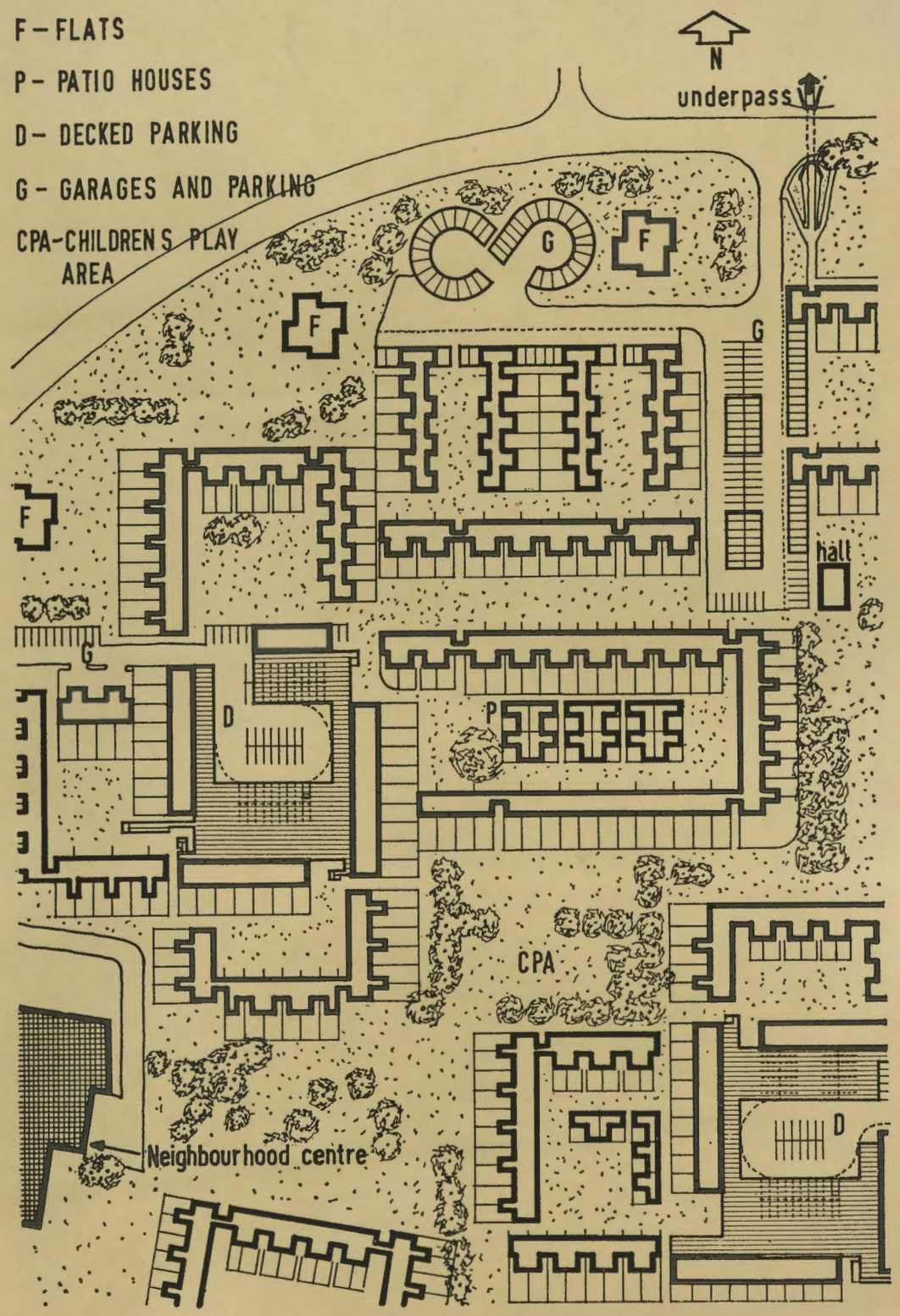
The diagram also shows the close integration of all amenities and service functions with the pedestrian movement structure, and the grade separation at pedestrian-traffic crossings.

The 10 minute/½ mile walking distance is the limit which determines the size of the superblock.



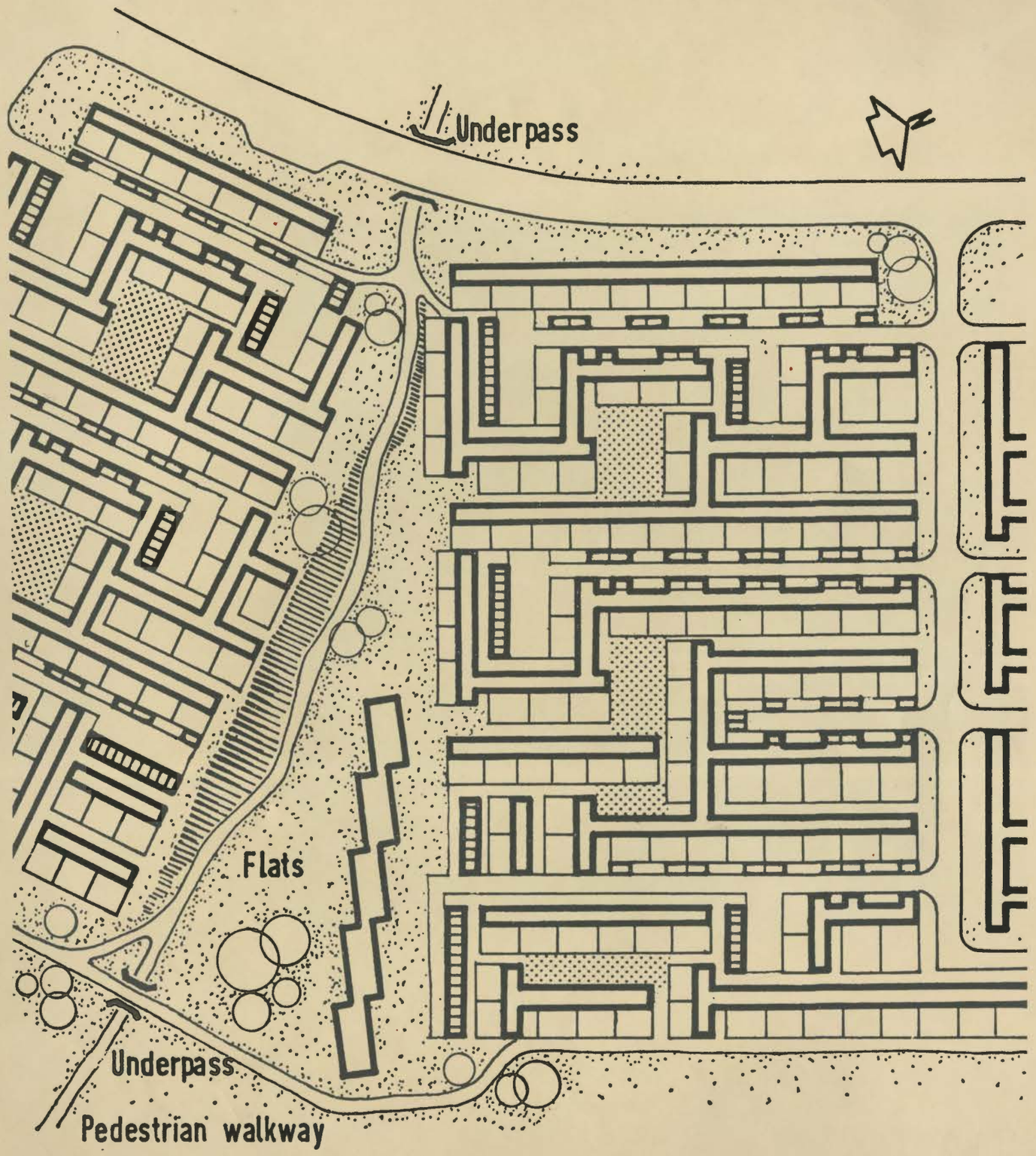
Housing in Laindon Neighbourhood, Basildon New Town:

A tight layout based on a car-ownership of one car per family.
Roofs of garages become pedestrian decks and cars are collected near the edge in order to keep a small scaled internal pedestrian zone.
Open spaces and neighbourhood centres are integrated into the layout.



Wide-Fronted Housing at Carbrain, Cumbernauld New Town:

A more extravagant arrangement, providing larger squares and gardens, easier by-pass access through the house, and better conditions of privacy.
It also attenuates roads and services and increases walking distances.
Attention is drawn to the central green which is logically combined with open space around flats - and to grade-separation of pedestrian walkways.



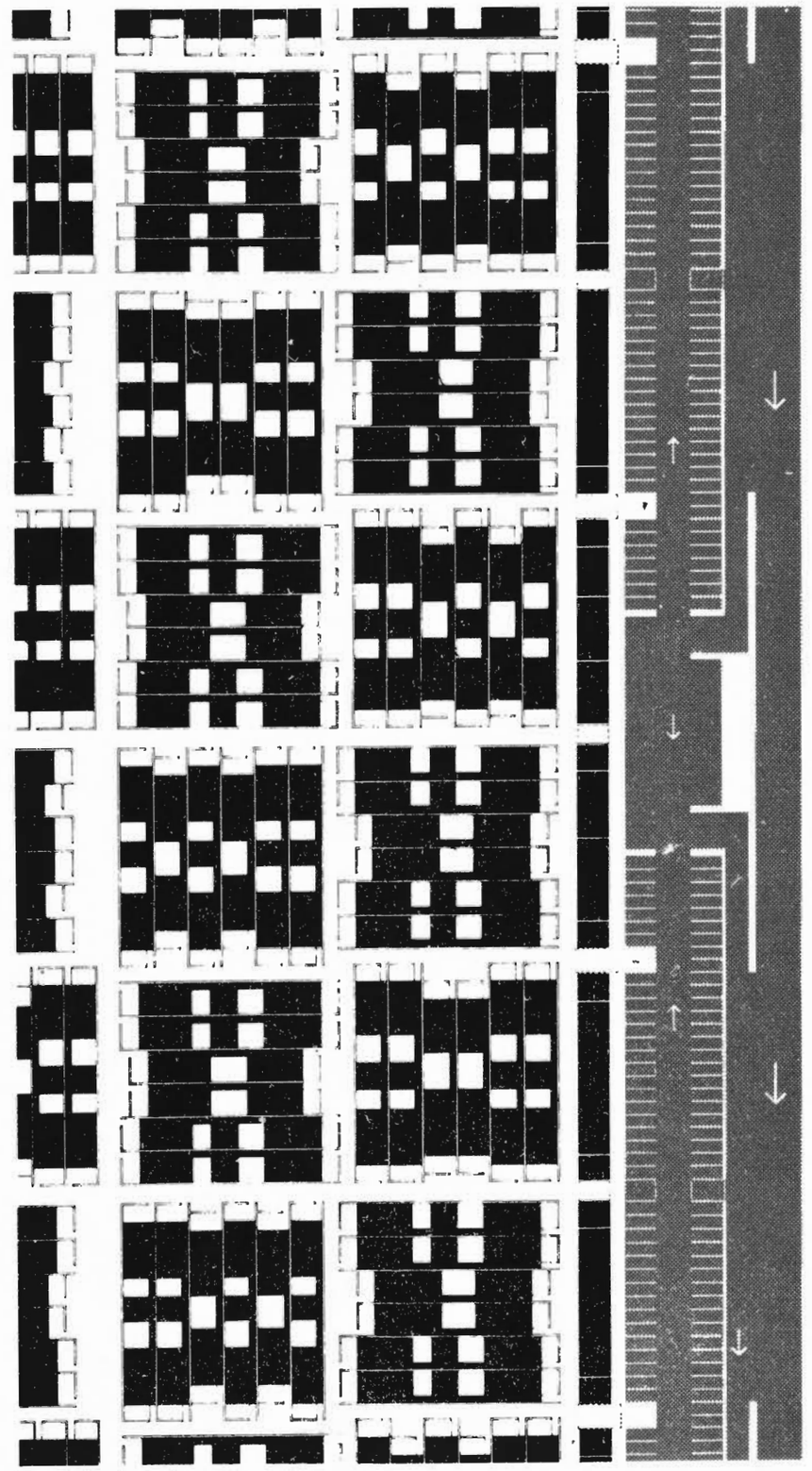
Levittown:

The most often quoted example of a suburban nightmare, forced romanticism, dreary sameness despite the search for variety, and lack of any community services.
The visual effect created by 16,000 detached single storey houses. Analogies with some less well considered townships in South Africa are obvious.

fig. 20

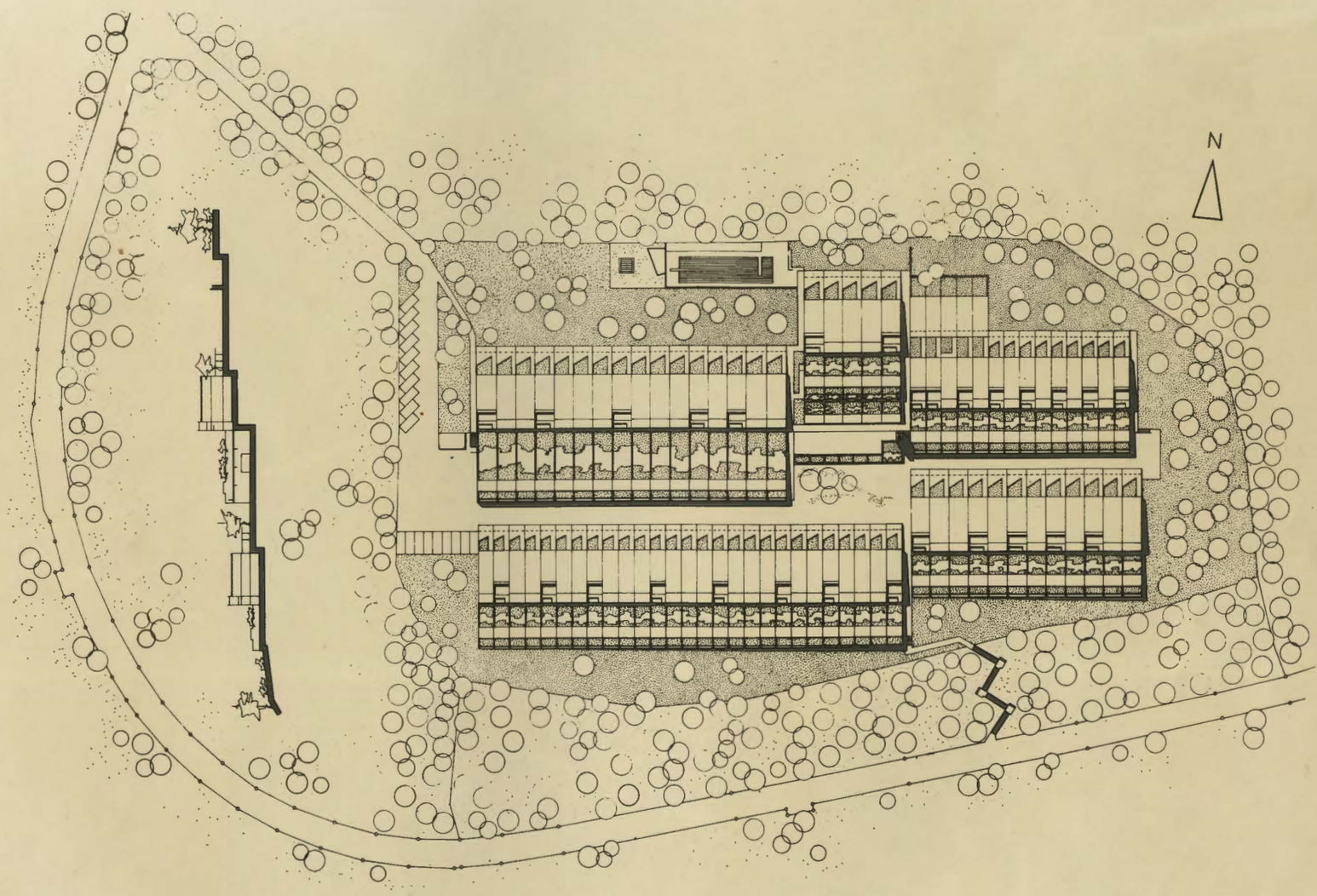
Model for an Urban Cluster: Alexander, Meunier, P. Chermayeff, Reynolds, Christie, 1962.

This compact group is a model which illustrates the rational application of the 33 criteria they have evolved (see Appendix 1). Its significant points are traffic and service separation, pedestrian alleys with a variety of rest and play spaces along them. Considerable attention to privacy through the use of internal courtyards.
This is a most significant urban housing prototype which probably has roots in Tell el Amarna. (see Fig. 12)



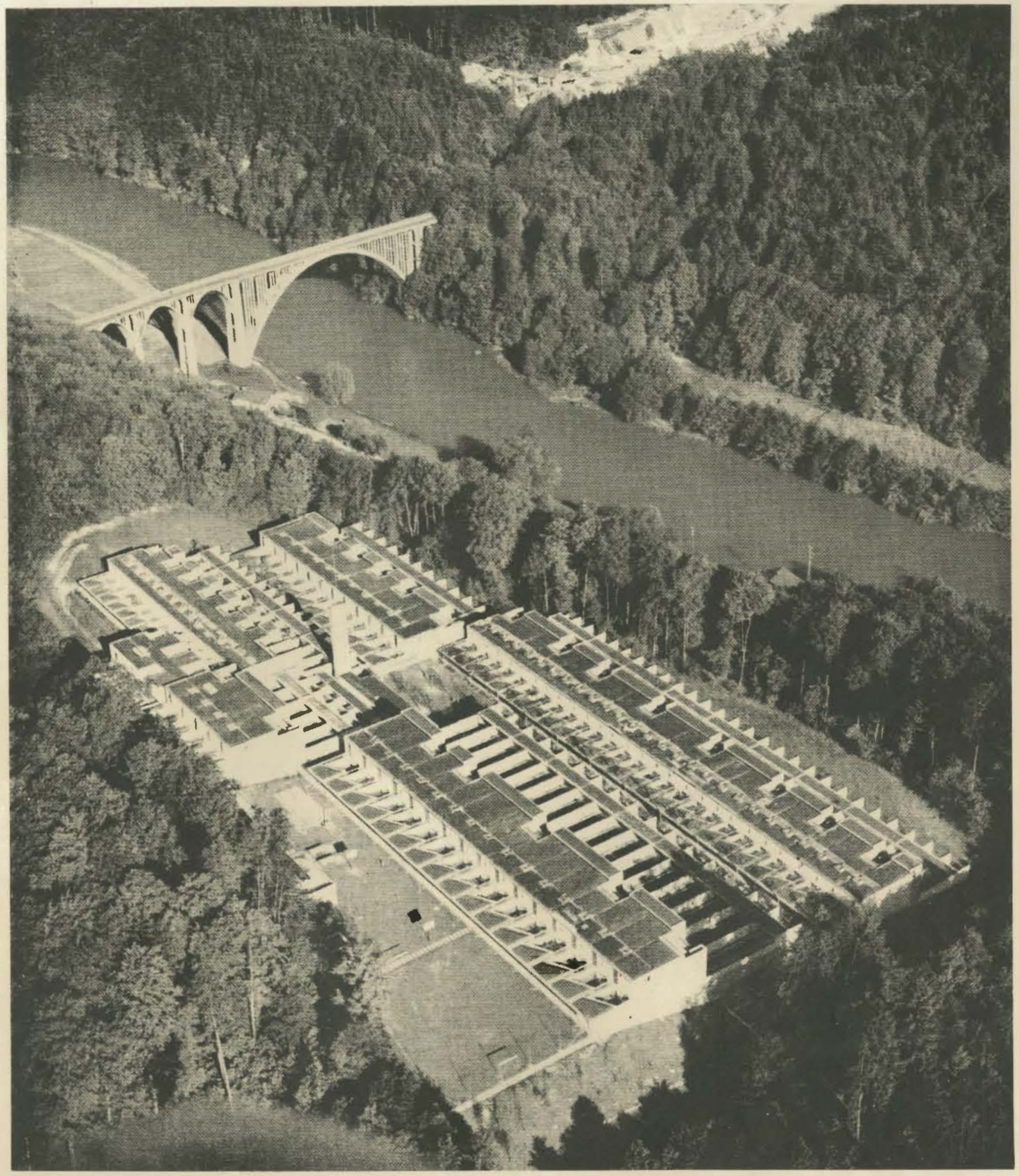
Halen Housing Estate, Near Berne: Atelier 5, 1961.

The plan shows an area segregated from all but special service vehicles. Pedestrians move from a central parking area below houses to their own dwellings along covered ways. All gardens are private and all units have the same view and orientation. Personal experience on site confirms all the positive qualities.



Halen Housing Estate, near Berne: Atelier 5, 1961.

A classic example of compact urban low-rise housing. Narrow-fronted units structured to form a meaningful unit but gaining rather than losing amenity by this process.
This example must be compared with Levittown. (Fig. 19).



La Ville Radieuse; Le Corbusier, 1933.

Le Corbusier's model for a city was a 'laboratory experiment' which would require adaptation to actual site conditions.
It shows a diagram based on a railway station at its centre, surrounded by the zones of greatest concentration and containing all the central uses. Surrounding these are dense residential units based on a 400 m. grid and beyond them the Garden City.

This diagram, like all this teacher's work, exercised a profound influence on central areas at all scales - including the model in this thesis.

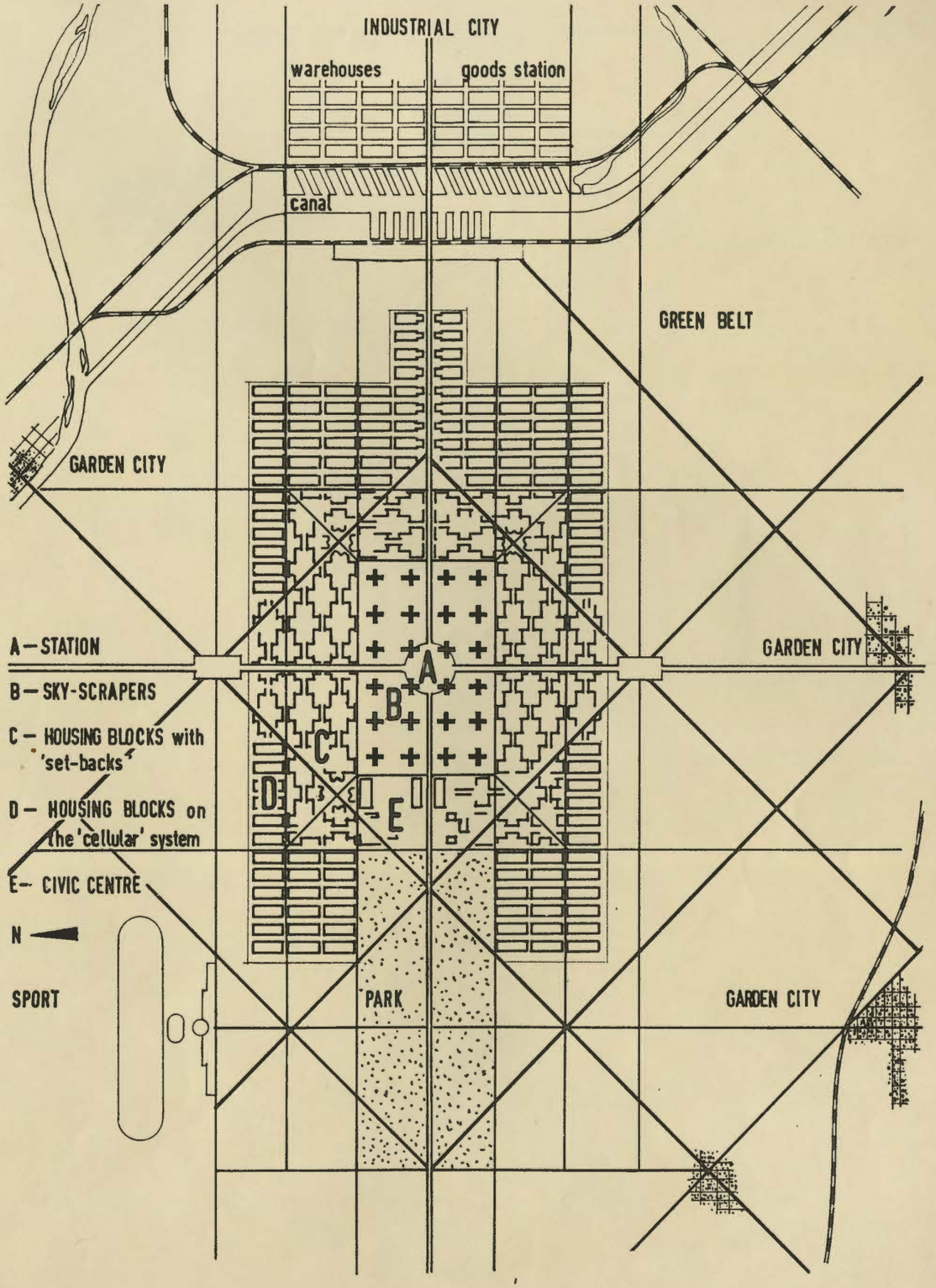
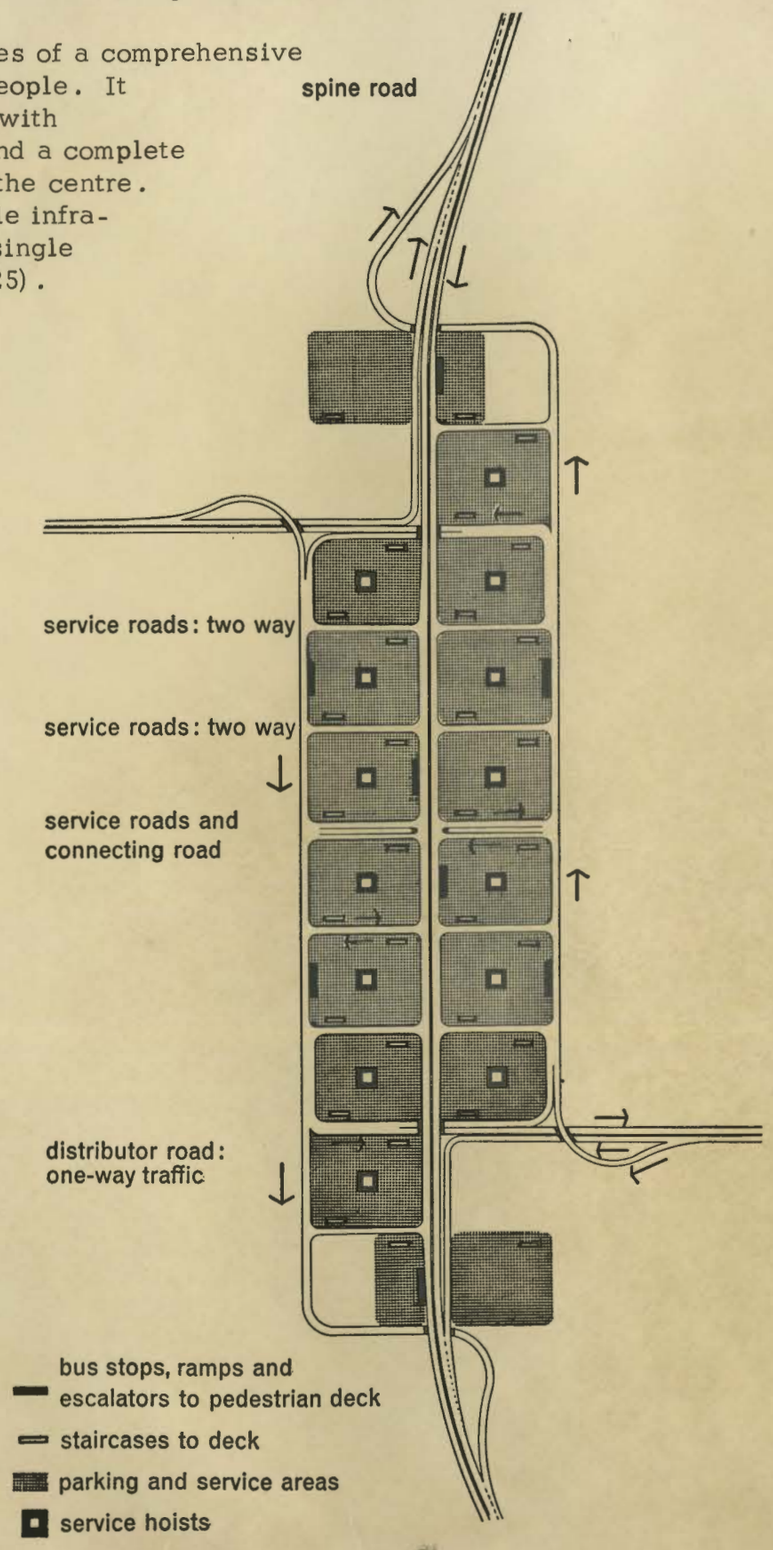
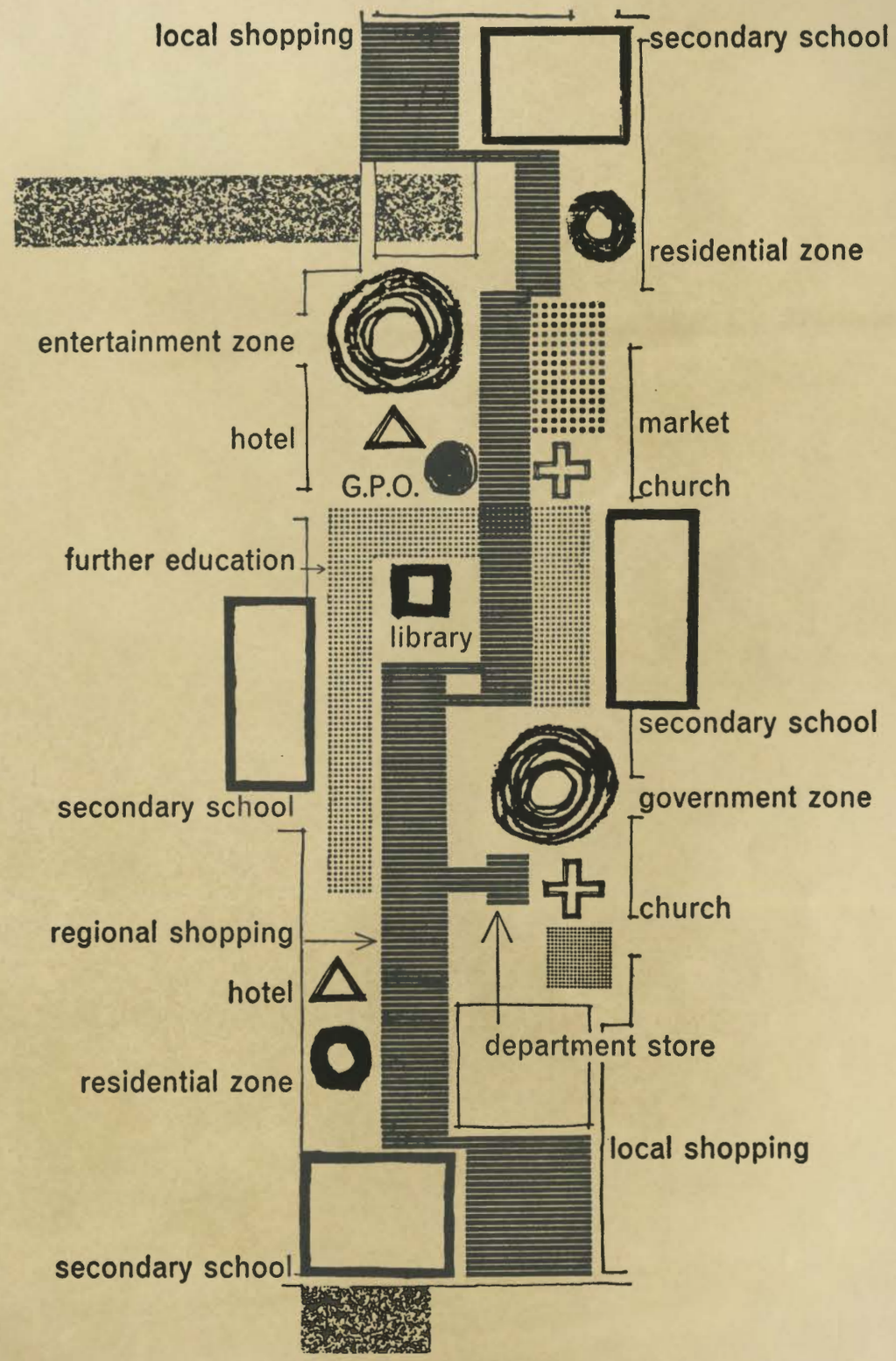


fig. 24

The Central Area: Hook New Town. London County Council, 1961.

A study model describing the principles of a comprehensive multi-functional centre for 100,000 people. It illustrates an artificial elevated site with parking, service and storage below and a complete range of central uses integrated into the centre. It does not, however envisage a single infra-structure as did Cumbernauld, nor a single enclosure as does Runcorn (see fig. 25).

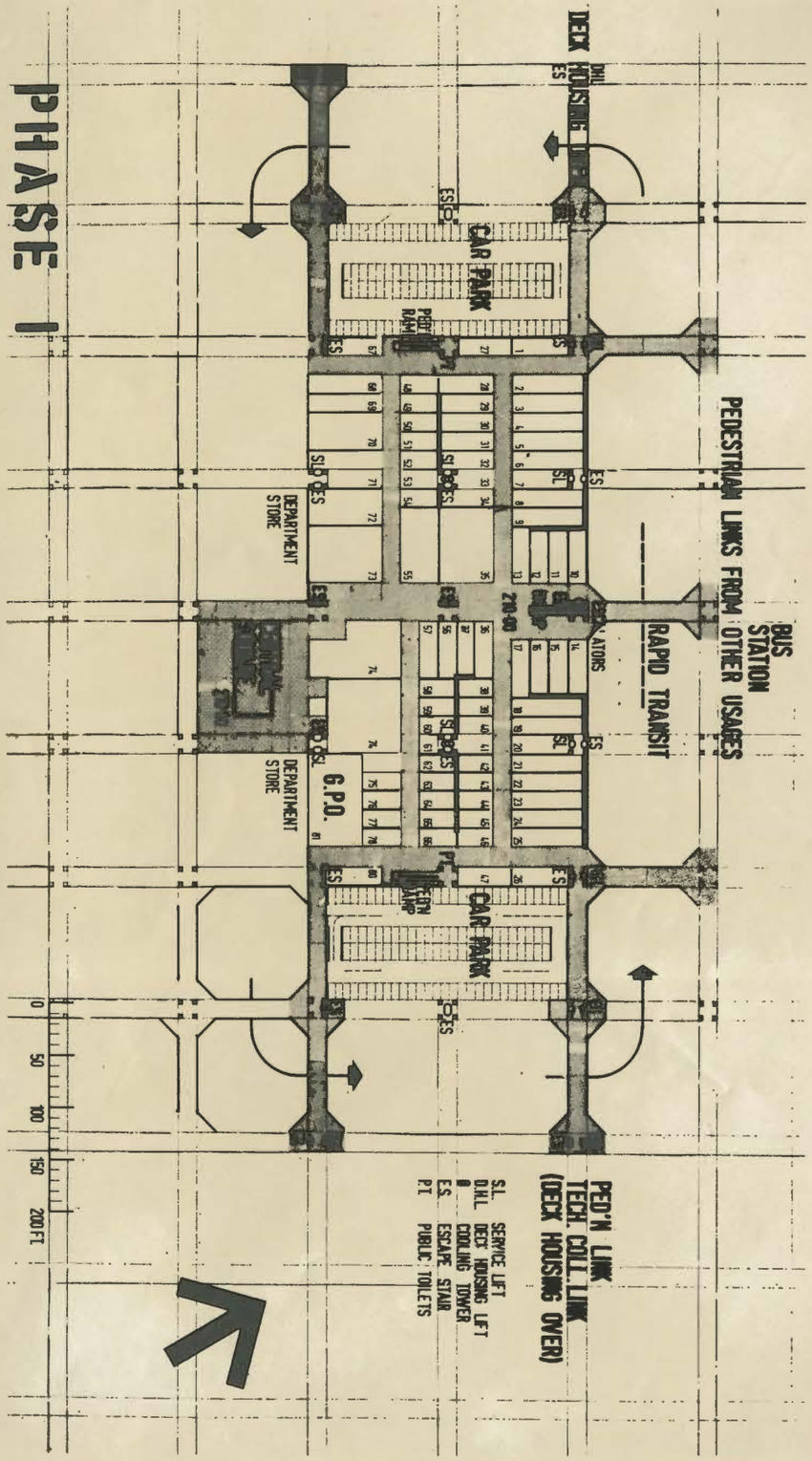




Town Centre: Runcorn New Town. F. Lloyd Roche, 1968.

The first phase of this centre indicates the relationship between the line of public transit, the main pedestrian spine with cross arcades, flanking car parks and the central square.

It also shows the upper-level pedestrian connection from deck housing above linking in from either side.



Town Centre: Runcorn New Town. F. Lloyd Roche, 1968.

Recently published is this design for a centre for 100,000 people.
Also built on a deck system it has a highly adaptible grid-structure reminiscent of Arup systems for Birmingham and Loughborough Universities.
It has a complex traffic system which separates private cars, service vehicles and public transport and it proposes including all central uses under one roof.

The closest approach yet to prophecies of 'The Metropolis as a Department Store' (1)

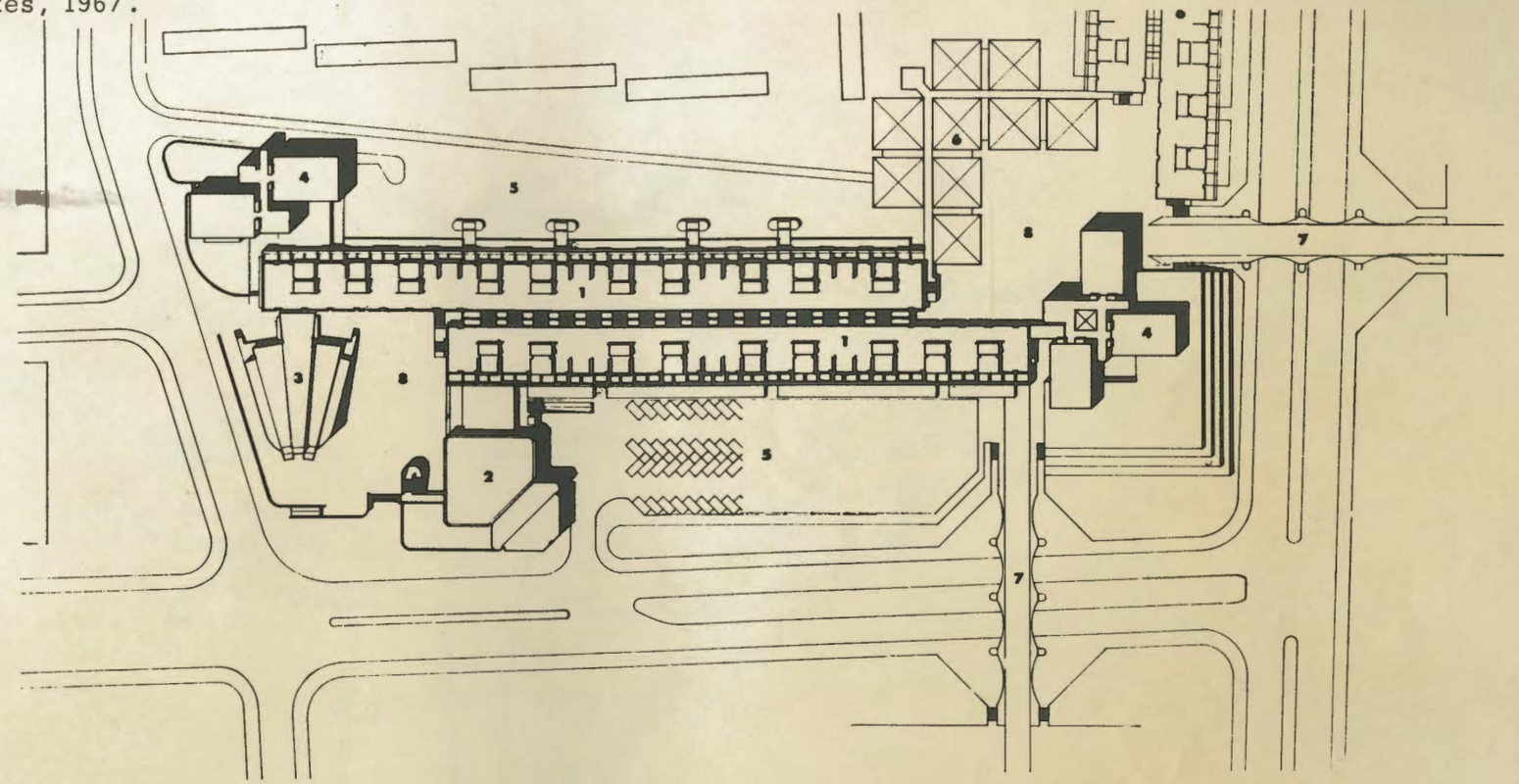
(1) Paul and Percival Goodman 1947 p.125

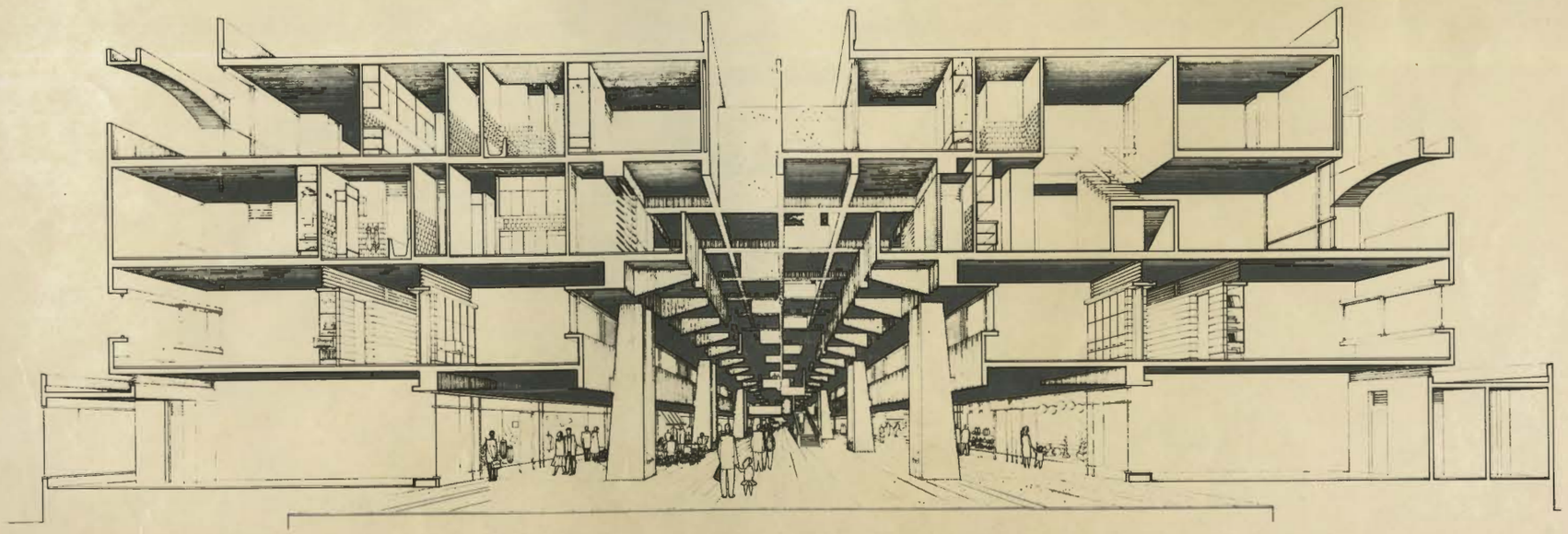
Neighbourhood Centre: Beersheva. Karmi and Associates, 1967.

This structure is linked at one end to a bus route connecting neighbourhoods, and the other to an existing main street containing administrative, religious and welfare uses.

The relevant aspects are:

It is strictly linear, has a wide range of functions, is modestly scaled and situated at ground level. It is a sheltered, compact and simple structure, and does not rely on lift or escalators, nor is it air-conditioned.
It has a particular relevance to smaller-scale low-cost developments such as the one studied here.

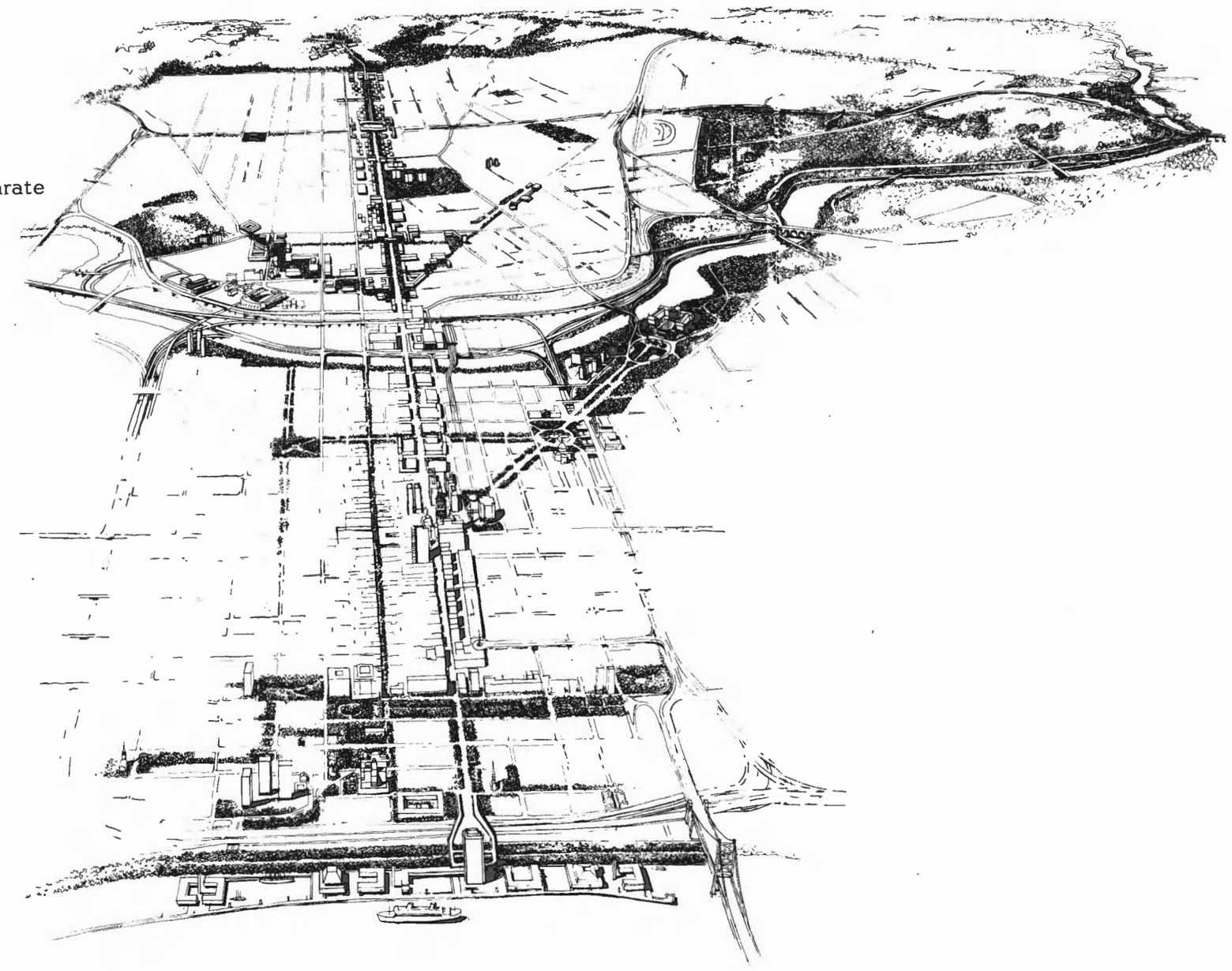




Philadelphia Central Area: City Planning Commission Philadelphia.

The City Centre as a Line:

The lineal structure for the centre of Philadelphia has been the subject of plans and studies dating back 20 years.
The logic and arguments to support this basic idea need no emphasis here.
The Market East Development nodal point in the central area is a high point in the redevelopment of cities in the U.S.
The plan is based on the interrelationship of five separate movement structures; motor-cars from an express-way loop, the railway, the underground railway, the bus system, and finally the pedestrian - on decks or raised walkways.



SYNTHESIS

SYNTHESIS.

Introduction.

The final statement, the drawing together of the facts and their application is presented in graphic form at the end of this document.
It is submitted as a diagram and not a plan, a structure rather than a settlement.
It is the resultant form that has culminated from the widely ranging collection of statistics, opinions, values, comparisons - and guesses.
The principles embodied are in every way the firm conclusions arrived at as the result of the research.

Methodology.

The precedent for the methodology is to be found in most preliminary studies for new towns but in particular in the Approach to Urban Structure adopted by Colin Buchanan and Partners in their South Hampshire Study. Their research begins at first principles of structure and growth and by a process of evaluation culminates in a planning model.
The most relevant aspects of their research were firstly the investigation of an appropriate hierarchy of movement structures and secondly the application of this structure to an area. This study, together with the whole precedent of ideal models has influenced the search for the optimum form capable of being achieved in the context under investigation.

THE URBAN STRUCTURE.

Changing Forms:
From the precedent examined it has become clear that discrete settlements have less relevance to todays concept of space and mobility than other systems which encourage connection rather than separation.
There is at present a wide consensus supporting the validity of lineal form in contemporary planning. Apart from Buchanan's Study, there is the example of the Central Lancashire Study illustrated here with the linear towns (1) and Doxiadis' well known diagram of Dynapolis (see precedent) which grows along a single line of expanding circles.

The Case for the Line:
Finally three major factors led to the choice of a linear form for the study model:

1. A belief in the continued significance of Cape Town as a central place.
2. The conclusive evidence to support the use of a railway line-haul system for low income commuters.
3. The strong case for a third radial corridor bisecting the two that exist and linking directly to the city and the central employment zone.

Form and Structure in Greater Cape Town.

The radial corridor is examined in relation to the existing movement structure in the city in an attempt to find constants applicable to the model. When topographic restraints and inherited fixes are excluded, natural patterns emerge which are instructive.
The 2-1/4 mile freeway grid bisected by a rail route as a corridor structure, is found to have good correlation with the existing pattern.
Dwg 2 compares an overall grid form with the radial form as the basis for an ideal structure. Clearly there is considerable divergence in basic form between the two, neither of which is found to be appropriate as a model.
A further study examines the effects of the introduction of a third strong diagonal radial into the emerging grid and how this might be structured.

It is found that it is in the reconciliation of the three radials and the grid that the success of the new movement structure will depend.

(1) Andrew Derbyshire 1967 p.p. 430-440

As this process is not within the scope of the study model, it is examined in no further detail beyond testing its appropriateness as a basic framework within which to proceed.

The New Lineal Corridor.

The Freeway Grid:

This structure is graphically explained in Dwg 3

It is in effect a 2-1/4 mile directional grid based on the existing national road to Faure, a proposed new railway line, and other freeways of lower orders of importance. The characteristic of this linear grid is that the routes in the direction of growth are stronger than those across it.

It is nevertheless a system designed to be open ended and capable of easy integration into lateral routes. The grid intersections are intended to be full service interchanges.

A Minor Grid of Main Roads:

In addition to the main freeway grid the corridor has a sub-network of main roads which have limited access but are major distributors which carry bus and motor traffic through and between the sectors and connect to the freeway at inter-changes 2-1/4 miles apart.

These are stop-go roads controlled when necessary by traffic lights, and grade separated from the railway and the freeway grid.

They also permit a secondary line of 'Main Road' movement along the corridor and between the sectors, independent of the freeway.

Feeder Distributors:

To complete the road hierarchy are separate distributors which provide access around and through the sectors, serving the schools and open spaces, the residential zones and the centre. They share the space beneath the road and rail overpass bridges to connect the sectors in two directions. In this way a high degree of movement between parts of the corridor at all hierarchies of route, becomes feasible. The distributor is three or four lanes wide and carries feeder buses which do not run in separate lanes but have lay-bys at stops en route and at termini.

Culs-de-Sac or Loops:

This structure is arranged so that it could permit either culs-de-sac or loops by the removal or inclusion of bollards at the terminals of parking zones.

As a loop system would only permit crossing of pedestrian routes by emergency and service vehicles, spaces for turning are provided anyway. The system developed is one in which a cul-de-sac terminates in a parking and service zone for flats or small row houses. This shortens its length and gives opportunities for shared hard standing for visitor's cars.

The Rail Structure.

Proposals for extending the railway within a large enough reserve to permit four lines is envisaged. This should allow for any rail expansion and for the eventuality of other future modes using this space, if it becomes necessary.

The railway is the spine of the scheme. It bisects the 2-1/4 mile freeway grid and the grid of main roads and it is placed on a line which gives the closest access to the greatest number of people.

Rail stops are 6000 feet apart which conforms to the requirements of this type of system. The track is depressed slightly at stations to reduce the climb necessary for crossing the line.

Ramped subways for cyclists and prams are intended at a spacing of 3000 feet.

The line is crossed by the freeway system every 2-1/4 miles and half-way between by the main road. This permits easy motor connection between sectors on either side of the line without getting on and off the freeways.

The Pedestrian Structure.

The pedestrian structure is arranged so that the main paths are open ended and continuous throughout their length, both along and across the settlement corridor. Lateral paths also link onto space or uses on either side of the corridor. The argument advanced is not that anyone will walk the length or breadth of the corridor, although they may do so if they wish. It is that it permits random segments of linkage to occur along its length allowing a much wider choice of association or amenity both in and between sectors.

The Concourse:
There is a hierarchy of paths envisaged ranging from the broad 50 foot wide concourse in the central zone to 10 foot wide paths serving the houses.
The main concourse stretches across the full width of the corridor interrupted only at the railway line and the main roads. It runs at right angles to the railway and crosses it at the station. At these points an upper floor deck system continues over the line or road to form bridges. The deck is the nucleus of an elevated walkway structure which can be augmented as time and funds permit.

Secondary Paths:
The second order of paths runs parallel to the railway for the length of the corridor. It passes through the middle of each residential zone along a spine of dispersed activity. Within the residential zone it links the schools to the centre and to the uses along this line. It collects from tertiary branches along its length and it crosses the concourses at the main civic squares. It has gently inclined ramped bridges in the direct line of movement which cross the main roads or freeways along its route.

Subsidiary Network:
This network serves the residential sector as a collector to the vennels which lead to houses and flats. Walkways have broad underpasses under the distributor roads and are scaled to have interest and variety along their length. No vennels are more than 500 foot in length. Bus stops occur at the intersection of path and distributor road and their design is indicated on the plan. The paths connecting the schools have rail overpasses permitting choices between sectors and close inter-relationship between schools.

Systems and Sub-Systems.
The amenities and services of the sector are related to the hierarchy of movement in a similar order of importance. Amenities usually locate at the intersection of a lower and higher order of movement. Thus a playlot may occur at the intersection of a vennel and pedestrian distributor route while a supermarket will locate at the intersection of the main concourse and the railway line.
The system could be applied equally well where a sub-regional shopping centre locates at the intersection of a national route and a principal freeway.
This system then is applied to all the amenities enmeshed in the housing sector and will be clearly read from the maps. As an illustration; uses such as corner shops which rely on pedestrian traffic for custom but are served by road, will be located at intersections between motor and pedestrian distributor routes and will benefit from both.

THE STUDY MODEL.

Aims Defined:
The aim of the thesis was to investigate an optimum environment with man as the measure. This led to choice of a man and an environment as a context within which to work. It is the bringing together of the two in an organised urban structure that has been the object of this study. It culminates now in the description of the planned environment that has resulted from the examination.

The Scope of the Model:
The area for detailed examination is the block approximately 6000 foot square which is contained between the main roads and has at its centre the railway station. The outer zones beyond the $\frac{1}{2}$ mile limit from the station are seen as growth areas related in the time scale to greater affluence, an increased car ownership, a demand for bigger plots and innovations in feeder and line haul bus systems. It does not therefore form part of the detailed study area. In general layout its structure is intended to conform in the main to that of the inner sector defined. The exception is that its central area is related to a line-haul bus terminus instead of a railway station.

THE PLAN DESCRIBED.

The plan is intended to conform to existing criteria wherever feasible and has used the requirements of the Department of Community Development (1) as a guide, except where otherwise stated.
The plan divides itself into five main components:

(i) The Residential Zone
(ii) The Central Zone
(iii) Education
(iv) Recreation and Open Space
(v) The Movement Structure

(v) Has been fully described as the principal element in the urban structure. The other four are described in order.

RESIDENTIAL ZONES.

Introduction:

More land in the model will be allocated for residential uses than for any other. In this instance it follows a consistent ratio of approximately half of the total. In establishing the criteria for housing two main issues emerge: firstly the density at which people are expected to live and secondly the types of dwelling that the particular circumstances require or justify.

Densities:

After an examination of the social and economic structure of the population in comparison with similar conditions elsewhere, it has been decided to provide gross densities of approximately 40 persons per acre.
The detailed consideration of how these densities vary within the sectors is considered of primary importance.

(1) Department of Community Development 1967
(quoted elsewhere)

Examination of a sector will reveal that each 7,500 to 8,000 person zone is kept compact and near the centre and the station with the large space-consuming uses moved to the edge. The effect is to achieve a sense of 'cityness' and proximity on one side with large open green areas on the other.

Diversity:

A mix within the zone of low, medium and high densities gives a wide range of choices in the same locality and encourages a balanced mix of population. This permits families in the area which are expanding or contracting to relocate without breaking local ties.
Densities do not, however, conform to normal new town patterns of the highest nearest the centre with the lowest at the outer edge.
It can be seen from the plans that zones of higher density occur in relation to secondary footpath systems in three belts running from north to south; one adjoining the schools (and benefitting from the open space); one adjacent to the centre; and one right down the middle.
A further concentration occurs along the primary pedestrian route that leads from the schools to the centre.
The arrangement is intended to provide activity, life and movement throughout the area, particularly near the path system.
In the culs-de-sac there are usually narrow frontage plots with row houses. Large wide fronted plots for the elite are located at the corners of distributors and culs-de-sac or along the north and south edges facing onto the parks or open spaces.
The high density zones have either smaller row houses, or flats above row houses. A small percentage of flats is located over the central area for single and older people and childless couples, who like to locate centrally.
Nett residential density within the zone is likely to be approximately 100 persons per acre.

Neighbourhoods:

No attempt is made to artificially define neighbourhood boundaries, and the primary school is not, as elsewhere, used as the nucleus of a unit. Apart from those minor uses which must be distributed among the dwellings, all facilities and services have been drawn into the central spine. By this process of concentration more activity and a wider choice of shopping and entertainment is expected to result. The natural more intimate web of associations in and around the households will, it is felt, be encouraged by the pedestrian structure and the dispersed facilities.

Dispersed Social Uses:

These uses which are not located in the centre are integrated into the residential sector. They are distributed in relation to catchment areas and do not form into clusters. These include toddler's play spaces, junior play areas, nursery schools, churches, clubrooms and some corner shops. All of these are directly linked to the pedestrian system although shops and churches for example also relate to distributor roads and bus stops.

Corner Shops:

The shops are strategically placed far from the main centre. They relate to the outer high density zone and to the schools, but could serve the large area of the sector that lies within its 5 minute radius. It is expected that these would develop a 'drug store' or corner cafe type character and under one roof provide a mini-neighbourhood mix of goods, incorporating a sub-post office and a newsagent.

Recent shopping trends do not favour this type of outlet but its successful survival in the midst of old neighbourhoods indicates a real need particularly with lower income groups who buy in small quantities.

Standard for Dwelling Types and Plot Sizes:

Plot sizes that are laid down or recommended by regulation are related to dwelling designs, and are assessed in relationship to them.

In this scheme units and plots are proposed which are narrower fronted than is commonly allowed. It is also recommended that "detached" dwellings be built on narrower fronts by permitting them to be sited hard up to both side boundaries, subject to certain privacy controls.

It is contended that considerable economies in roads, paths and services result from this procedure without loss of amenity to occupants. The minimum recommended width of house is 20 foot (Ebenezer Howard and the City of New York).

Orientation:

The angle of the corridor and its street network gives an orientation of about 26° east of north to the dwelling. In a thesis on the insolation of buildings Harper (1) found this to be the most satisfactory orientation for the latitude in the South Western Cape.

It is intended that all living rooms and most bedrooms should be north facing. Mabin (quoted) has found that at an income where heating costs cannot be afforded, the need for the winter warmth provided by north sunlight is very necessary, and more critical to comfort levels than in higher income brackets. This attitude to orientation is stressed because it is of major importance and because it has a very strong influence on the street patterns within the residential zone.

Plot Grading:

Regulations lay down plot sizes and building types in a descending hierarchy from the "Elite Class" at 7,000 - 10,000 Cape square feet to 2,400 square feet for the "Indigent Class". In the latter category it is not recommended that dwellings be sold to private individuals as this would entail the subdivision of land into very small plots.

In an addendum they add that a subsequent report is being prepared which investigates residential densities at much higher densities than have hitherto been contemplated.(2

(1) D. R. Harper 1947
(2) Department of Community Development 1967 p.14

This model is working on the basis of much smaller plot sizes - the average size being those allocated to the indigent - but not a reduction in house sizes.

Anyone who is familiar with the amount of space around houses in settlements laid out on existing criteria, will see this as a reasonable approach, if not an essential one, to raising densities without the use of flats.

Large plots will also be available but those wishing to own very big sites will be able to buy more than one and combine them.

At plot depths of 85'0" the following widths are proposed:-

Double storey terrace house	20'0"
Double and single storey terrace house	25'0"
Connected or detached houses	33'0"
Detached houses	50'0"
Large detached houses	66'0"

Typical Dwelling Unit.

On the basis of research the dwelling unit in which the majority of people will be housed, emerges clearly.

The factors relating to it have been examined earlier.

The typical dwelling is a double storeyed, north oriented, narrow-fronted three bedroomed house. It will stand on its own ground and be served by a 25 foot motor access on one side and a 10 foot pedestrian vennel on the other. It will have provision for parking one car and a visitor's car on the site directly adjoining the road. It will have its main entrance and private garden on the pedestrian walk. There will be provision to move through the house without entering any living rooms.

The narrowness of its frontage requires that for privacy it have 6 foot walls or screens separating the houses on side boundaries and these should be included as part of the building. (Funds saved by reduced lengths of roads and services will more than compensate).

The closure of street and vennel boundaries is an option and can be by fence or hedge. It can be made private or not according to the tastes of the household.

Economics.

The arguments relating to housing mixes have been made. The final decision is based on rent-paying ability, the rising standards of living and simply what ought to be provided.

The category breakdown is as follows which is recommended as a desirable mix:

Low cost	50%
Medium cost	25%
Home Ownership	12½%
Private development	12½%

A necessary corollary is that as many houses as possible should be ultimately capable of being privately owned.

Building Lines.

Housing can only become more compact and maintain standards if new attitudes to building lines are adopted.

The removal of side space setbacks is a great improvement and permits better planning and more privacy.

Regulations have been developed which permit the full width of narrow plots to be used for detached dwellings without any lowering of privacy standards. These are proposed here.

The only building line considered to be valid is one which sets all buildings, other than those for vehicle storage, 20 foot back from the motor cul-de-sac. This provision is made in the light of trends observed elsewhere where narrow frontages are fully absorbed by vehicles, boats, caravans, trailers and other similar equipment.

Other Dwelling Types.

No conventional 3 tiered flat buildings are proposed.

The typical multi-level unit will involve a maisonette at ground level with a single level apartment above.

The maisonettes have a small garden. The apartments have a large north-facing balcony and get access from a gallery on the south side.

An alternative to this system is one with a duplex above a maisonette. This unit is similar in all respects to the previous example but has a family sized unit above ground.

Some 2 room apartments are located above the centre served by the lineal gallery system and having reserved parking spaces or garages in the shops' parking zones.

Special Residential.

Housing for the aged, where provided, will be in the residential zone but close to the centre and station.

Hotels, hostels and other 'pension' type accommodation will all locate in the central area or in the high density zone adjoining it. A licensed hotel is proposed on and above the Civic Square with out-door restaurant rights on the square itself.

Venice and Vennels.

The residential zone is a pedestrian-segregated realm in which children may wander free of danger from traffic and where streets and public spaces are scaled to people rather than cars. One of the most beneficial advantages of a traffic-free environment is the change to a more intimate world. The delights of Venice are particularly associated with streets 10 foot wide or less, articulated by small squares and unexpected pausing places and it is this sense of delight that influences the pedestrian structure of the model.

Radburn Reviewed.

At this point it is important to stress the radical difference between the structure proposed and conventional Radburn or superblock type layouts. The Radburn system usually places open spaces and sometimes the schools on the central pedestrian collector with paths linking the amenities. Traffic is fed inwards by a ring distributor and culs-de-sac.

Under local conditions this is seen to be impracticable. The school sites are very large, exploding the housing around 8 foot high fenced stockades. The open places are often sandy wastes and dangerous to cross at night. The densities are not considered high enough to require an internal open area of this magnitude.

The Preferred Solution.

The solution offered is one where narrow paved streets, hopefully tree-lined in time, and with many different kinds of meeting place along it, will achieve urbanity, propinquity, shelter from wind, safety and the intensive use that such a system requires.

The close interleaving of the motor feeders which strike through the middle as well as around the perimeter, provide the added activity and the convenience of having the vehicle close at hand without danger to pedestrians.

Hilltown Lessons.

The lessons to be learned from the pedestrian structures of Italian hilltowns and the Aegean Islands have long been recognised as significant. This model attempts to apply some of the principles that shape them.

THE CENTRAL ZONE.

Criteria.

This model subscribes to the concept of a centre which will provide a complete range of services; social and cultural and official as well as commercial.

The advantages of a single integrated deck structure are acknowledged but rejected for this model. A system is favoured which starts simply, can be phased without dislocation and can become more complex in the future if need be.

Traffic.

The central zone is the area of the greatest concentration of traffic, and movement in this area is most important. It is 400 feet wide. The railway stops at the most central point and discharges commuters either at grade or on overhead ramps or bridges. On either side of the station are terminals with lay-bys for eight to ten feeder buses which serve both centre and station. They will connect primarily with the outer sectors but serve the inner sector as well. Next to the station are two large parks for 'park and ride' commuters.

The centre is served by two one-way service distributors 400 feet apart. The full length of the centre is flanked by double banked parking zones which will more than accommodate the parking needs for the present and immediate future. At Runcorn parking spaces at the centre will be provided for 4,500 cars or 4.5% of the population, whereas at Hook provision was considered necessary for 7% of the population for the Saturday peak.

Space has been allocated in the model for parking cars for 3.5% of the population at ground level although initially much less hard standing will be needed. If this figure is exceeded within the time scale under review, then the space could be doubled to 7% by the inclusion of a single level deck - linked to the central circulation galleries. In the model this eventuality is allowed for.

The centre is serviced by culs-de-sac service courts screened from the street and having covered loading bays.

The central market area on the civic square is similarly served and permits a concentration of vehicles to locate close by.

The Central Infra-Structure.

That part of the central zone which stretches from the station to the civic square is planned as a single integrated structure in the manner now common with centres of this kind.

It is intended that it be a simple modular structure designed to take a variety of loadings, services and enclosure systems. It may be built in stages growing outwards from the station as demands justify. The form it takes may vary along its length but its typical cross section will be as follows:

(i) Ground Floor: Two lines of shopping spaced 50'0" apart back serviced from loading courts; the concourse to have wide covered walkways on each side of it.

(ii) First Floor: A complete office floor in close relation to the concourse.

(iii) 2nd and 3rd floors: A broad gallery overlooking the concourse from either side giving access to duplex apartments or, in intensive business zones additional offices.

Deck Structure.

The galleries are 18 feet above the ground and run the full length of the infra-structure. There are cross galleries every 200 feet which extend out laterally to link up with future parking decks and to the galleries of deck housing beyond. The galleries are linked with the ground by staircases that rise from the centre of the concourse.

The galleries extend at the station end to form a bridge over the bus station and the railway line. Here they become the main link which joins the centres and form an area of intense concentration which could support upper level uses of all kinds. If air rights over public transport routes become available, the infra-structure is designed to extend across the railway line, and link into one central hub of activity.

Pedestrians.

Pedestrians reach the centre from the residential sector by secondary paths that lead to the station, the main civic square, or the centre of the 'general business' area. They also reach it from bus stops and the lineal parking zones. The main concourse is lineal with cross movement only on the paths to the parking.

Close traffic integration into the centre is effected at certain points along its length where temporary or permanent structures for fruiterers can operate on a 'drive up and buy' system such as operates on the Grand Parade, Cape Town. The sense of enclosure in the central concourse is however maintained.

The Civic Square.

The civic square is a public open space partly covered by the extension of the infra-structure of the centre above it.

It is an important intersection of pedestrian routes and has a sub-terminal for buses on either side of it.

It is a secondary shopping node and is the place where cafes and newsagents and places of entertainment could locate. On one side and above it are the hotel with licensed premises and a restaurant.. It is also the site for the weekly market and would probably support some permanent flower and market stalls. The civic, administrative and municipal uses, to which the public require frequent access, are on the 'far' side beyond the shopping.

After the station it is the strongest pedestrian node in the sector.

Beyond the Square.

This is the area for centrally located social, cultural and recreational uses and the rigid line breaks down to permit a complete freedom of building shapes. Cinemas, bowling alleys, library, community halls locate here. The lineal parking continues to flank this zone and will provide sufficient spaces combined with off-peak areas in the centre itself. During the day it will not be as intensively used and can supplement the central parking if needed.

General Business.

Further from the station and in relation to the main road, lies the omnibus zone which includes all service, light industrial, wholesale and warehouse activities.

A simpler single storey infra-structure with service yards and large storage areas is provided.

It contains dry cleaning plants, builders and plumbers yards, workshops, service stations and the municipal depot.

It continues as an extension of the pedestrian concourse and provides the mixes and diversity needed for a working centre.

The noisiest and most noxious uses would be located in the belt lying between open spaces and adjoining the road reserve.

EDUCATION.

The schools are designed on the edges of the residential zones in linear 550 foot wide belts across the full width of the corridor, on either side of freeway or main road reserves.

They are served by car or bus on the distributor road and by pedestrians from a feeder path which is also continuous across the corridor. The schools are connected in the east-west direction by the main pathway that runs the full length of the corridor.

This structure then provides a choice of 8 primary and 4 secondary schools within any one mile width of the corridor. It permits choices between language media and possible alternative streams.

The schools so placed, constitute wide neutral zones between freeways and housing, insulating them from noise and fumes; and they compliment the road system by forming natural parkways along their length. The school property is always fenced and will provide an effective barrier between the residential zones and the roads.

Nursery schools and creches are considered here as an integral part of the residential zone and are described in that section.

RECREATION AND OPEN SPACE.

Toddlers play areas and junior playlots are for reasons of propinquity related to the pedestrian system of the residential sector and their position is related to the distance that the respective age group can venture. Adult recreation zones, parks and playing fields are set in a line similar to that of the school but along the corridor rather than across it. A narrow strip of open space for bowling greens, tennis courts and

smaller space consumers runs next to the railway while the large playing fields and the public parks are next to the main road.
At the edge of the open space are pleasant walks unfenced from the park and suitable for evening strolls and exercising dogs.
There is sufficient space for swimming pools and a small stadium to be developed on either side of the centre where there is good access and plenty of parking at weekends.

THE SUMMING UP.

The main deductions are briefly reviewed.

1. The narrow fronted double storey row house is considered to be the most appropriate house type in this context.

2. Compact low and medium rise housing in a densely structured residential zone is preferred in the light of population characteristics.

3. Minor uses and community services are integrated within the residential zone without delimiting neighbourhood boundaries. Intimate neighbouring habits are encouraged by the morphology.

4. A completely segregated pedestrian path system is considered necessary, with the 10 minute time-distance as the limiting dimension.

5. Schools and all open spaces other than playlots are located in belts around the perimeter of sectors.

6. The contrast between the above and conventional Radburn systems is emphasized.

7. The preferred central area is a linear one stretching the full width of the sector having its most intensive node at the railway station.

8. The 6000 feet square static sector centred around rail stops, 6000 feet apart, is seen as the optimum urban structure with present and anticipated modal splits.

9. A major freeway grid, spaced 2-1/4 miles apart in both directions, and having wide corridor reserves and full service interchanges at crossings, is considered to be the most efficient major traffic structure.

10. A lineal corridor based on such a 2-1/4 mile grid is a valid system of urban growth and one which could be related to the existing National Route to Faure.

11. The radial sector concept, based on line-haul routes giving direct connection to the City and emphasizing the significance of Cape Town as a Central Place for all, is favoured as the most appropriate composite movement structure.

12. Political and economic changes are likely to cause radical adjustments in settlement patterns.
An urban structure in this context, therefore, must be capable of mutation as well as growth, and of adjustment to changing incomes, life styles and degrees of mobility.

LAND USE ALLOCATION.

A table of land uses that could result from the application of the model, is included. It has been based broadly on the 'Standard Requirements' (1) in order that the planning hypotheses may be tested against existing solutions. The only departures from the Standards relate to house plots and this has been fully qualified in the text.

The sector described is the typical 6000 feet square internal unit having as its centre a railway station.

The areas and percentages do not include major roads and rail reserves.

LAND USE TABLE

	No.	Area in Acres	%
1. Residential: Including minor mixed uses associated with it. No. of Sites	5,976	370	46.3
2. Education:			
Primary Schools	8	62	7.85
Secondary Schools	4	62	7.85
3. Open Space: Including barrier strips to major roads		120	15.1
4. Central Uses: Including Commercial, Social and Administrative and 'General Business'		48	6.1
Flats in Central Area	200		
5. Roads:			
Traffic		55	6.9
Pedestrian		45	5.7
6. Rail Reserve		33	4.2
TOTALS: Total No. Sites	6,176	796 acres	100%

(1) Community Development 1967

HOUSING SCHEDULE.

A proposed composition of dwelling types related to population and density.

Classification	Dwelling	Plot Size	No. of Units	%
Indigent Sub-Economic	Single and double storey terrace houses with or without flats above	22' x 85'	2,756	44.74
Economic	Single and Double storey terrace houses	25' x 85'	1,740	28.24
Economic Elite	Single storey or double storey or detached houses	33' x 85'	1,040	20.00
Elite Private Developer	Detached Houses	50' x 85' 66' x 85' 100' x 85'	440	7.02
TOTAL:			5,976	100
Flats in Central Zone			200	
Total Number of Dwelling Units:			6,176	

Gross Development Density — 8 houses per acre (approx)

(At 5 persons per family) — 40 persons per acre

COLOUR CODING SYSTEM.

A colour key is used which relates to the functional aspects of the model.

Colours are graded in degrees of tone and intensity which is in direct relationship to the intensity of the land use movement structure that it illustrates.

Motor traffic is graded from the palest blue in the low intensity zones and progresses through culs-de-sac distributors and main roads in an increasingly intense range of colours up to the freeway system which is shown in dark purple.

The same system is applied to the pedestrian zones so that the areas of greatest activity are easily recognised as the most vivid colour, and the small vennels leading to the private houses are palest. Land uses are broadly categorized in the same way, the schools being indicated in the main as open space of a higher intensity of use than the parks.

The centre is shown as red, indicating both its pedestrian character and its degree of intensity, and the residential zone is indicated in neutral tones.

The system is to be seen not as an attractive differentiation of colours but as a technical tool significantly aiding the analytical process.

SPECIFIC LAND USE:

- CENTRE
- RESIDENTIAL
- SCHOOLS
- OPEN SPACE

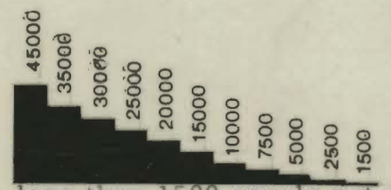
MOVEMENT:

- TRAFFIC
- PEDESTRIAN

DETAILED LAND USE:

- CHURCH
- NURSERY SCHOOL
- PRIMARY SCHOOL
- HIGH SCHOOL
- LOCAL SHOP
- PLAY LOT

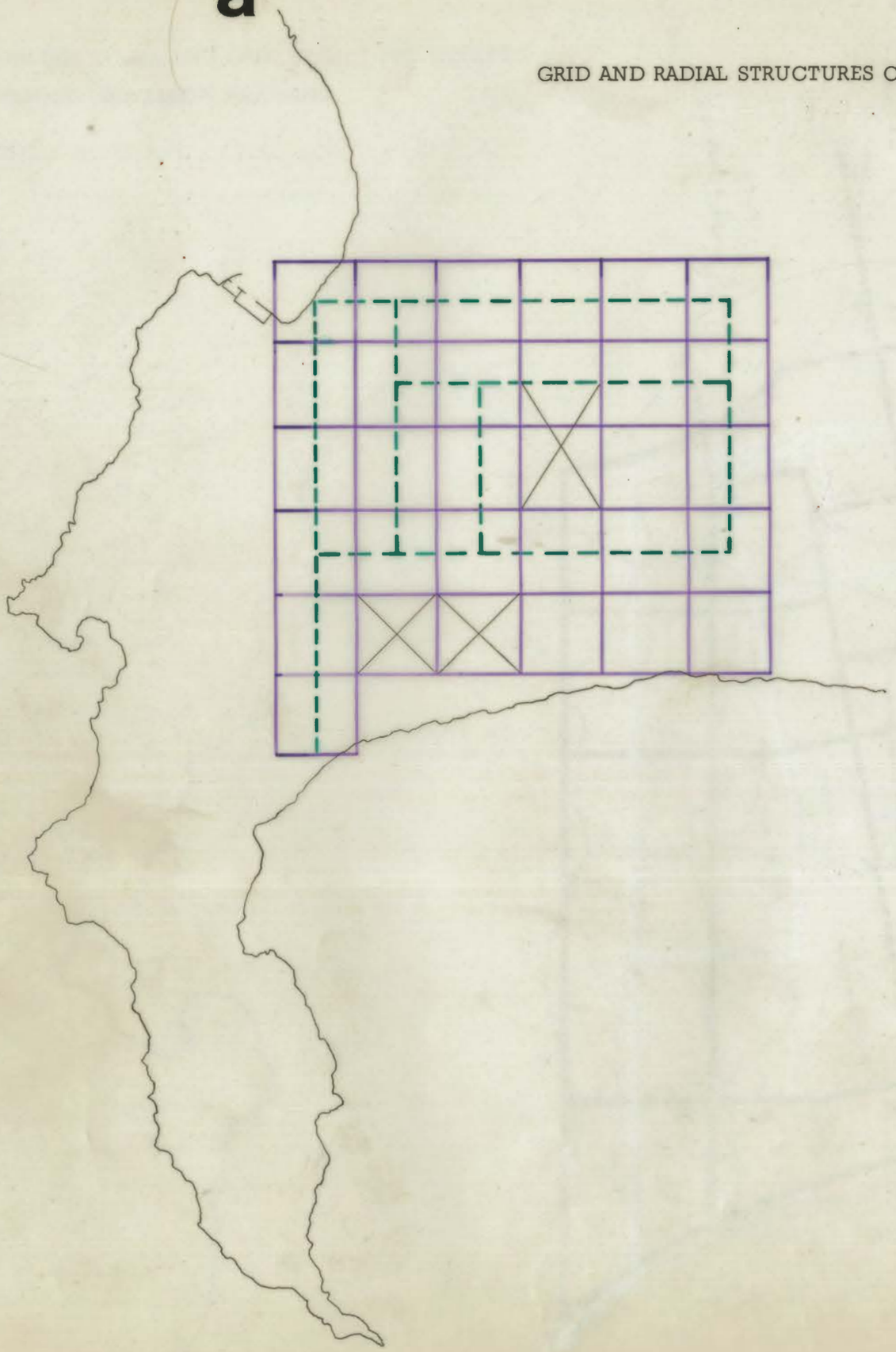
COMPARISON OF BUS AND TRAIN PASSENGER FLOWS:
INWARD JOURNEY, MORNING PEAK PERIOD. 1966.



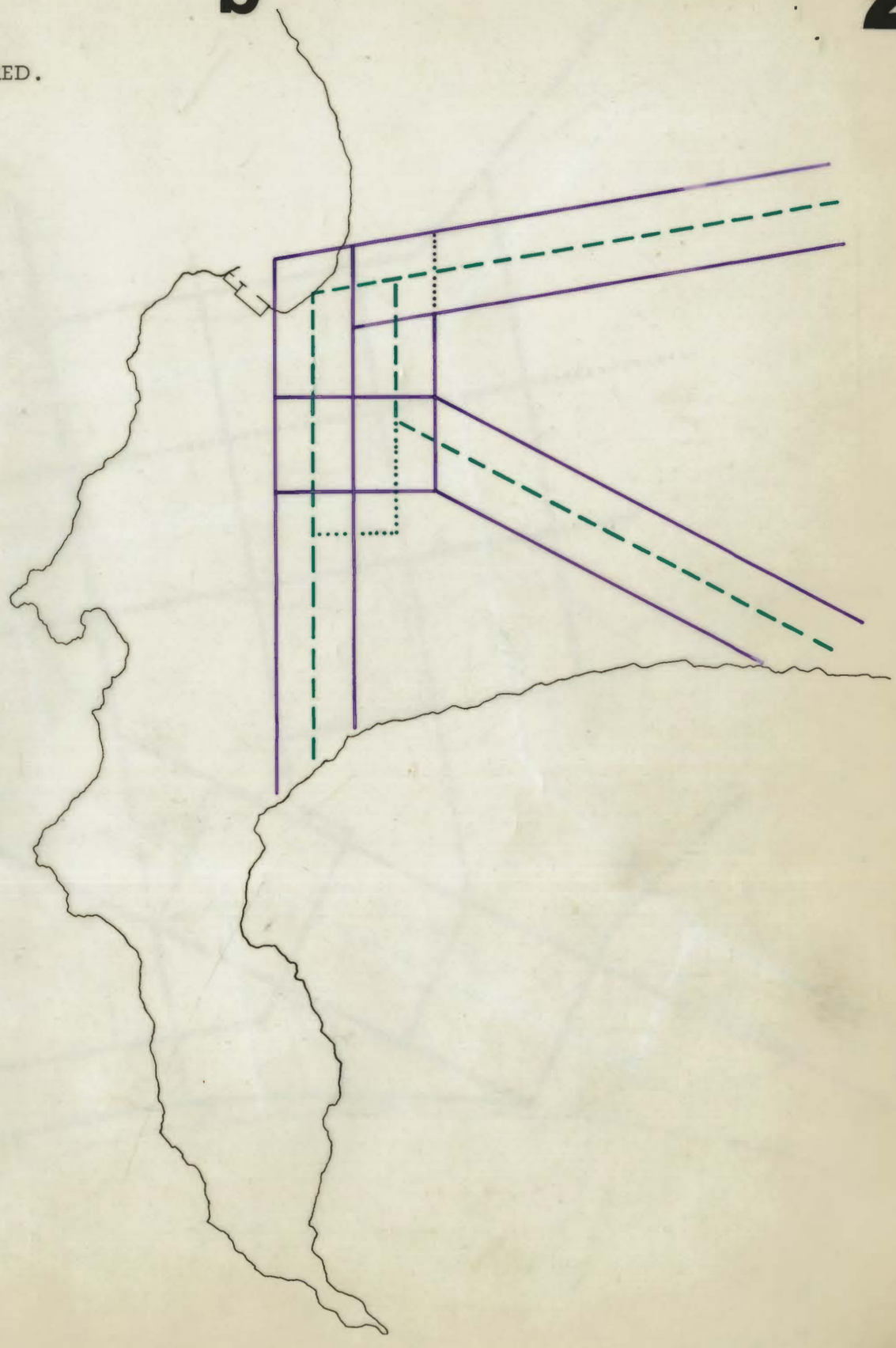
less than 1500 people not shown

GRID AND RADIAL STRUCTURES COMPARED.

a



b

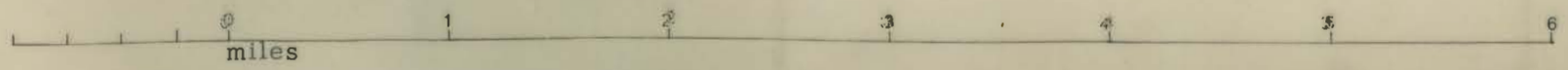


INTEGRATED RADIAL AND GRID STRUCTURES RELATED
TO EXISTING MOVEMENT PATTERNS.

EXISTING AND PROPOSED ROAD AND RAIL PATTERN
from: Joint Town Planning Scheme (1967) Dwg TPR5093

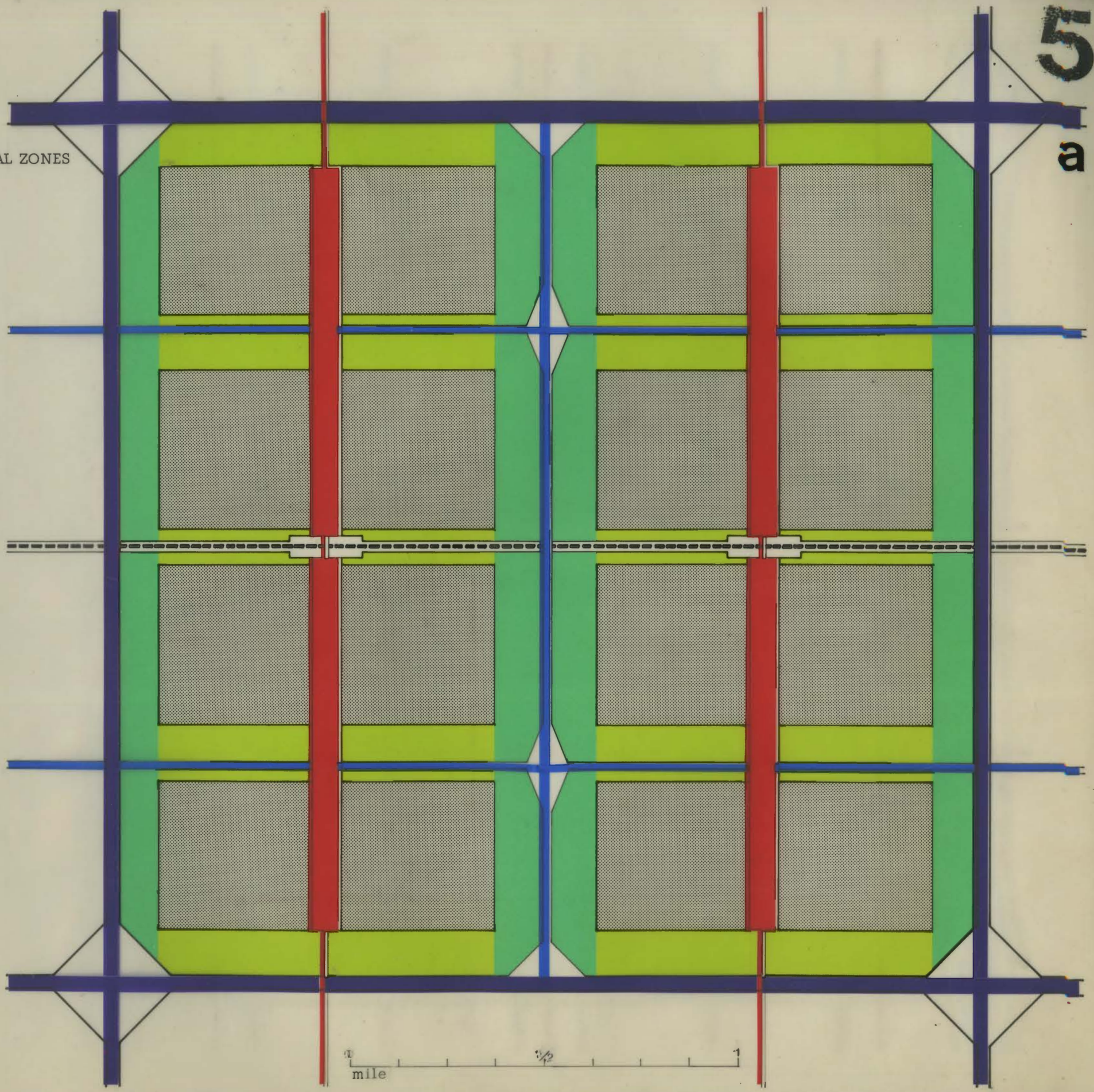
THE DIRECTIONAL GRID STRUCTURE APPLIED TO A RADIAL CORRIDOR.

a - LAND USES IN THE RADIAL CORRIDOR



THE 2-1/4 MILE MAJOR SECTOR

a - MOVEMENT STRUCTURE AND CENTRAL ZONES

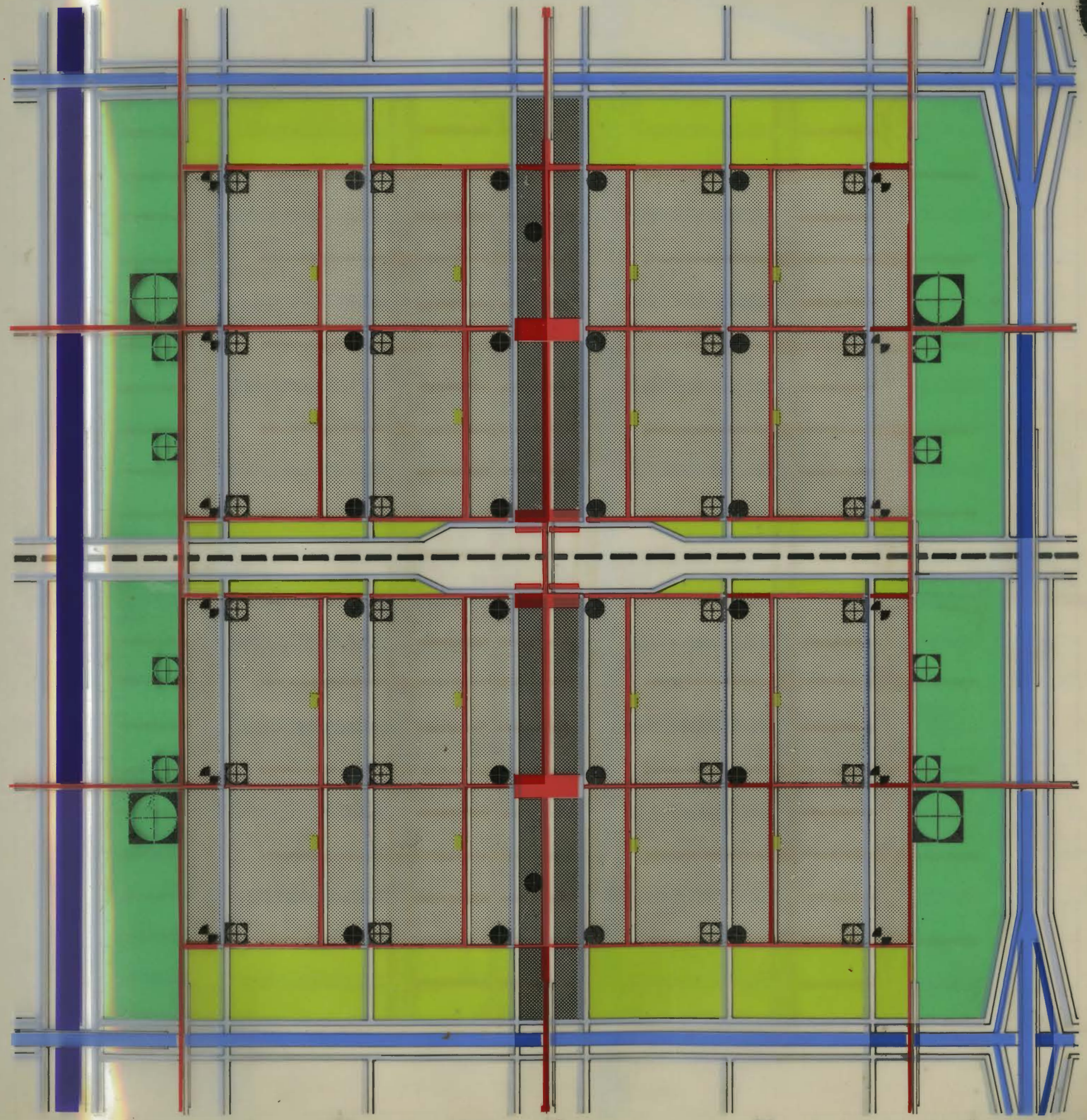


6000 FOOT INNER SECTOR

a - MOVEMENT STRUCTURE

b - LAND USES

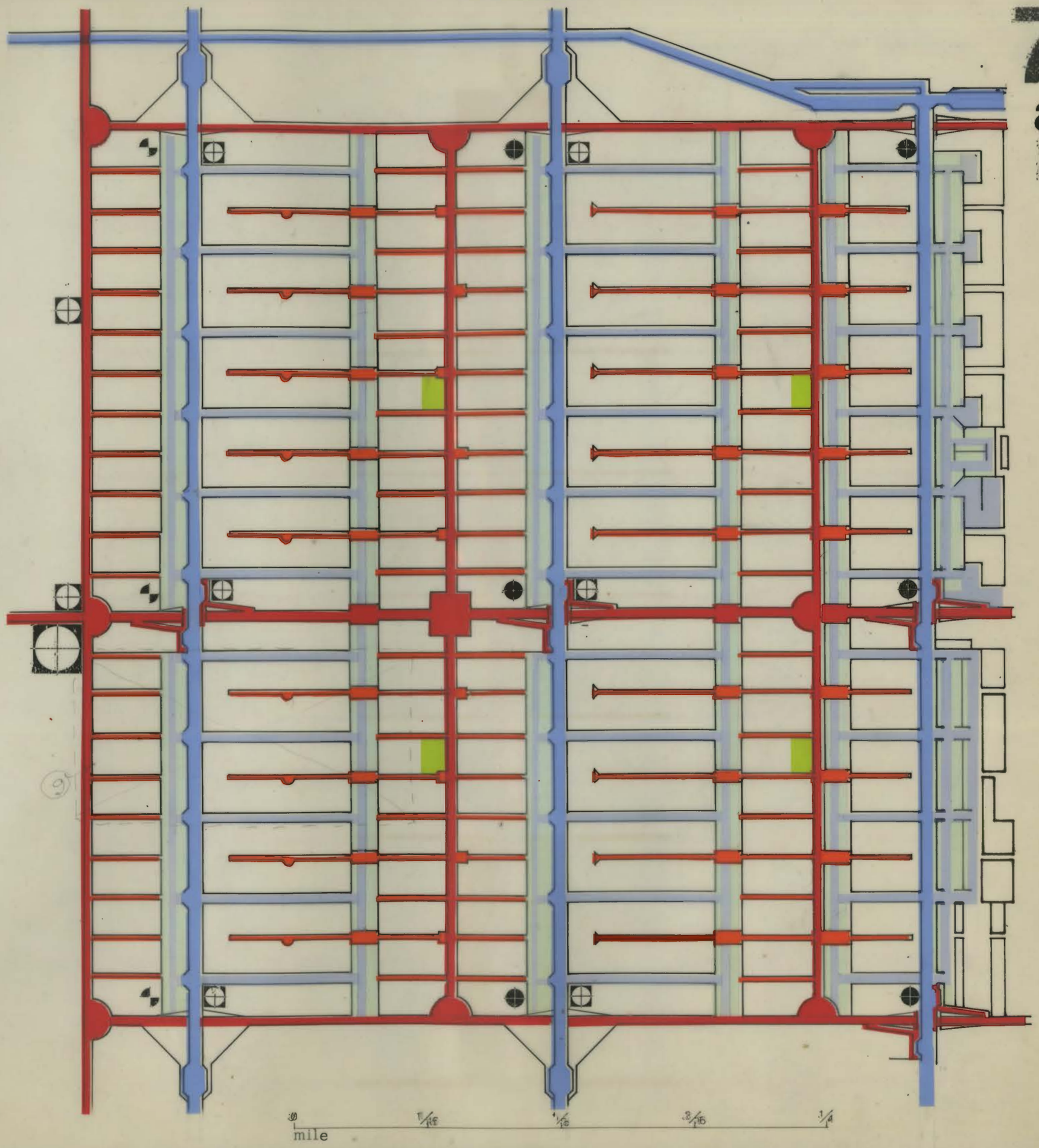
6a b



A TYPICAL RESIDENTIAL ZONE.

a - MOVEMENT STRUCTURE

b - LAND USES



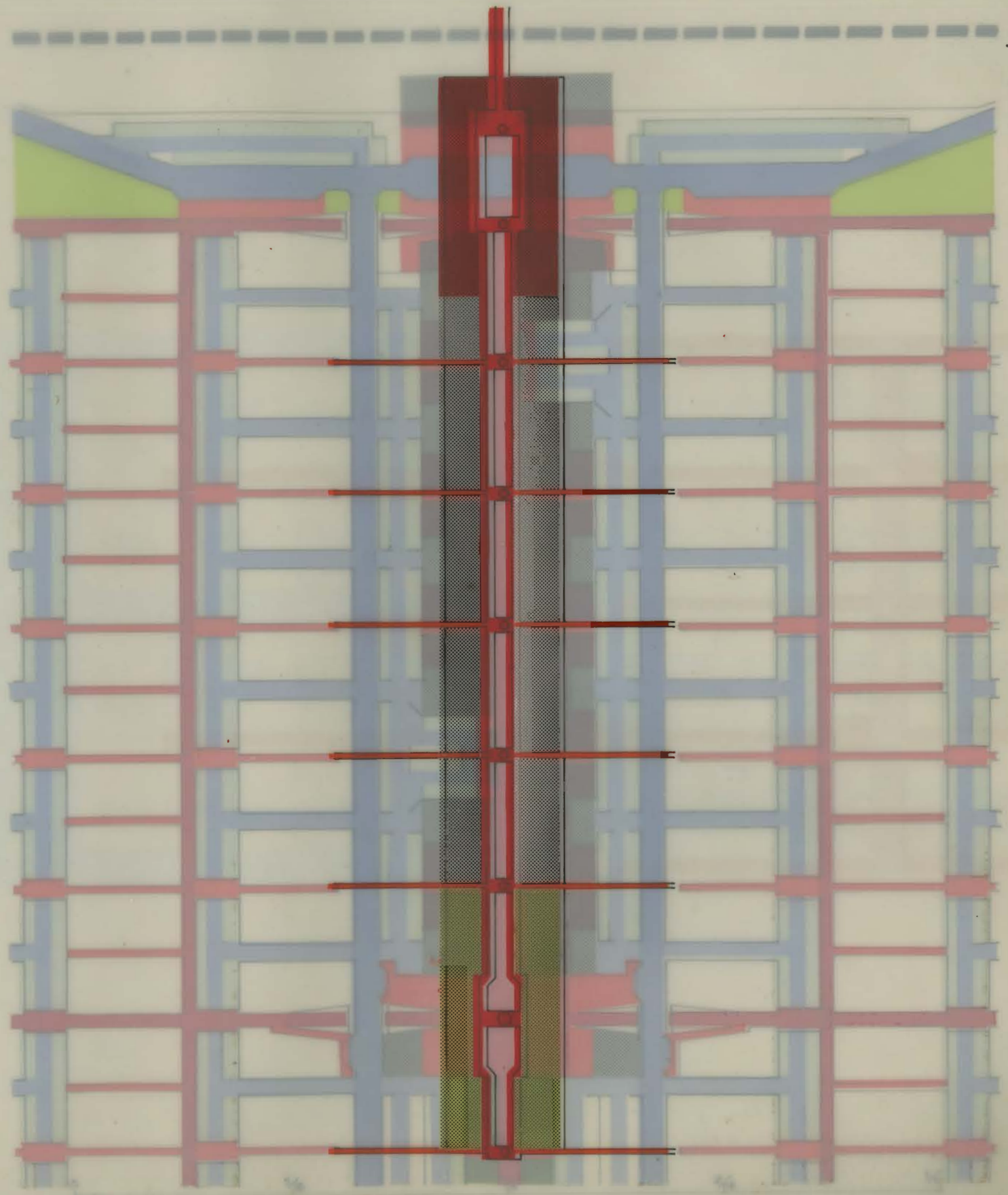
7
a
b

A CENTRAL ZONE - GROUND LEVEL.

a - MOVEMENT AT GROUND LEVEL

A CENTRAL ZONE - DECK LEVEL

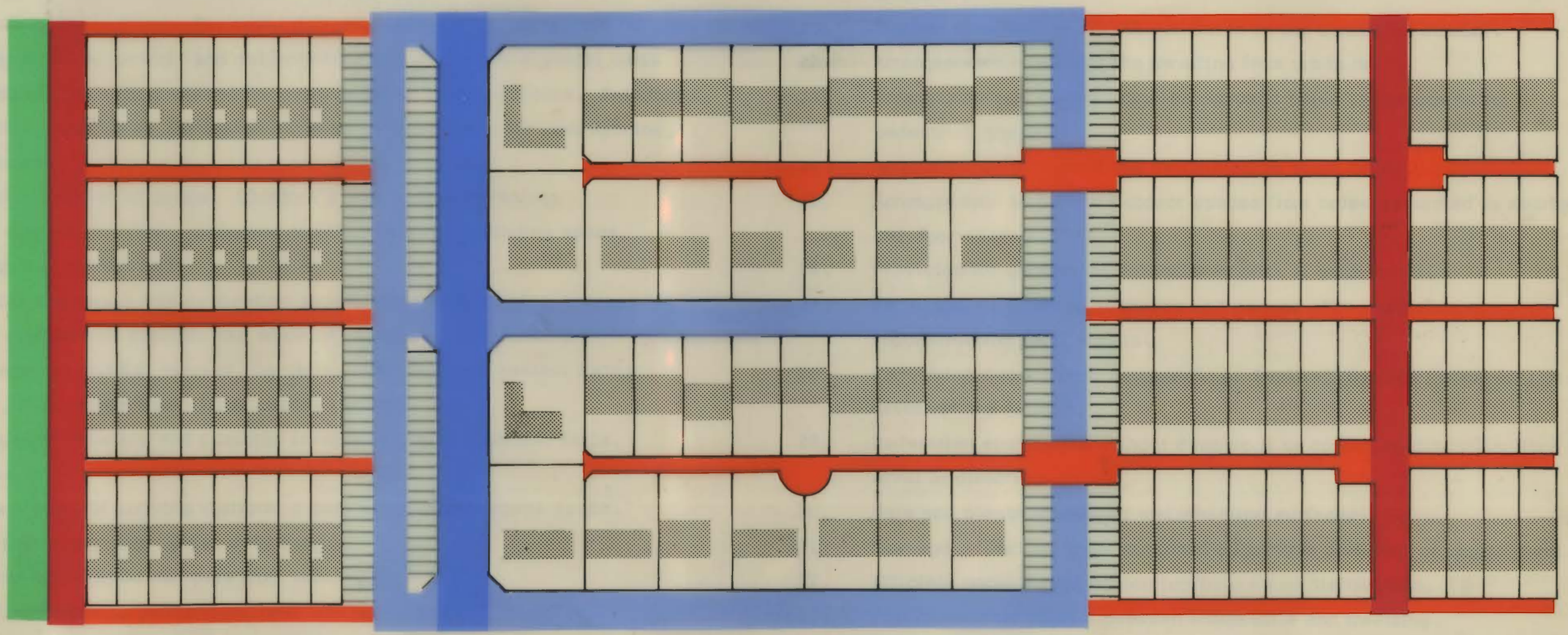
b - MOVEMENT AT DECK LEVEL



8
a
b

DWELLINGS AS URBAN STRUCTURE.

a - MOVEMENT STRUCTURE.



0 mile 1/16 1/8

APPENDIX 1

Criteria for Urban Housing.

Basic Requirements:

1. Efficient parking for owners and visitors; adequate maneuvre space.
2. Temporary space for service and delivery vehicles.
3. Receptioh point to group. Sheltered delivery and waiting. Provision for information; mail, parcel, and delivery boxes; and storage of parcel carts.
4. Provision of space for maintenance and control of public utilities. Telephone, electricity, main water, sewerage, district heating, gas, air conditioning, incinerators.
5. Rest and conversation space. Children's play and supervision.
6. Private entry to dwelling, protected arrival, sheltered standing space, filter against carried dirt.
7. Congenial and ample private meeting space; washing facilities; storage for outdoor clothes and portable and wheeled objects.
8. Filters against smells, viruses, bacteria, dirt. Screens against flying insects, wind-blown dust, litter, soot, garbage.
9. Stops against crawling and climbing insects, vermin, reptiles, birds, mammals.
10. A one-way view of arriving visitors; a one-way visible access space.
11. Access points that can be securely barred.
12. Separation of children and pets from vehicles.
13. Separation of moving pedestrians from moving vehicles.
14. Protection of drivers during their transition between fast-moving traffic and the pedestrian world.
15. Arrangements to keep access clear of weather interference: overheating, wind, puddles, ice and snow.
16. Fire barriers
17. Clear boundaries within the semi-private domain. Neighbour to neighbour; tenant to management.
18. Clear boundaries between the semi-private domain and the public domain.
19. Maintenance of adequate illumination, and absence of abrupt contrast.
20. Control at source of noises produced by servicing trucks, cars and machinery.
21. Control at source of noises generated in the communal domain.
22. Arrangements to protect the dwelling from urban noise.
23. Arrangements to reduce urban background noise in the communal pedestrian domain.
24. Arrangements to protect the dwelling from local noise.
25. Arrangements to protect outdoor spaces from noise generated in nearby out-door spaces.
26. Provision for unimpeded vehicular access at peak hours.
27. Provision for emergency access and escape, fire, ambulance, reconstruction, and repairs.
28. Pedestrian access from automobile to dwelling involving minimum possible distance and fatigue.
29. Pedestrian circulation without dangerous or confusing discontinuities in level or direction.
30. Safe and pleasant walking and wheeling surfaces.
31. Garbage collection point enclosed to prevent pollution of environment.
32. Efficient organization of service intake and distribution. (1)
33. Partial weather control between automobile and dwelling.

(1) Serge Chermayeff and Christopher Alexander 1966 p.p. 154-156

APPENDIX 11.

A general windshield survey of Bonteheuwel - an existing and fairly well-established resettlement on the Cape Flats:

This visit was made during the writing of the analytical data in order to get a direct and immediate i mpression of the physical environment and the ways in which people used it. The impressions are clearly apparent and have influenced the evaluation of the collected data.

Observations most relevant to the present study were:

(1) The openness suggested by a town of single storey units without large trees and separated by wide road reserves.

(2) The high incidence of children - all of whom used the roads.

(3) The absence of well-scaled public places conducive to meeting or lingering.

(4) The long walking distances between facilities which seemed associated with wide road reserves, large unbuilt areas near the centres and the presence of schools between the houses.

It's just before 5 p.m. and we drive in Bonteheuwel along the main street, Jakkalsvlei Road. Front doors of houses opening on to the main bus route. Children playing and sitting in groups and no apparent differentiation between this street from other minor feeders.

On one side Bonteheuwel station about 200 yards away from Community Centre. The lower income seem to be located nearer to the station. A play area is being well used at 5 o'clock, lots of people. The streets are also full of kids playing, sitting at an intersection in the road. Small group of four little boys sitting on the pavement of the main route. Girls skipping. Here is a line of about 3 or 4 shops representing quite an active centre. There appear to be flats above.

Roman Catholic Cathedral opposite the shops and a mosque a little further on. All streets have a wide pavement strip along the street, approximately 30' with a 4' or 5' hard surfaced walk-way at the curb.

Attempts at tree planting not looking promising, it's mostly sand where surfaces are not paved and planted, although some scrub grass seems to survive here and there. Always some sort of fence: pickets, packing case screens, chicken wire net or hedges.

A shopping corner with a market stall attached out on the front of it and lots of life and activity. Children playing soccer on the edge strip beside the main road. Small children, 3 to 5 years old walking unattended along main traffic routes. Here is a little girl about 4 years old carrying food supplies and the day's shopping, big bundles, loose packets.

Children are everywhere mostly in the 3 to 10 years old age group. Here is a hawker's lorry with a whole concentration of children around it and its quite a social event. One little boy pretends to throw another one in front of our car. Four little girls between the ages of 3 and 8 sitting on a kerb doing drawings in the road.

This is Netreg station on the rail route. Netreg is the lowest income group. We are now going along the route adjoining the rail reserve. Again wide pavements, stockaded gardens and as always on the kerb line or on the edge of the traffic route, small children. There is a higher concentration of children and people on or near the shops, and this particular time, just before 5 o"clock, appears to be a popular after-work shopping period.

Around most of the houses is a sand waste. There are isolated attempts, some of them very good, to make gardens. The garden areas are nearly always in front, the back areas are washing lines and mostly unattended. Outside toilets in this area occur at the back of most plots. Here a Primary School with good lawns, trees, some tired flowers and 8'0" wire mesh fences. Adjoining the School an open play lot, with play equipment fenced in with 8' high fencing. Adjoining it an open field where grass is growing and children are playing.

Lots of chicken wire fences, many of them trodden down. All properties have their territory demarcated by some primitive form of fence. Very few trees survive. The tallest bushes are about 8' high and are of some sort of Port Jackson growth. There appears to be a low incidence of motor cars in the area and the children's play habits would indicate that the streets, to quite a large extent, are untrafficked. The hawker's lorries and a few other vehicles are moving around but in the time that we've been driving we have passed few private cars. It would be hard to assess ownership from what one sees here at the moment but there are no garages and the few cars that are parked, are parked hard up against the front of the houses inside openings in the fences.

The space front to front of houses is extremely wide and although the densities appear to be quite high, the wide streets or street reserves, including the 25 foot setbacks of the houses give a kind of open and desolate look.

This is the main communal space that is geometrically in the middle of the area. Quite an elaborate building with a good-looking library, some shopping adjoining it and a lot of communal facilities which are approached across widetraffic roads. There are some shops that are not occupied. Next to the centre is a group of business uses: Eternal Shopping Centre No.1, Standard Bank Depot, Protea Stores, Fish and Chips and a Barclays Bank Depot. Outside the 'shopping centre'are the usual market produce and vegetables out on trestles. Some more uses: there is a Chemist, Cornflower Stores which are groceries and Fataars Moslem Meat Market. This is one of the few Chemists and he seems to be making a good living. There is also the Bonteheuwel Post Office.

On the whole single storeyed development in short lines of row housing. The general pattern of these houses is brick on edge up to dado which is window sill line, cream painted fair-faced brickwork above, steel windows and doors painted in strong colours - reds, greens, blues and other primaries. We leave by the National Road and there are children playing even on this edge strip where the concrete posts and diamond mesh over large areas have been destroyed and where the road reserve is being quite heavily used by kids, people walking, and persons crossing from one side of the road to the other.

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