THE GROWTH POLE SYSTEM

AN ALTERNATIVE PROGRAM FOR LOW-INCOME HOUSING IN COLOMBIA, SOUTH AMERICA

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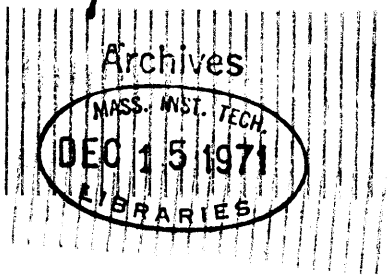

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ABSTRACT

Of the 200 million persons living in South America today, over 30% exist as squatters. The current uninterrupted 4% per annum growth rate will find an additional 24 million persons clammoring for these "urbs" by 1980--just 10 years. The rural-urban migration is irreversible. The city is the social and physical resource of their 20th century. Amidst land plenty, there is a shortage of urban lands. "Ranchos," "favelas," or "barriadas" as they are sometimes called, are appearing everywhere: in villages, along dirt roads and highways, and scattered along the hills overlooking the city.

The squatters possess neither the foresight nor the technical abilities to realize the future implications that their increasing numbers represent to themselves and to the cities they invade. Virtually ignored by upper class planners and architects, their fate may remain largely within their own abilities to assume these functions, however clandestine they may be. Their rapid growth rate and already uncontrolled settlement tradition represent the greatest single social problem of their time. If for no other reason than size, they will not remain unnoticed for long.

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TABLE OF CONTENTS

INTRODUCTION

The purpose of this thesis is to provide a positive direction for increasing both the quality and quantity of housing for low income families. Although our attention is specifically related to Colombia, South America, the principles and conditions described herein are not uncommon throughout Latin America.

Our evaluation of the housing problem is to treat housing as a component of larger national and regional development. Housing is a multi-purpose utility for the poor. Besides shelter, it is a vehicle for social mobility, economic security and political mobilization.

When we see housing in rapidly urbanizing areas, it is a competitive process for urban survival realized by both legal and illegal strategies. These strategies are capable of meeting some of the needs of low income families, but not all of them.

Our research draws from a number of case studies to decide if institutional programs are reasonable solutions to housing problems--incorporating the advantages of both legal and illegal housing processes.

We have organized our presentation by examining the historical pressures for rapid urbanization throughout Colombia. As a direct consequence of this urbanization, two housing processes evolved for low income families--a legal institutional process and an illegal (but popular) process. We review the advantages of each process by comparing four case studies. From the case studies evolved a new housing process which we have called the Growth Pole System.

CHAPTER I

THE HISTORIC DEVELOPMENT OF COLOMBIA--A SHORT COURSE

1.100 THE HISTORICAL DEVELOPMENT OF COLOMBIA

The following short course is provided to orient the reader with the basic historical precedents that have contributed to the growth and development of Colombian cities. Many of the present day traditions and attitudes are results of events that took place in the transitional period from the Pre-Colombian era to colonialization. It is at this point that we will begin our presentation.

1.110 PRE-COLOMBIAN PERIOD

Before the arrival of the Spanish in 1530, the indigenous populations lived in dispersed regions of Colombia: on the north coast, in the highlands that drained into the Magdalena River, in the Cauca Valley, on the Pacific coast and in the Amazon Basin. Colombia occupied an important geographic position that was connected by trade routes to Peru, to the south, and Mesoamerica to the north. Culture, technology, and goods circulated through Colombia as empires prospered and declined.

The peoples that reached the highest cultural development in Colombia were the local chieftains of the Tairona of the Sierra Nevada, where Santa Marta was established, and the Muisca of the Andean highlands, where Bogota developed.

The Tairona culture developed lithic architecture in an urban context that included large public works, such as temples, agricultural terraces, irrigation, paved roads, and well-planned patterns of domestic architecture. The construction employed flat, dressed, trapizoidal granite blocks as bases and entries to their round homes. The dwellings were grouped in clusters connected by stone stairs and paved walkways. Only in the Muisca culture is found an economic system, a social organization, and a religious integration to surpass the achievements of the Tairona.

In 1537, the first Spanish troops arrived in the highlands and found the Muisca organized into two loose federations. One was in the area centered around what is now Bogota, and ruled by the "Zipa," and the other centered around what is now Tunja and was ruled by the "Zaque."

The Muisca were an agricultural people who domesticated a variety of highland potatoes. Their caciques lived in large, well-built houses in planned villages. Religion centered around the sun; large temples were dedicated to it and to the moon. Trade routes, as with the Tairona, were important. Salt, emeralds, cloth, fish, and gold passed from region to region. Colombia achieved the highest quality good-work in the Americas. The principal culture hero "Bochica" is described as an old bearded man who lived a holy life and taught people many arts and crafts before ascending to the sky.

Bochica could not, however, protect the fabled gold. "They took it from the living and from the dead, by torture and violence, and by looting shrines and graves. The search for gold soon became a decisive factor in determining the routes of the conquering troops and in the choice of sites for the establishment of the first Spanish settlements." (1)

1.120 THE PERIOD OF COLONIAL FEUDALISM (1530-1810)

Spanish first landed in what was later to be called Santa Marta in the year 1530. Their immediate history of war characterized their orientation at the time of the discovery of Colombia.

> Hard and continuous fighting during eight centuries in the Spanish peninsula had made the Spaniard a stubborn and enthusiastic soldier, which left a profound influence on their character and tradition. (2)

The Spanish landing in Colombia merely changed the theater of operations. Between 1530 and 1540, they discovered the three principal valleys of Colombia--the Sabana, the Cauca, and the Antioquia. In all three regions they sought gold and silver. In the first two regions nothing was discovered. However, because of the favorable climate and the fertility of the soil cities were established.

(1) Reichel-Dolmatoff, G., Colombia, pp. 18-19.
(2) Hernao y Arrubla, History of Colombia, pp. 1-3.

It is necessary to emphasize the well-developed ability of the Spanish for establishing the basic forms of cities. They recognized the city as a complex system and designed well-developed plans for such cities as Cartagena. The basic method of land tenure in the early cities were through the king's decree, allowing each conquerer to occupy an area of land and to take Indian slaves. Through this process land became the property of individual Spanish families.

Spain's economic control of the colony followed a mercantilist pattern. Trade was permitted only with the mother country, on both sales and purchases from the colony taxes were levied, greatly burdening the producers in the colony.

Politically the colonies were completely dominated by Spain which meant that the colonies had no representation in the mother country. Two reasons account for much of the discrimination in Latin America at that time: first, many of the original immigrant-adventurers were of the lowest economic and social class in Spain; second, many were suspected to be, in part, of Indian or slave blood. (It is interesting here to note that after Colombia's independence from the mother country, the Creole American-born of spanish blood assumed the same role the Spaniard had had before the independence and looked down on the Mestizos and Indians with a contempt proportionate to the dubiousness of their own blood claim. (3)

Spanish officials always considered themselves a superior race. The superiority of the Spanish can best be described as:

> An absurd national prejudice according to which they considered work as being unworthy of a noble and for the plebian. This foolish predisposition was ruinous in the colonies, for every Spaniard, no matter how humble his origin, considered himself offended...if he had to work. It was an affront to remind himself that he had been an artisan in the land of his birth. (4)

(3) Hagen, Evert, The Theory of Social Change, p. 357.

It was through the process of the conquest, and later by the evaluation of Feudalism in the colonial period, that the elite became possessors of power and with control of tne country's land became the recipients of a considerable share of the nation's income. In summary:

The society was semi-feudal and patriarchal in nature

The prominent goal was to maintain the status quo

Class relationsnips were based on the belief in the essential superiority of the elite classes

The elite were oriented towards Europe and attempted to emulate it

Thougn there was a certain amount of movement between peasant and artisan occupations, tne movement from any occupation to any other was limited

Except for tne conflict between the Spanish and the Creoles, class relationships were fixed

Internal investments in transportation facilities were only provided as a means of channeling the outflow of raw materials to the Spanish Crown

The urban structure of Colombia was determined first by tne economic motivations of the Spanish Conquistadores in gold and silver. It led them to discover the Sabana, Cauca, and Antioquia and secondly by tne natural resources available in the three regions.

1.130 INDEPENDENCE AND COMMERCIAL CAPITALISM (1820-1900)

Social Goals

The major goal of the native Spaniards before the time of independence was the incorporation of the new world into the Spanish Empire. Independence from Spain was never in the minds of the early settlers. A growing friction between the Spanish officials and the native elite as well as a question of equal rights for a small minority of Spanish-Americans considered

by Spain to be inferior, characterized the events prior to the wars of independence.

European academicians of the Enlightenment, under the authority of the Roman Catholic Church, proposed to create an independent Ibere-America in which reason would rule from the throne long occupied by authority and tradition. (5) This move by the Church into the political administration of Colombia brought with it a political class whose power was largely determined by ideological convictions rather than political experience. Their knowledge of government and politics was academic and once initial independence was obtained, they soon restored the administrative model of the Spanish.

During the period of 1810-1830 two ill-fated attempts were made at independence. Both failed as a result of the political inexperience on the part of the Creoles. They failed to attract and unite the Mestizos and Indians into the struggle since their initial goal was only to achieve equal rights for the Ibere-Spaniards and not to achieve independence from Spain.

After initial separation took place they simply adopted the models of the Europeans and looked with contempt on the Mestizos and Indians, as the Spaniards had once looked at them as inferior.

The third attempt at independence was more successful than the previous two, because of the leadership of Simon Bolivar. As leader of the revolution, Bolivar accomplished the impossible by uniting the Mestizos and Indians under the leadership of the Creoles.

Following the war of independence Colombia's history was characterized by sporadic periods of war and peace. Some 70 civil wars, both minor and major, marked the period of 1819 to 1920. During this time, some 100,000 persons were killed, about 2.5% of the total population. (6)

One of the most impressive facts of studying the Colombian economic history is the gradualness

(5) Ibid., p.214.
(6) Ibid., p.579.

of technological progress. During the eighteenth century little economic change was recorded. After independence, however, economic activity became more noticeable. Production of unrefined brown cane sugar, Panela, and the cultivation of coffee soon became the largest national industry.

1.131 THE ROLE OF THE CITIES

The city throughout colonial times was the central point of departure for the settlement of land. This function is in contrast to the position held by western European cities, for they represented a movement of economic energies away from extractive pursuits toward those of processing and distribution; the Colombian city was the source of energy and organization for the exploitation of natural resources. (7)

> As a second consequence, the towns of Bogota, Medellin, and Cali, plus other small regional centers became encircled and their common lands absorbed by the individual holdings pre-empted by first comers. Status was defined by ownership of land rather than, as in older societies, the relation to the land being a function of status. This created the expansion of municipal oligarchies and their power to control much of the land without putting it into full production, a common practice even today.
>
> Asfaras the spatial structure of urban centers, two broad phases of development have taken place. First a centrifugal phase in which the towns distributed status and fortune seekers out to the agricultural hinterlands. The social organization was often unstable. Political and economic power followed to the rural states. The second phase saw the appearance of the commercial entrepreneurs (after independence) resulting in an attraction back to the city during the last half of the 19th century. The process of urbanization up to the beginning of the twentieth century represents a pressure of population against the ordeals of the social and economic feudal order rather than against the land itself. (8)

(7) Morse, Richard, Some Characteristics of Latin American Urban History, p. 317.
(8) Ibid., pp. 317-484.

In summary:

Society was still semi-feudal and patriarchal in nature. Politically their primary goal was to fight for ideologies, most of which were coming from Europe

Political power was centered in each region, each one having their own "caudillo"

The location of the colonial town was decided by political and strategic agricultural considerations. Industrial and commercial objectives were negligible

The pattern of urban form was a nuclear grid plan surrounded by arable field

The latifundia (9) controlled by individual owners originally from an urban background, became the agency by which rural workers were organized for production (10)

The village community tended to lead a marginal existence, because the land owners found it economically desirable to move their haciendas to the country and the villages were therefore partly abandoned during this period

The goals of society after independence were not very much different from colonial times.

1.140 THE ANTIOQUENOS AND THE APPEARANCE OF THE ENTREPRENEURIAL CLASS IN COLOMBIA

Foreign investments in Colombia before World War II were almost non-existent. Only after its own economic growth was firmly implanted did it attract foreign enterprise. (11) In part, some of this developmental lag is due to the inaccessibility of the Sabana, the Cauca, and Antioquia. Production till 1900 was largely for local market consumption while large-scale

(9) Definition: Large expanses of land, opposite of minifundia
(10) Mojica, Gillermo, The Economic Development of Colombia, pp. 39-43.
(11) Hagen, Everett, Theory of Social Change, p. 363.

production of cash crops (coffee, sugar) was for export. Within this context, however, there began to emerge an entrepreneurial class out of the Antioquenos, not from the richer Sabana society.

The rise of the Antioquenos' enterprises cannot be immediately traced to the usual economic advantages: greater market, greater access to foreign technologies, or better resources of capital. The Sabana had the larger population, best land, and therefore the best agricultural production. The Cauca was second best. Industry first begain in the Sabana. Hagen seems to feel that the isolation of Antioquia contributed to their self-determined attitude of development. Hagen says that if Bogotanos with all their favorable endowments were as effective as the Antioquenos, rapid economic growth would have begun around 1850, instead as it did around 1900.

There are several theories why this cultural and organizational split took place. It is a common attitude, even today, in Colombia that the Antioquenos were backward and even socially inferior to Bogotanos, perhaps because of their work in mining as opposed to agriculture.

> The Antioquenos, however, did not think of themselves as inferior....They could not have used the Bogotano as a model for their own behavior, for they probably sensed their life as unsatisfying and anxiety creating....On the other hand, their own life was unsatisfactory, since their values and purpose were not respected by the Bogotanos and other groups of the society whom they value. Thus they found an alternative channel of behavioral satisfaction in the adaptation of new techniques in industrial enterprises (12)

1.200 TRENDS IN GROWTH AND URBANIZATION

Colombia is characterized by the following demographic characteristics:

Rapid population growth

Rapid descent of mortality rates

(12) Mojica, Guillermo, The Economic Development of Colombia, p. 48.

Increasingly younger population

Great movements of population towards the largest urban centers

Rapid formation of a middle class

In this section we will present some of the more important characteristics influencing the designs of Colombian cities. Although our presentation is directed specifically towards Colombia, these problems are characteristic of many other Latin American countries.

1.210 INCREASING POPULATIONS

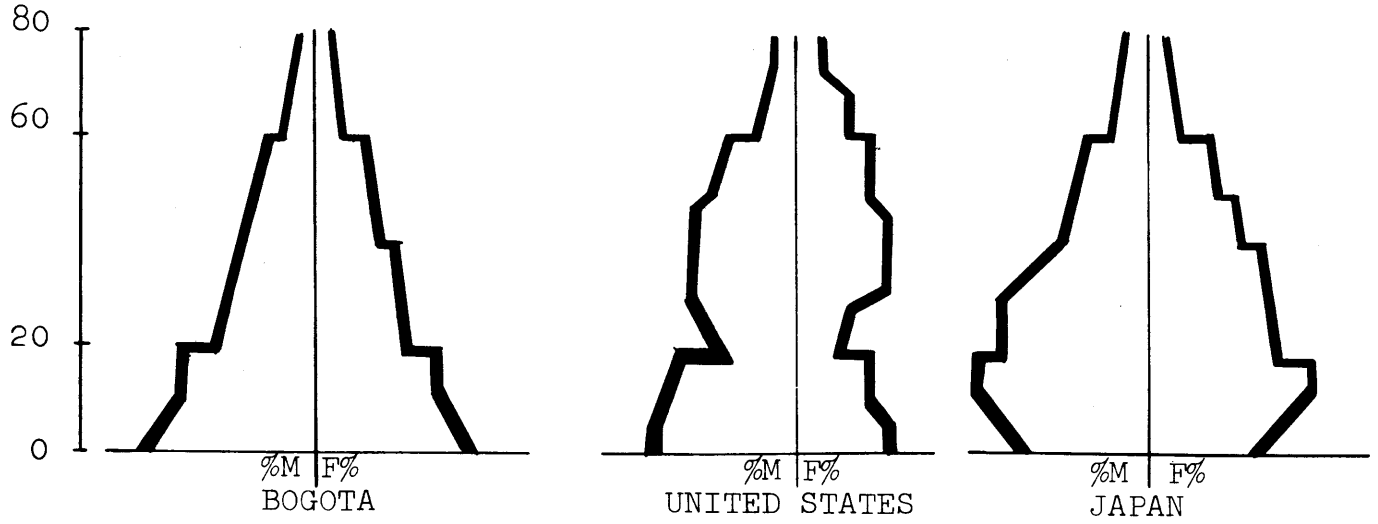
Population growth establishes the magnitude of the demand for shelter for the world's growing numbers. A look at the populations in different geographic locations and at various stages of industrialization shows several interesting facts related to urban populations. The populations of Colombia, the United States, Peru, and the United Kingdom present a cross section of modern and modernizing populations:

	COLOMBIA	UNITED STATES	PERU	UNITED KINGDOM
population estimates for 1969 in millions	21.4	203.1	13.2	55.7
birth rate/1000	45	17.4	42	17.5
death rate/1000	11	9.6	11	11.2
current rate of population growth in %	3.4	1.0	3.1	0.6
child mortality rate/1000, under one year	80.0	22.1	63	18.8
population under 15 in %	47	30	45	23
per capita gross national product (US$)	280	3520	320	1620

	COLOMBIA	UNITED STATES	PERU	UNITED KINGDOM
population illiterate 15 years and older	30-40	0-3	35-40	0-1

source (13)

The following charts show the age sex distribution in three areas:



Examining these example profiles, we find the following: The profile of Bogota is wide based; the young predominate. The profile rises through the age classes of 15-59 and 60 and older in a sharp proportional decline in population. Ehrlich calls this a "pinched" profile. It signifies high birth rates with correspondingly high death rates. The profile of the United States is bell-shaped that results when a population that once had a low birth and death rate undergoes a

(13) Ehrlich, Paul, Population Resources Environment, pp. 332-333.

subsequent rise in birth rate and begins growing again at a relatively rapid rate. When it had a low birth rate and death rate the population was more evenly distributed in a narrow profile. Japan's profile has a narrow base that is indicative of a sharp decrease in birth rate. From the 10-14 age group upward, however, the profile is typical of a modernizing country. In general, a profile that is more or less an equilateral triangle is characteristic of countries that have both high birth rate and death rate such as India.

Another significant feature of the age-distribution of a population is the percentage of people who are economically active in relation to those who are economically dependent. The productive age group is from 15 to 59 years. The proportion of dependents in modernizing countries is generally much higher than in the modernized or highly industrialized countries, principally because a large fraction of the population is under 15 years old.

The high percentage of people under 15 years of age is indicative of the explosive growth potential of their populations. In most modernizing countries the under 15 group is usually 20-30%. Thus modernizing countries have a much greater proportion of preproductive people. As these young people grow up and move into their reproductive years, the size of the childbearing fraction of the population will increase astronomically. If 10,000 houses per day were built in Latin America between 1969 and 1979, something on the order of 100 million persons (more than one-fifth of the expected population) would still be inadequately housed at the end of that time.

1.220 PRESSURES FOR URBAN DEVELOPMENT

In 1950, 30% of the Latin American population (61 million persons), lived in urban centers of more than 2,000 inhabitants; while 61% (96 million people) lived in rural areas. By 1960, just 10 years later, these percentages reversed: 46% (95 million persons) were now living in urban centers and 54% (111 million) were in the rural areas. The urban growth rate for that decade was 55%, reflecting an annual rate of nearly 12%. Projections of Latin America's population in 1975 will exceed 291 million with an urban rural distribution of 54 and 46% respectively. A look at the urban distribution will give some idea of the impact that this population growth has had. Until 1930, Buenos Aires was Latin America's only city of one million. By 1950,

Mexico City, Rio de Janeiro, Sao Paulo, Havana, Lima and Santiago were to join it. By 1960, Bogota, Caracas and Montevideo joined the list. By 1970 there were a total of 16 cities with populations of one million or more and by 1980 there will be an estimated 26 urban centers on the list.

When we focus on the development of Colombia's 19,719,000 persons, we find a similar population growth pattern.

Urban-Rural Population Distribution

Year	Total Pop. (Millions)	Urban	Rural
1948	9.890	-----	-----
1950	11.273	4.196	6.974
1955	12.969	5.504	7.332
1960	14.901	7.066	7.705
1965	17.165	8.891	8.094
1970	19.719	11.079	8.510

Source: Plan General de Desarrollo, p. 431
Note: Urban is defined as towns of 1500 persons

The following chart illustrates the relative emphasis in city size growth for years 1938, 1951, 1960 and 1965. The most impressive characteristic of population growth is that it was not concentrated in just one or two urban centers as was the case for most of the other countries.

Urban Size Distributions by Percentage

Urban Size	1938	1951	1960	1965
500,000	0.0	14.6	15.2	38.8
100,000-499,000	24.5	24.5	27.6	15.6
20,000-99,000	19.7	19.9	20.2	18.0
1,500-19,000	55.8	41.0	37.0	27.6
	100.0%	100.0%	100.0%	100.0%

Source: The Economic Development of Colombia, p. 88

Note that the population percentage in cities of 500,000 or more was not significant until 1965. This late start in large city creation is reflected in the relatively new emphasis that mass rural-urban migration has had in the large urban centers. Thus when we rank the urban centers of 100,000 persons or more, we find that Colombia has the most uniform cross section of city sizes of any Latin American nation:

1964 Colombia:
Rank of Cities of More than 100,000 Persons

City	Total Population	Population % of Total Country
Santa Marta	104,471	.60
Pasto	112,876	.65
Cienaga	113,143	.65
Monteria	126,329	.72
Armenia	137,222	.78
Palmira	140,889	.81
Ibague	163,661.	.94
Cucuta	175,336	1.00
Pereira	188,365	1.08
Manizales	221,916	1.27
Bucaramanga	229,748	1.31
Cartagena	242,085	1.38
Barranquilla	498,301	2.85
Cali	637,929	3.65
Medellin	772,887	4.42
Bogota, D.E.	1,697,311	9.71
	5,562,469	31.81

Source: Urbanizacion Y Marginalidad, p. 22, table 9

With the exception of Medellin and Bogota doubling their population, almost all other ranges are represented. The rates of change as one goes from Santa Marta to Barranquilla are relatively constant. Once the 500,000 mark is reached there are larger increments in the population until Bogota.

> As has been recently observed, Colombia is fortunate in that its urban growth has occurred in many cities and has not been as concentrated as in Mexico or Argentina, and therefore the social costs associated with an excessive size, has not been so grave. However, recently, there have been disturbing indications that this situation may be changing with the changing emphasis that makes Bogota the political and financial capitol of the nation, and the most important manufacturing and commercial center, that generates the high and difficult rate of growth of 6.8% per year, which indicates that the population will double each 11 or 12 years, and, together with Cali and Medellin, disallows the (future) possibilities of growth of many small cities. (14)

The implication of this for future urban development is that cities are polarizing. There are those of 500,000 persons that show gradual change while the bulk of migration and urban center expansion will be felt in cities of two and four times this size. This emphasis in large urban center development will greatly increase and localize the migration targets which were previously absorbed in smaller sized and more numerous cities.

1.230 THE URBAN EMPHASIS IN MIGRATION

Migration has played a major role in the development of every Colombian city. For our brief historical sketch, we described several cycles that cities have had. Not always have they been the great attractions they are today. Since we define migration as a physical redistribution of the population, a closer look into some theories of migrant movement in Colombia will furnish us with the basic sources and orientations that migrants have. We are

(14) Plazas, s., Jorge, Alternativas para el Desarrollo Urbano de Bogota D.E., p. 5.

particularly interested in what kinds of aspirations and skills the migrant has, for this will give us an idea of specific demands he will make upon the city and most of all upon the housing market. There are several active theories of migration, these include direct campo (country) to city patterns, inter-city migration, and intra-city movement.

> Migration is essentially the product of social discontent that agricultural laborers suffer, called "anomily" that is determined by the incompatibility of their goals and their means. The sociologists have pointed out that of the most important forms for escaping the mentioned conflict is that of innovation, a mechanism through which individuals accept the institutionalized goals of the society and conscious of the impossibility to achieve them by available means, among which migration appears as the most important. We see that not only is the migratory population young, and potentially productive, but that also the migratory population is extremely innovative. (15)

1.231 THE "STEPPING STONE" THEORY

There appear to be two predominant patterns to rural-urban migration throughout Colombia, one of which makes a direct contribution to the squatter problem. This is the "stepping stone" process by which people move out of rural areas and collect in small nearby towns. The small townsmen are in turn attracted to the larger urban centers. This incremental process provides a high degree of urban socialization by the time in-migrants reach the large metropolitan areas. Because Colombia has such a wide range of intermediate sized cities, there is considerable diffusion in this process. In other countries, such as Peru, Chile, Venezuela, Argentina, and Equador, where there are but one or two major centers, this transitional process is much more abrupt. This stepping process has profound effects on the basic urban acculturation of the migrants:

> One can make very important conclusions from this observation. One does not refer to a totally rural population dedicated to agricultural labors. One can say that much more time is required for the move from the country to the county seats than from

(15) Cardona, Ramiro, Las Invasiones de terrenos Urbanos, p. 24.

> the small villages to the metropolis. It seems that the "culture shock" that affects the migrants occurs with most intensity when the former abandons his land and assimilates into the life of a small village, than when the inhabitants of small villages enter into the great centers. (16)

What appears to be happening to migrants as they leave the land and become urbanites is that they are forced to toally relinquish their land-based skills. The move into the major centers is only changing the scale and the level of modernization for something they have already been prepared for and accustomed to.

1.232 LA VIOLENCIA

La Violencia was a civil war which centered largely in the campo of Colombia for some 25 years. Initiated by the assassination of Jorge Eliezer Gaitan, a popular political candidate, the Violencia brought the liberal and conservative factions into open warfare. It has been often cited as one of the most influential catalysts for rural migration to the cities and is undoubtedly a cause of uncontrolled urbanization in the larger cities. Sociologists German Guzman and Orlando Fals Borda state that over 800,000 people were forced to change residence between 1946 and 1962 because of the Violencia, over 60,000 refugees had come into Bogota by 1953, the most intense period. (17)

Although there is no direct data to prove that these immigrants collected in squatter settlements, John Powelson in an article on the invasion settlements of Cali, suggests that this may have been the case:

> Migration from country to city is a phenomena throughout Latin America. But in Colombia it is intensified by the violent fighting between conservative and

(16) Ibid., p. 20.
(17) Guzman, German; Orlando Fals Borda and Eduardo Umana Luna, "La Violencia en Colombia," V.I., Bogota, Tercer Mundo, 1962, pp. 294-297.

liberal villages, which has seared thousands of country people into the safety of the city, where the scarcity of houses has caused even slum rents to soar. (18)

There are other reasons for this migration as indicated in a recent study by William Paul McGreevy which shows that:

> Only small percentages of migrants interviewed, even though they might have come from areas deeply affected by the Violencia, list it as their reason for coming to the city; the principal direction of migrants fleeing the Violencia could well have been from vereda to small town and not, as previously supposed, from small town to large city. (19)

When 448 migrant families were interviewed in Bogota concerning their reasons for coming to the city, by far the largest response was "to get work." The group samples was from the Central Nacional Pro-Vivienda's membership, an organizer of squatter invasions. The distributions were as follows:

Motives for Migrations to Urban Centers

Stated Reason for Move	No.	%
Health	20	4.5
Work	199	44.4
Violencia	65	14.5
Economic Situation	54	12.1
Military Service	2	.4
Brought to City as Child	44	9.8
Came to Visit and Stayed	23	5.1
For Education of Children	17	3.8
To Study	4	.9
Without Answer	20	4.5
	448	100.0%

Source: Las Invasiones de Terrenos Urbanos, p. 36

(18) Powelson, John P., "The Land-Grabbers of Cali," p. 30

(19) McGreevy, William Paul, "Change in Rural Colombia: Population Movement and Strategies from Change," Berkeley, Latin American Center U.C., mimeo, 1965, pp. 23-25.

1.240 · PROBLEMS IN "OVER URBANIZATION"

Some of the immediate results of this concentration of growth in urban centers is that of "over urbanization." In contrast with the developed countries where urbanization accompanies the process of industrialization, in Colombia urbanization is not accompanied by industrial development of equal magnitudes. In other words, urbanization is not synonymous with industrialization but indicates an extraordinary rural poverty moving to the city. (20)

The doubling of population in the larger cities every ten years has outdated municipal services as fast as they have been installed. Complicated by the appearance of squatter settlements, the directions and logical extensions of infrastructure have often become distorted and unevenly distributed.

> If the people better than anyone know what they want and what they dan do, and they frequently show a capacity to take best advantage of their available resources, but don't understand clearly their positions in the city, pretending to live in it the same life that they lived in the country, the phenomena of "ruralization" of the city is grave, not only because it annuls the city for what it is, but because it can never present the advantages the country presents either. Such as, for example, the condition of overcrowding and the lack of water and sanitary services, that need not be services in a rural dwelling, but are required in an urban dwelling. They can not avoid anti-hygenic conditions. (21)

Rapid urban growth is more the result of economic "push" factors, from the rural countryside, than from "pull" factors from within the cities. The city has created the illusion of providing jobs and opportunities for all, however, the benefits from the city in actuality, tend in the end to be more social than economic and increase the transfer of the rural poverty into the

(20) Cardona, Ramiro, Las Invasiones de Terrenos Urbanos, p. 10.
(21) Rojas, Ernesto, Urbanismo Y Migracion, p. 263.

city slums. The disparity between manufacturing employment and the degree of urbanization can best be illustrated by the following estimates for the Car region:

> Agriculture 21.0%, manufacturing 21.5% and other 57.8%. The Car region comprises an area encompassing Bogota in which the total population was 1,604,000 for 1961. The city proper accounted for 1,300,000 of this. The population of the Car area in 1961 was 80% urban, since the urban-migration is in excess of the expansion of employment opportunities in manufacturing, this indicates that migrants must take their living at unskilled labor-intensive positions. The high percent classified as "others" accounts for this. (22)

From another point of view, the effects of job and over urbanization can be seen as an over-saturation of various skill markets. In the lower income sectors, in-migrants find their greatest competition with others of the same background and level of skills. Their labor intensive job markets are flooded: street vendors, artisans, manual laborers, etc., abound in every city. At the other end of the job market, professional administrators, doctors, technicians, and teachers cluster in the cities and saturate their respective areas. Worse yet, the university system, without sufficient knowledge of the realities of the country, prepares students for unnecessary roles and denies the areas of greatest national priorities. In our own field of architecture, it is curious to see almost every university design studio filled with proposals for office towers, low-density detached residences, cultural buildings such as national museums, vacation resorts and other projects of both unrealistic demand and cost. In a country where one-third of the total population is provisionally housed, this is professionalism at its worst. The greatest indictment comes from those sufficiently educated to both recognize the problems at hand to contribute solutions and yet do not.

1.250 THE FORMATION OF THE MIDDLE CLASS

One of the most profound consequences of rapid 20th century urbanization is the appearance of a significantly sized middle class. The middle class, as of yet, does not fulfill the central

(22) Mojica, Guillermo, The Economic Development of Colombia, p. 91.

condition for a class, that is, that the members have a common background of experience, for they represent nearly every economic and cultural background. In general, the middle class is the group most aware of the existing social and economic inequalities of their time because as a newly formed class they are more often confronted by these inequalities than are members of the lower classes.

In Colombia, the middle class emulates two distinctly different models. On one hand there is the nationalistic criollo model which is based on an European ancestry elite. On the other hand, the consumer-based American model has made a tremendous impact: rapid communications, a greater foreign and international mobility, and a large influx of American based firms have invaded what once was a strong nationalistic and even provincial aspiration.

For the middle class to deal effectively with the problems and issues that urbanization has brought, it needs to assume leadership of the popular forces and to direct these forces through a democratic process. This requires that the middle class identify themselves, through their cultural background, with the common man. The possibility of their becoming political and economic activists is strictly dependent upon their ability to produce leadership under the pressures of the existing oligarchic program. This will be possible if and only if the middle class can stop emulating upper class values.

In speaking of the problems of developing countries, the United Nations has accused the middle class of frustrating economic development by indulging in self-protective measures to obtain increased public employment, inviolable job security and legislative safeguards against competition. The pressure for these measures was said to have come from employers, businessmen and professionals. (23)

The protective competition that this U.N. article refers to is particularly strong in the area of housing. In many cases the middle class has forced the invasion of public lands by squatters because the low-density tradition that the middle class has followed has already

(23) The New York Times, "U.N. Study Warns of Latin Tension," April 7, 1963, p. 24.

squandered much of the valuable inner-city land, leaving only public sites for invasion by the poor.

One can immediately see political implications in the formation of the middle class. Middle class values have placed an importance on the democratization of the city offering an alternative to the ever present Marxist model of socialist radicalism and revolution. As we have seen, the history of Colombia shows that an enormous price has already been paid for social change through armed revolution, i.e., the Violencia, 1946-1962. However, it seems that due to American military assistance programs that armed conflict is a clandestine process in the 20th century, and as Regis Debray states, the "Cuban model of revolution" will not work again in Latin America. (24) Hence the formation of a middle class will form an alternative process for social change.

1.260 IN SUMMARY

Colombia is characterized by rapid population growth, high fertility rates, rapid decent of mortality rates, an increasingly younger population, great movements of population towards the urban centers, and a formation of a large middle class.

Colombia's greatest urban amenities lie in the fact that there are many intermediate sized cities in the 100,000 through 500,000 population range, causing rapid rural to urban migration and dispersing economic development throughout the entire country.

The principal factor accounting for the rapid growth of cities throughout Colombia is migration.

Cities are not capable of assimilating the increasing number of in-migrants into the city.

There exists a ruralization trend in parts of the city (rural in the sense that decidedly rural traditions begin to co-exist in a stable way with patterns both

(24) Debray, Regis, Revolution in Revolution, pp. 50-100.

modern and urban).

The process of urbanization in Colombia is accelerating the process of modernization of its inhabitants.

Migration patterns indicate that cities are polarizing in size with a decreasing emphasis in the number and rates of growth in cities of less than 500,000 persons and a concentration of populations in cities of 1,000,000 or more.

There are several theories accounting for large city in-migration: 1) The "Stepping Stone" theory where migration takes place between cities of increasing size and 2) direct rural urban migration. Migration due to the Violencia has been responsible in part for the first theory.

High concentrations of migrants in one city have flooded the labor intensive job markets. This over urbanization is also found in the reluctance of professionals, etc., to leave the large cities and distribute themselves and their skills throughout the country.

The high levels of urbanization are reflected in the formation of a large middle class which has determined that the city will no longer be the exclusive receptacle of a national elite. The middle class has also been accused of restricting development by being overly protective and conservative with respect to their new accomplishments.

The in-migrant to the city is creating a new and successful pressure group for social change.

1.300 BOGOTA

Bogota is the capital of Colombia. It is the industrial and financial center for 10% of Colombia's 22,000,000 persons.


BOGOTA

1.310 HISTORICAL ASPECTS

1.311 COLONIAL PERIOD

Bogota was founded by 1538 by Gonzalo de Quesada and named Santa Fe de Bogota after his birth place and the southern capital of the Muiscas, Bacata. It became the capital of the vice royalty of Nueva Granada and soon thereafter one of the centers of Spanish colonial power and civilization. The original population consisted of the members of the Muisca tribe that the Spanish met on the savanah of Bogota. In 1812, there were 20,000 inhabitants.

1.312 INDEPENDENCE AND THE INITIATION OF THE REPUBLIC (1812-1880)

In 1811, the city's inhabitants revolted against Spanish rule and established their own. In 1816, the city was re-occupied by Spanish troops under General Pablo Morillo. His regime lasted until Bolivar's victory at Boyaca forced the remaining Spanish out. Bogota then became the capital of the new Republic of Gran Colombia that included the territory of what is today Venezuela, Ecuador, Panama, and Colombia. Then the republic was dissolved into its three constituent parts of Venezuela, Ecuador, and Nueva Granada (Colombia and Panama). The city was clustered around what is now the Plaza de Bolivar until 1840 when it initiated its elongated form with the installation of its first mule drawn street car. In 1861, Colombia officially came into being and Bogota was its capital. The population from 1812 to 1880 increased from 20,000 to 70,000.

1.313 MODERN PERIOD 1880-1970

Political violence characterized Colombia's entry into the 20th century. Animosity between the Liberal and Conservative parties culminated in the assassination of the popular Liberal candidate Jorge Elizer Gaitan on April 9, 1948. The assassination sparked a period of violence and guerilla warfare which resulted in the death of 150,000 to 200,000 people. In the "Bogotazo" alone 100,000 people were killed. A brief period of calm reigned when General Gustavo Rojas Pinilla proclaimed himself dictator on June 13, 1953. Discontent with the ever increasing

repression of the regime finally caused his overthrow. In 1958, Alberto Lleras Camargo, who helped engineer the coup, also helped establish the Frente Nacional, a parity system of government automatically alternating the control of the country between the liberal and the conservative parties.

From 1910 to 1938, Bogota's urban population increase was slow as indicated in the following chart. After 400 years of existence Bogota had only 330,000 inhabitants. Its population has multiplied itself 7 times in the last 32 years. It is presently over 2,300,000 inhabitants, as presented in the following age sex distribution chart. The increased demand for municipal services, transportation, and housing facilities to accommodate this population increase has created a wide array of urban problems.

Bogota: Population Growth

Year	No. of Persons
1670	3,000
1812	20,000
1851	29,603
1880	70,000
1910	100,000
1938	330,312
1951	648,000
1958	1,139,058
1964	1,697,911
1969	2,235,000

Source: Dane, Bogota

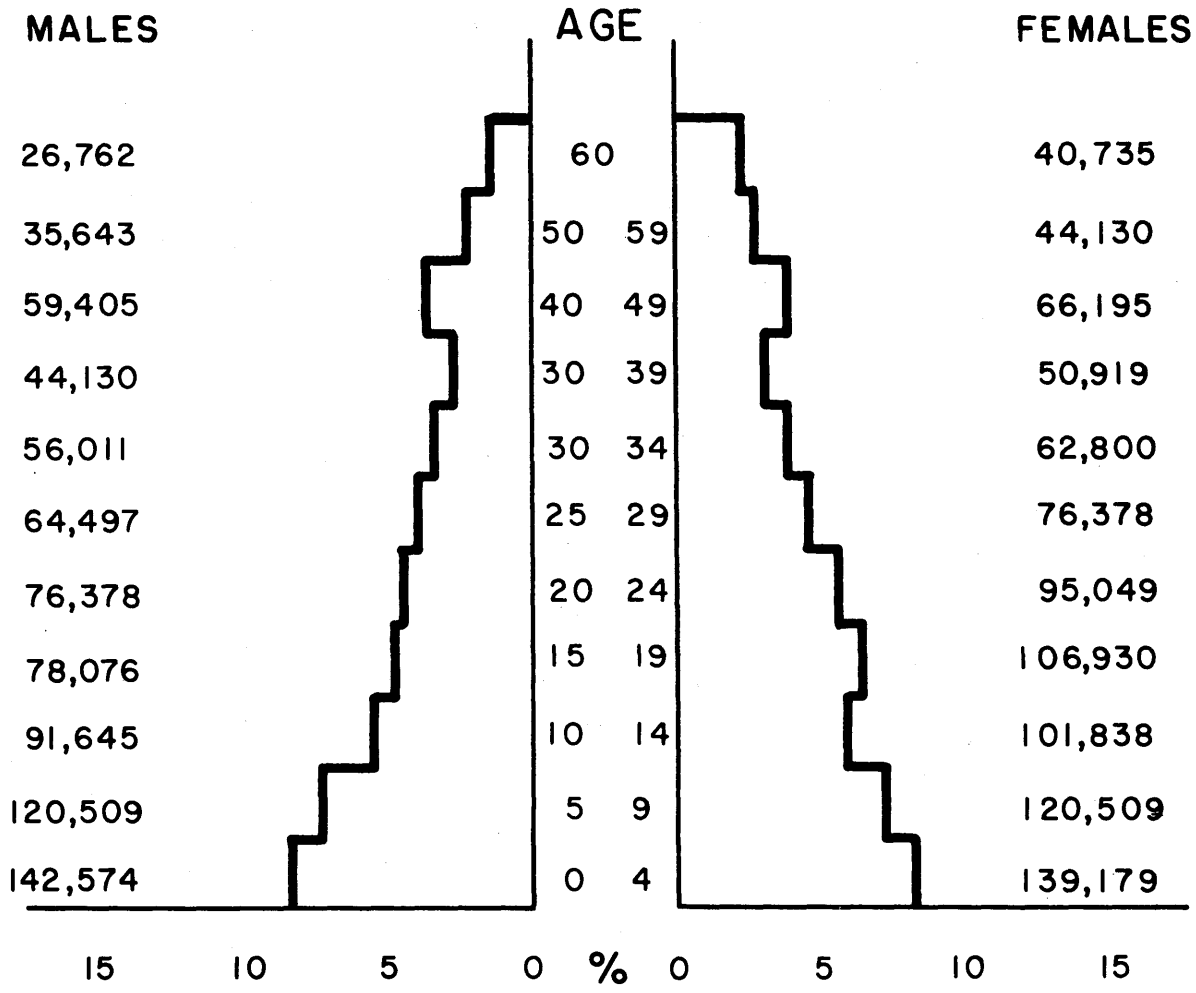
1.320 ECONOMIC ASPECTS

The estimated income distribution for Bogota is typical of urban centers in developing countries undergoing rapid growth and expansion. The bulk of the population earns one or two times subsistence level incomes. In Bogota, 42.5% of the population earns less than 11,000 pesos annually ($550 US). Worker and low level bureaucrat incomes account for 27% of the families, middle income jobs such as shop owner, highlevel governmental employee, etc., represent 16% of the families, and 14% of the population earns more than 60,000 pesos per year. (25)

Subsistence level is defined as that amount of money needed to provide shelter, clothing, food and fuel with no margin for savings. In Bogota, the subsistence level is approximately 800 pesos per month. In 1964, there were 54.8% of the families that earned 2,000 pesos per month. (26)

(25) Plazas, Jorge, Alternativas Para el Desarrollo Urbano de Bogota D.E., p. 134.
(26) Cardona, Ramiro, Migracion y Darrono Urbano, p. 206.

BOGOTA : AGE SEX DISTRIBUTION



TOTAL MALES = 791,946
= 46.7 %

TOTAL FEMALES = 905,365
= 53.3 %

TOTAL POPULATION = 1,697,311

PERCENTS TAKEN OF TOTAL POPULATION IN 1967

Bogota: Age Sex Distribution for 1964

Total Males			Females	
%	No.	Age	%	No.
8.4	142,574	0- 4	8.2	139,179
7.1	120,509	5- 9	7.1	120,509
5.4	91,654	10-14	6.0	101,838
4.6	78,076	15-19	6.3	106,930
4.5	76,378	20-24	5.6	95,049
3.8	64,497	25-29	4.5	73,378
3.3	56,011	30-34	3.7	62,800
2.6	44,130	35-39	3.0	50,919
3.5	59,405	40-49	3.9	66,195
2.1	35,643	50-60	2.6	44,130
1.4	26,462	61+	2.4	40,735
46.7%			53.3%	

Source: Las Invasions de Terrenos Urbanos, p. 50.

1.330 GEO-POLITICAL ASPECTS

The historic development and importance of Bogota has been outlined in the preceding section. The rise from colonial capital to international metropolis has been accompanied by the development of essential governmental agencies, such as the statistics center, DANE, national offices of Public Works, Development, Housing, cultural facilities, such as the Gold Museum, theaters, educational facilities, hospitals, etc. In 1964, the metropolitan area of Bogota was organized as a Special District (Distrito Especial), retaining its position as capital of the Republic of Colombia. The metropolitan area incorporates six surrounding municipalities (Usme, Bosa, Fontibon, Engativa, Suba, and Usaquen) is closely related to them because of their economic dependence and geographic location.

1.340 SOCIO-ECONOMIC PATTERN

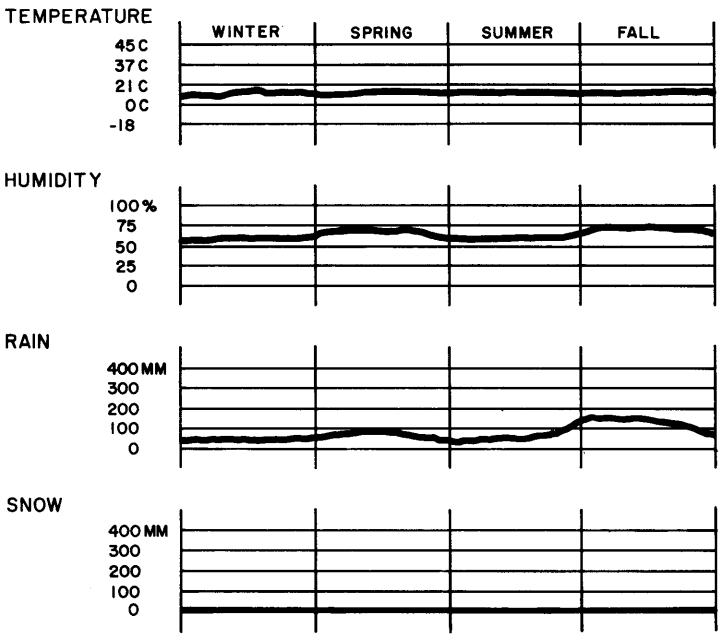
The commercial center of Bogota is the geographic as well as the social dividing line. The remaining colonial houses and new apartment buildings house a variety of economic groups--very low to upper income levels. It is now becoming fashionable to move back into old colonial homes that had become rooming houses for rural migrants. The high income groups now occupy the northern sectors of the city in the barrios Chico, El Retiro, etc. These groups are composed of the least racially mixed population, generally families of Spanish descent and colonies of foreign diplomats and businessmen. The southern portion of the city is composed of the lower income and worker groups. The racial composition of these barrios is generally "mestizo," a mixture of white and Indian populations. There is a small but growing number of mulatto, a mixture of black and white populations, and zambo, a mixture of black and Indian groups, population immigrating from the coastal areas to the city. The racial composition of Colombia in 1963 was 40% mestizo, 30% white, 18% mulatto, 7% Indian, and 7% black. These lower middle and middle income groups occupy the western and southwestern sectors of the city.

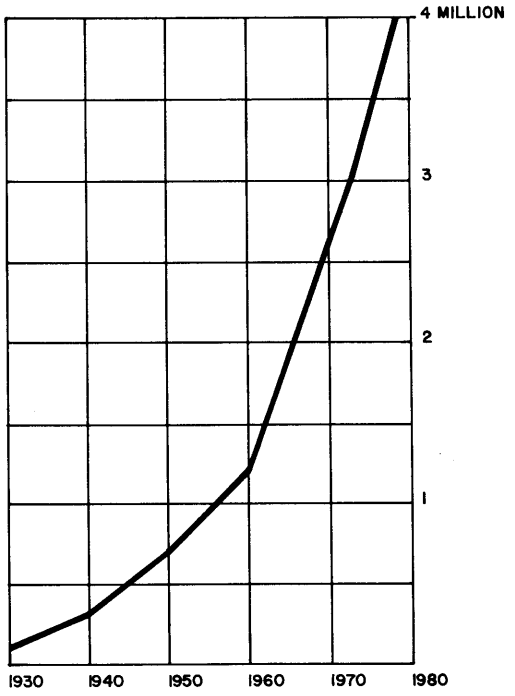
1.350 PHYSICAL PLANNING ORIENTATIONS

The earliest planning concepts that guided the physical development of the city came from the "Ley de Indias." It stipulated that blocks had a length of 100 "varas," about 80 cm., and that they were organized around a plaza whose length was to be 1½ times its width. The homes were large and had rooms grouped around ample interior courtyards. As the city grew the blocks lost their relationship to the "Plaza Mayor" and "The Calle Real" but retained the same basic dimensions. In the early days of the colonial epoch and the first decades of the period after independence these guidelines could function.

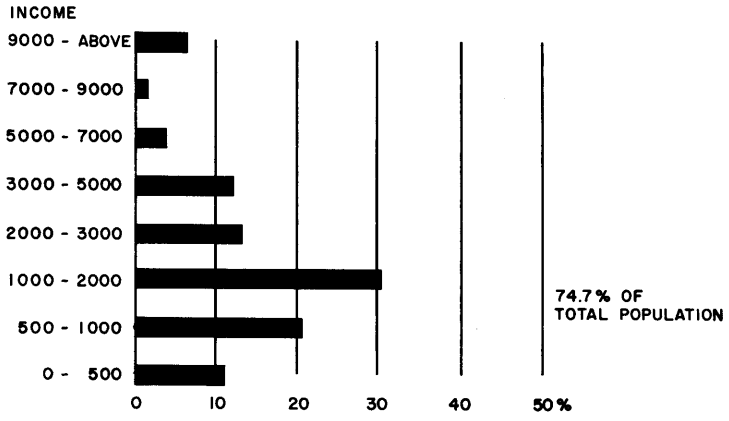
Now, however, economic, social, demographic and technical transformations have promoted the decadence of the old colonial sectors of the city. Houses and lots have been subdivided, high rise construction has created "volumetric chaos," and blocked the light from the streets, and a mixed land use has allowed the establishment of repair shops, entertainment centers, and other commercial ventures. (27)

(27) Posada, Reinaldo, Apuntes Sobre Agrupaciones de Vivienda, p. 3.

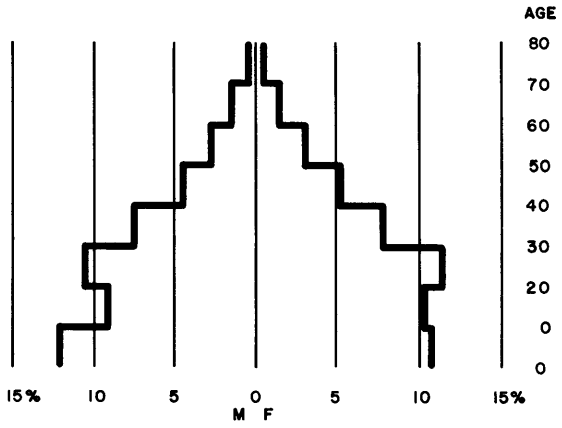




URBAN POPULATION GROWTH



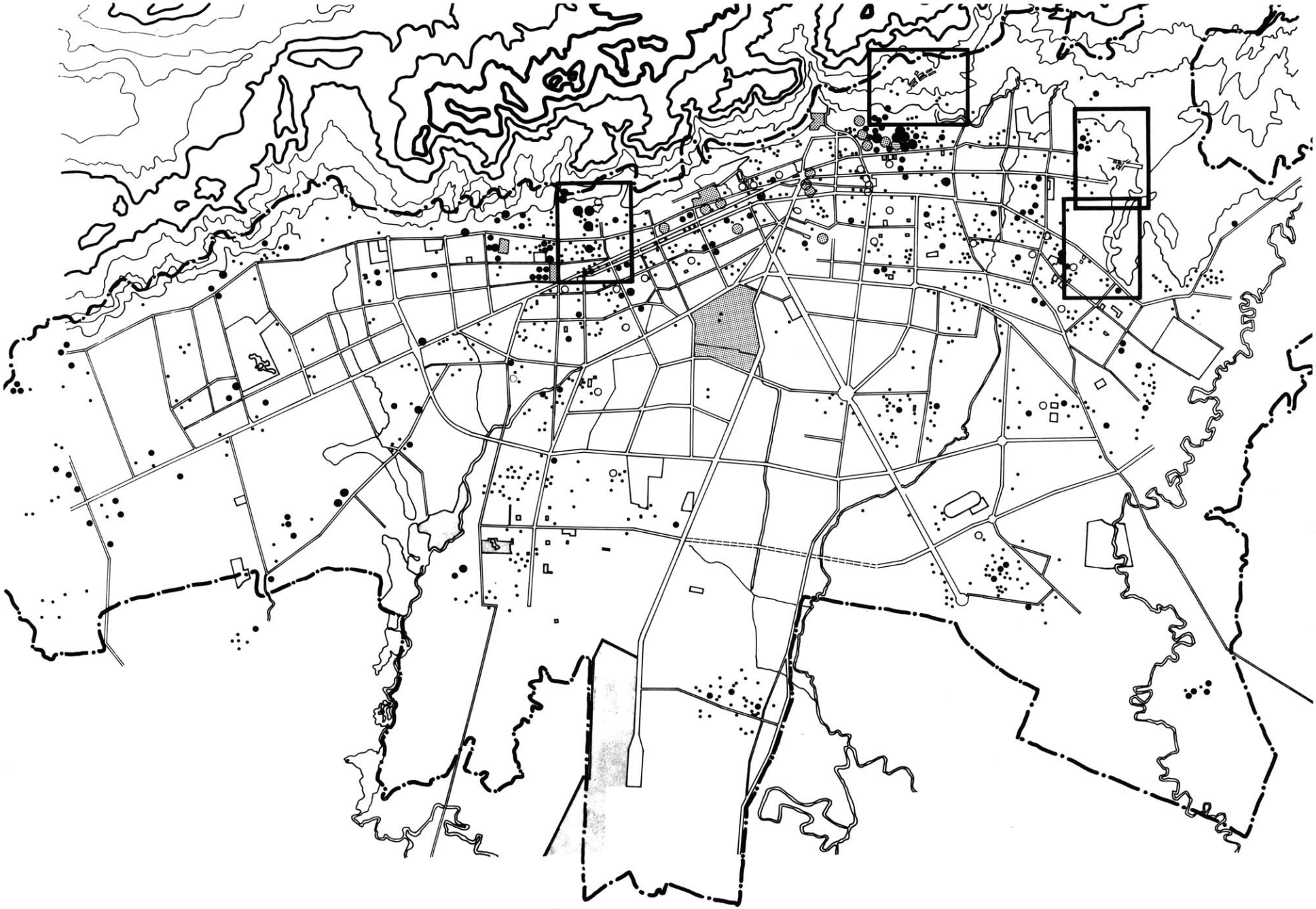
INCOME DISTRIBUTION IN PESOS

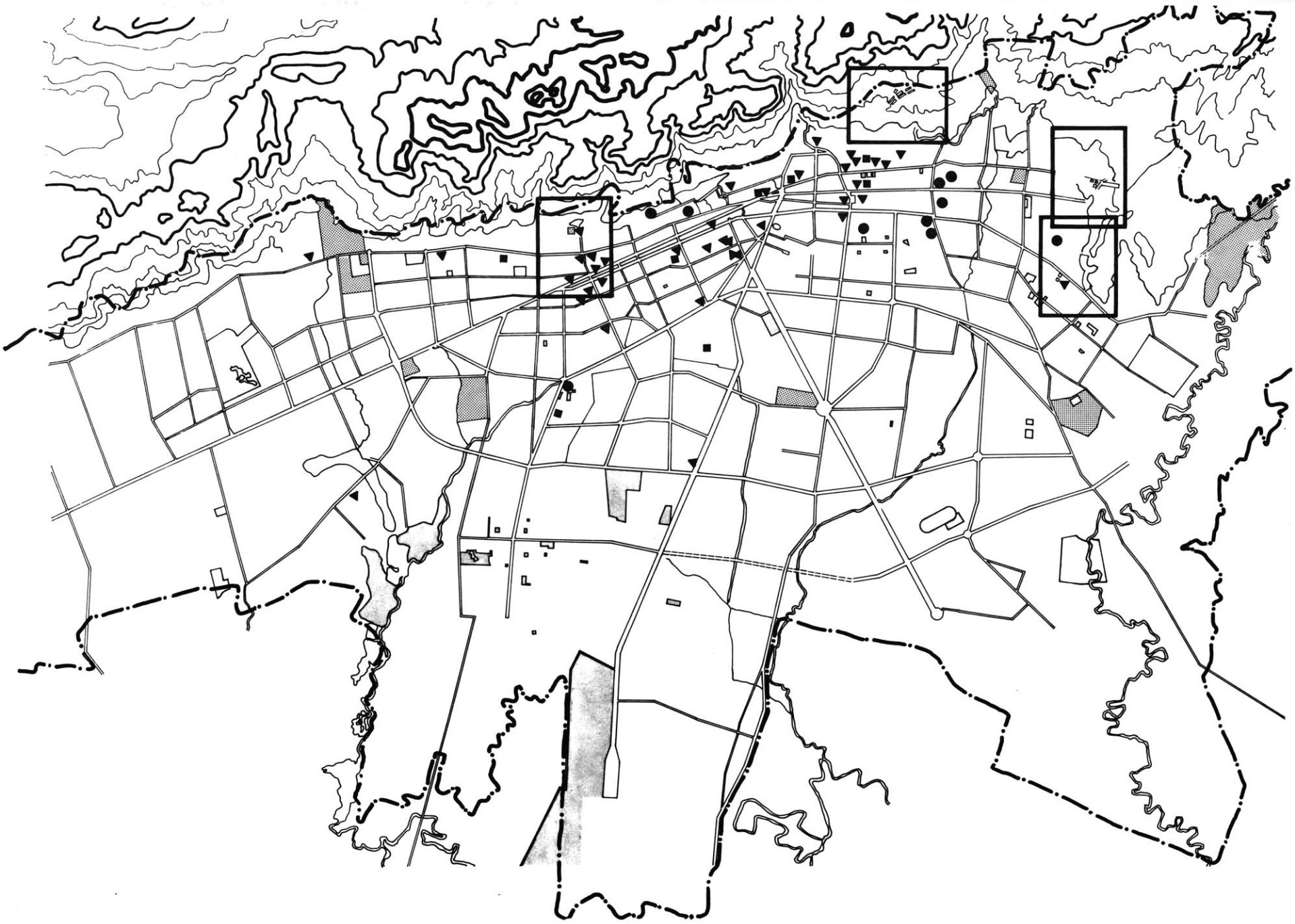


URBAN POPULATION DISTRIBUTION

BOGOTA, COLOMBIA


BOGOTA , COLOMBIA
LAND USE MAP
0 .50 1 2 4
SCALE IN KILOMETERS
RESIDENTIAL
INDUSTRIAL
COMMERCIAL
INSTITUTIONAL


BOGOTA , COLOMBIA
EDUCATION FACILITIES
0 .50 1 2 4
SCALE IN KILOMETERS
1-20 CLASSROOMS
21-42 "
43-72 "
GOVERNMENT HIGHSCHOOL
UNIVERSITY
NATIONAL UNIVERSITY


BOGOTA , COLOMBIA
PUBLIC FACILITIES
0 .50 1 2 4
SCALE IN KILOMETERS
MUSEUM
LIBRARY
HOSPITAL
MILITARY


BOGOTA, COLOMBIA
SOCIO ECONOMIC LEVELS
0 .50 1 2 4
SCALE IN KILOMETERS
LOW
MEDIUM
HIGH

1.351 THE PHYSICAL PLANNING OF BOGOTA FROM 1948 TO 1969

In 1948, the "Plan Piloto" and "Plan Regulador," the most comprehensive urban studies for Bogota, were begun. These were elaborated by the urbanists Le Corbusier, Jose Luis Sert and Paul Lester Wiener. The "Plan Piloto" was concluded in 1951 and the "Plan Regulador" in 1953. It was established that:

a) The urban growth of Bogota had a defined north-south orientation along the existing streets; to the west development was limited because of the successive locations of railroad and flood zones. However, in certain sectors, a tendency of the city to grow in this direction existed.

b) The "Plan Piloto" as well as the "Plan Regulador" reinforced the city's form as lineal, and proposed measures for regulating and controlling the city at its extremes.

c) The plans proposed an extreme separation of the urban functions, especially between residential and work areas. The only exception to the separation of these functions were the designations of some commercial strips along major traffic arteries and in civic centers.

d) They recommended the location of a single group of industrial areas placed symmetrically in relation to the axis of the city and one important business, office, and administrative center.

e) The plans foresaw the formation of a compact city, by using high densities of habitation. To achieve the densities, the following was proposed; the construction of horizontal units on small lots, multi-family units, and the application of an urban perimeter of limited extension.

f) The "Plan Piloto" and the "Plan Regulador" have only partial effects today. Unfortunately, the referred only to the area of the old municipality of Bogota, within which they established a reduced "urban perimeter" of development, surrounded by an area "non-aldificandi." In the same period the initiation of numerous barrios took place situated next to the municipal limit. These barrios were under the jurisdiction of the surrounding municipalities. These authorities permitted the formation of the so-called "barrios piratas" or barrios "clandestinos."

The later proposals of urban zoning, prepared by the District Administration, and the urban development that has taken place within these guidelines, or in contradiction to them, have the following outstanding characteristics:

a) An increasingly larger area in the process of urbanization, and the constant acceptance by authorities of spontaneous development. The existence of these settlements obligated the city to begin an extensive program of rehabilitation of barrios. The goal of the city is to provide basic urban services to the barrios.

b) A tolerance for the growth of the city's low density in barrios to the north. This growth is accompanied by the formation of an extensive zone of suburbs and difficulties in extending public service, such as sewage, transportation, etc.

c) A push of the growth of the city to the west and southwest, not counting the existence of large undeveloped zones outside the market, in a form more semicircular than periods before.

d) An uncontrolled extension of narrow bands along the regional roads, Soacha-Muna, Funza-Mosquera, and Usaquen-La Care.

e) The search for a greater variety in the location of the industrial and artisan zones of the city, with proximity to the working class sectors and the regional roads.

f) The centralization of tertiary activities within the city, with the simultaneous appearance of some new centers; as the official administration center, those of 7 of August, Restrepo, etc., and the strengthening of the Chapinero, etc.

g) The slow establishment of a system of circulation that emphasizes a mixed mode of transportation, private automobiles and buses.

h) The appearance of new types of housing developments: large scale developments such as Ciudad Kennedy, barrios of progressive development, planned or not, and housing programs run by profit-making entities and others.

i) The utilization of the available natural areas for the location of green zones to counter an expanding deficit of park areas.

j) An attempt to give flexibility to the association of diverse land uses by the concession of licenses for special uses. By reserving small zones or islands for commercial, artisan, industrial, civic centers, into areas previously designated for other uses, such as residential. "This mix has been effected on occasion with liberality and with looking towards the existing amenities." (28)

1.360 PRESENT LAND PROBLEMS

Bogota has expanded lineally to the north and the south. Movement to the west has been hindered by large land holdings and land that is difficult to develop due to the flooding. Growth to the east has been contained by the slopes of the Andes, spotted now by housing developments. The areas and densities of Bogota presented chronologically in the following chart indicate the tendencies of rapid growth in area and declining density.

Bogota: Occupied Area and Population, 1560-1964

Year	Area in Hectares	Inhabitants	Inhabitants per Hectare
1560	20	-	-
1600	56	-	-
1670	129	3,000	23.23
1851	294	29,603	100.69
1938	2,514	330,312	131.40
1958	8,084	1,139,058	140.91
1964	14,615	1,729,911	118.37

Source: Plazas, J., Alternativas para el Desarrollo de Bogota D.E., p. 72.

Residential land use and circulation combined account for 90% of the area of Bogota with 10% of the land mass occupied by all the other land uses.

3.361 LAND COMPETITION

Land speculation, urban sprawl, and rapid demographic growth have created an intense competition for land available for housing among the different economic groups. What was considered to be marginal land, expensive to

(28) Plazas, Jorge, Alternativas Para el Desarrollo Urbano Bogota D.E., pp. 55-56.

develop, and difficult to maintain and secure, has now become property that offers physical and locational amenities to the economic groups at the opposite ends of the income scale. The steep slopes offer amenable views, are located near employment and commercial centers, and are relatively inexpensive to buy. Economically marginal populations rely on the local building tradition to develop dwelling units of natural and permanent construction materials at high densities that can only be equalled by expensive technical methods appropriate to the high income groups. Middle income housing produced by individuals, commercially, and by governmental agencies, is limited by the available economic resources to developing sites that do not require large investments in site and lot development, but concentrate on the production of a finished unit. The result is under utilization of the total site because of its steep slope or low swamp land. In view of the rate of growth of urban populations, land waste is planning suicide. The differences in the densities of the project Los Laches, built by the municipal housing office of Bogota, The Caja de la Vivienda Popular, and the invasion barrio, Las Colinas, are immense. Los Laches has a density of 12.8 families, and Las Colinas has a density of 77.5 families/ha. These settlements are further illustrated in the third chapter where we have presented them as case studies.

1.362 POPULAR BARRIO GROWTH

"In all the regions in development, typical national rates of growth of population are 2% and 3% per year. But the typical rates of population growth for the urban centers actually exceeds 6% per year. In some of these regions the population growth in the barrios or slums, or in the areas of spontaneous growth is 12% per year, registering numbers as high as 20% per year, that is a rate of growth that doubles the population of the poorest areas of these cities every five years." (29)

The land traditionally used by the poor to solve their housing problem is no longer exclusively theirs. Luxury homes and apartments are now beginning to occupy the steep slopes in Bogota. The loss of these locations will force the low income population further south, and along the road

(29) Cardona, Ramiro, Migracion y Desarrollo Urbano, p. 189.

to Villavicencio. The distributions of the housing zones is "totally discriminatory." The north and the south sectors represent social positions and prestige symbols. This social split is the cause of excessive expansion and demand in the northern sector of the city. The most beautiful areas of Bogota, near the rivers San Cristobal and San Francisco, have not been intensely developed.

> The lot sizes too, are identified with social strata, since tne city has not been capable of offering to its inhabitants solutions of diverse densities that permit them to choose their places as needed in relation to the nearness to work or the recreation centers, or by reason of the beauty of the landscape....Densities of 100, 200, and 350 persons/ha. are indicators that almost always occur in poorly developed marginal areas, and are the logical consequence of the lack of areas of public use for roads and for green zones. (30)

Urban expansion, causes a one-sided battle in land use. As the city stretches the metropolitan area to accommodate the demand for new housing, it moves into high altitude, agriculturally productive land that can offer no real competition with the economic opportunities capitalized on by land speculators, developers and city agencies. "Agriculture can never compete with an urban use of the land, except, perhaps in the case of vegetables and flowers. The continual growth of Bogota, with the economic and job opportunities that it will present, carries with it "social costs" that in the long run have a real economic significance--the costs of transportation, congestion, the increase in the costs of public services, and the irrecupable losses of the very limited areas of agriculture at 2,500 meters altitude. (31)

(30) Plazas, Jorge, Alternativas Para el Desarrollo Urbano de Bogota, D.E., pp. 21-56.
(31) Ibid., pp. 21-56.

CHAPTER 2

THE HOUSING SYSTEMS--LEGAL AND ILLEGAL

2.100 THE LEGAL HOUSING SYSTEM

As we presented in the previous chapter, Bogota has begun the process of formal planning by creating an administrative program to deal with problems of growth and urban land use. In this section we describe the legal housing system that is composed of a public (governmental) and a private (commercial) sector.

2.110 THE LEGAL REQUIREMENTS

The requirements placed by the government on construction are legal, material, and dimensional. The possession of title or tenure is the legal access to land. The fact that the developer has title to his land provides him with the opportunity to solicit financial support in the form of a home improvement loan or a mortgage loan from either a public or private housing finance institution. Another legal aspect is the building permit. It is issued after the plans of a project have been guaranteed. The choice of building materials to meet health, fire, and building codes emphasizes the use of permanent materials or industrially produced asbestos cement roofing material. Other parameters dictating how the lot is to be developed are the constructed and open areas, and the maximum height of tne building as defined in the zoning code. For buildings to be considered "legal" they have to fulfill these standards, however, variances do exist.

2.120 HOUSING CAPACITY OF COLOMBIA

In its attempt to solve the increasing housing demand, Colombia has allocated to the activity of construction 3.5% of the GNP. This sum, combined with private investment in construction, supplies the legal housing market with an increasing number of buildings (housing, office buildings, commercial establishments, storehouses, industry, educational facilities, and others). Of the total investment in construction in 1966, 80% went into housing; the next ranking category was office buildings, representing 8.5% of the total investment in building. The average

cost of housing is 385 pesos/m^2 and the average cost of the office building is 960 pesos/m^2. (1)

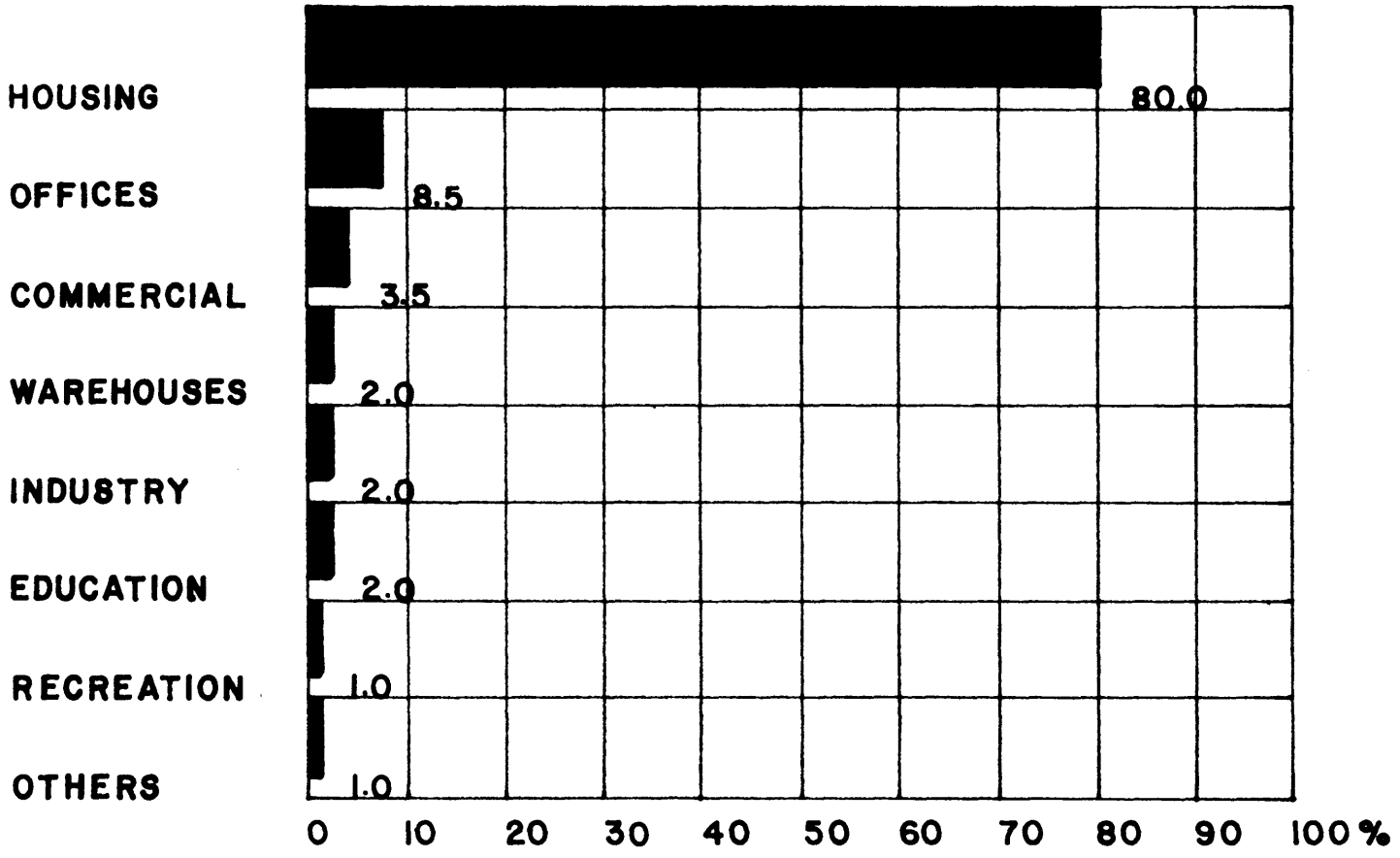
Depending on the individual builder and the socio-economic position of the client, a variety of building types result: high-rise apartments, walk-up apartments, detached one and two family houses, one and two family semi-detached houses, row housing, or single family detached houses (most common). The ICT establishes the goal with its slogan "Una casa para cada Colombiano," or "A single family detached house for every Colombian."

The proportion of houses and apartments constructed in Bogota in 1966 and the first part of 1967 describes the sprawling, low density tendencies of the city. In 1969, the metropolitan area of Bogota occupied 16,500 hectares at a density of 118.4 people/ha. In 1977 the projected area for Bogota will be 26,000 ha., or an increase of 9,500 ha. with a density of 143 people/ha. Of the total number of dwellings built 84.7% of the money went into homes and 15.3% was invested in apartments. The potential clientele served by the legal housing system is spatially distributed in the northern and western sectors of the city. Geographic location also corresponds to the socio-economic groups of the highest incomes. The distribution of housing among the different socio-economic groups has, more or less, remained the same over the last seven years. In 1960 the investment in worker housing was 20% of the total investment. This percentage of worker housing was in 1966 18.6% and in the first half of 1967 17% of the total investment in housing. The following chart indicates the housing emphasis according to investments (2)

2.130 DEMAND

In 1964 Bogota had 168,340 houses for 1,697,000 inhabitants, (approximately 10 persons per house). Also noted is the existence of 7,446 caves, tents, and huts. An effective public housing program must meet the needs of the low income in-migrant and seek to anticipate the increasing needs of new-family formation, which will soon pass in-migration as an urban

(1) Plazas, Jorge, Alternativas Para El Desarrollo Urbano de Bogota D.E., p. 222.
(2) Ibid., p. 222.



HOUSING EMPHASIS IN CONSTRUCTION

ACCORDING TO INVESTMENT

growth factor. Kingsley Davis maintains that urban in-migration is a temporary source of increased population, and will diminish as the pressure on the rural population is eased by improved living conditions and better educational and economic opportunities. When this occurs urban population increases will be the result of the excess of births over deaths, through the reduction of infant mortality and increased life expectancy. The housing stock to serve this population increase will have to be aimed at young married couples who have little money and who are establishing new households. The requirements for shelter and a secure basis from which to plan their future is similar to the squatter.

The 11,000 peso limit ($550 US) established as the minimum income that the legal housing market can accommodate isolates 42% of the population. Income of families requesting ICT housing are presented in the following chart. The income range indicates that population lived in marginal areas or bahareque homes as did 4% or 60,000 people in Bogota in 1964.

1961 Incomes of Families Requesting ICT Housing

Income/Month (in pesos)	No. of Families	%
- 500	3,679	13
501- 750	6,993	24.7
751-1000	8,095	28.6
1001-1500	6,263	22.1
1501-2000	2,015	7.1
2001-2500	636	2.2
2501-3000	317	1.1
3000+	343	1.2
		100.0%

Source: Unpublished Report on Juan XXIII, p. 37

Colombia now has approximately 300,000 houses that are considered to be built to the legal standards, and another 300,000 that are not considered to be so. The average number of dwelling units built per year is 40,000 and the growth of families in urban areas of greater than 10,000 is 60,000 families per year and hence a deficit of 20,000 units per year.

2.140 THE PUBLIC HOUSING SYSTEM AND ITS AGENCIES

Those responsible for the orientation, the construction and the financing of the dwelling are the public and private institutions and individuals. In the period 1961 to 1965 their combined efforts have produced the following number of dwellings:

Housing Production and Deficit for Colombia, 1961-1965

Year	Number of Families (Thousands)	Units Built Public Sector	Units Built Private Sector	Total	End of Year Deficit
1961	47.4	21,400	18,200	39,600	272,700
1962	48.9	20,500	20,000	40,500	281,000
1963	51.1	20,600	22,000	47,500	290,000
1964	53.3	22,700	24,000	46,000	296,000
1965	55.5	28,400	28,000	56,600	272,000

Source: Mojicia, G., The Economic Development of Colombia, p. 92.

2.141 THE PUBLIC HOUSING AGENCIES

The public sector related to housing is composed of semi-autonomous governmental agencies involved directly or indirectly in the construction of dwellings. The most important are the Banco Central Hipotecario (BCH) or the Central Mortgage Bank, and the Instituto de Credito Territorial (ICT), or the Land Credit Institute, which operate throughout Colombia. The Caja de la Vivienda Popular (Caja) or the Popular Housing Bank, operates in the municipal area of Bogota in the area of barrio rehabilitation and low income housing projects.

THE BCH

The BCH was established in 1932 after two earlier attempts to establish a mortgage bank in Bogota. Following the depression of 1930, as part of his plans for economic recuperation,

the government of President Enrique Olaya Herrera issued decree #11, which promoted the founding of the BCH. The first director, Julio E. Lleras, was responsible for the basic structure and organization. The new entity began its program July 1, 1932. Its initial capital was 20 million pesos, and the original subscription of bonds was 11,192,110 pesos, of which 50% was given by the Bank of the Republic and the rest by private commercial banks. Mortgage credit was based on this new fund that was given earlier by the banks. In developing the basic plans of the national government, decree #687 was issued which stipulated that 80% of the reserves of the social security program were to be invested in bonds called Va valor constante para seguridad social, or Consistent value for social security. Of the 80%, 50% was destined for the BCH and by the end of 1967 it had received 74.5 million pesos. Information presented in BCH publications states that they have intervened in the construction of 41,857 dwellings in the period of 1960 to 1967. (3)

THE ICT

The Instituto de Credito Terretorial (ICT), created in 1939, is one of the oldest housing agencies in Latin America. Although starting as a rural housing agency, by 1956 the ICT was concerned only with urban housing. The period from 1957 to 1961 saw it change from an agency dependent on directly financed and commercially contracted procedures and a middle class clientele, to an organization that aimed at worker as well as middle-income housing, built by self-help and on a contractor basis. The number of houses built with funds administered by the ICT had grown from 2,945 in 1959 to 31,898 in 1962, showing a doubling of the total national production of urban houses. (4)

Public funds are important to the ICT. The public contribution was approximately 600 million pesos from 1967 to 1970, This sum is almost exactly equal to the funds that are projected to be produced internally, and an average of projected foreign credits of approximately 180 million during the same period. (5)

(3) Cardona, Ramiro, Migracion y Desarrollo Urbano, p. 263.
(4) Mangin, William, Revolution of a Governmental Housing Agency, p. 384.
(5) Plazas, Jorge, Alternativas Para el Desarrollo Urbano de Bogota D.E., p. 179.

In the period 1960-1967, the ICT produced 105,319 units, for a middle class clientele. (6)

THE CAJA

The Caja was founded in 1964 as a decentralized agency of the Special District of Bogota. It has two principal functions: 1) housing for the city's employees, and 2) housing for the large slum population. Three solutions to the problem of very low income housing employed by the Caja are: 1) the erradication of slums; a system considered to be a useful tool by the city's administration for clearing land necessary for the development of its projects of infrastructure; 2) rehabilitation of settlements considered to be below standards; and 3) prevention of the formation of other slum settlements by the implementation of programs for progressive development of the dwellings, sites and services. The ICT cooperates both financially and technically with the Caja. The Caja has been responsible for the projects of Los Loches (488 units), the rehabilitation of the barrio Las Colinas, and Las Lomas (800 units). (7)

THE BCH AND THE ICT CAPACITIES

The institutional loaning agencies account for 75% of the housing assets. The banking insituti ns alone, with the BCH as owner of 88% of the banking assets, serves 35% of all the mortgage loans and 47% of all the mortgage loans expedited institutionally for housing pertains to them. The BCH registered 41.5% of the total amount of the mortgage loans given for housing. The other large loan agency is the ICT, whose mortgages correspond to 23% of the total of the housing assets and 31% of the institutional activity. Together, the BCH and the ICT control 72.5% of institutional mortgage finances. The degree of centralization of both sources of mortgage financing and of investments in institutions of housing finance is clear. The other institutions loan almost exclusively to persons related to them in one way or another, such as members of cooperative groups and construction societies, holders of insurance policiés, investors in capital bonds, employees in companies or members and veterans of the armed forces. The total

(6) Cardona, Ramiro, Migracion y Desarrollo Urbanos , p. 263.
(7) Caja de la Vivienda Popular, Tratamiento De Asentamientos Urbanos Subnormales, p. 1.

of their operations, although important, is relatively small. (8)

The ICT is in the position now to be able to guarantee the financing of approximately 35,000 units per year, for the next few years. The units will be destined for a diverse range of income levels under conditions appropriate to the client. Approximately 60% of the volume of construction would be of minimum cost or very reduced (from 5,000 to 30,000 pesos), with tne concession of an elevated subsidy depending on the conditions of the occupant (with rates of interest from 2 to 8%. The optimistic prediction of 35,000 units annually would be a quantitative "leap over" the construction of the ICT in urban areas of 10,000 units average per year over the last 10 years, 1960-1969. (9)

2.150 OBSTACLES AND OPPORTUNITIES IN HOUSING

Housing can not be viewed isolated from the pressures and models that promote or frustrate the goal of decent shelter for all. The responsiveness of financing institutions to the gross housing demand controls the housing market. Investment in housing is discouraged by inflation which, at an average of 12% per year, has caused a lack of incentive to save, stimulated speculative investments in property and pressured the interest rates toward higher levels. If one has the luck to get a loan from the ICT, he receives a subsidy of up to 70% of the real value of the loan. Even the client of the BCH, if he is able to finance 50% of the cost of his house, finds the opportunity to benefit by the lowering of his debt because of inflation, and in spite of the 17.20% rate of interest charged. It is therefore not unreasonable to describe investment in financial institutions of housing as one of the worst possible investments. In order to qualify for the loan, the borrower should be almost in the position to not need the money. (10)

The financial problems are further complicated by the exceptionally low private savings in Colombia. Many people have incomes that maintain a subsistence level of consumption only.

(8) Plazas, Jorge, Alternativas Para el Desarrollo Urbano de Bogota, D.E., p. 181.
(9) Cardona, Ramiro, Migracion y Desarrollo Urbano, pp. 222-224.
(10) Plazas, Jorge, Alternativas Para el Desarrollo Urbano de Bogota D.E., p. 178.

The level of subsistence is approximately 800 pesos/month or $40 US. This amount pays for food, shelter, clothing, and fuel with no remaining income for savings. This definition refers to the quantitative and not qualitative reach of the subsistence level income. There is a considerable disparity in income levels of Bogota's population. A small select group receives an income that maintains a luxurious standard of living and for substantial savings as well. In an economy such as Colombia's, upper-income groups often assign considerable prestige value to conspicuous consumption. This propensity seems to be reinforced by what is called "the demonstrated effect"; people at all levels of income try to emulate standards of consumption in economically advanced societies. Therefore, in Colombia, mostly due to the United States' consumer model, despite great disparities in income and wealth, the rate of private savings is very low relative to national income. (11)

Modernization as a national goal affects housing production. Anibal Quijano's definition of modernization implies the imposition of standards and norms other than those that presently exist within the capabilities of Colombia.

> Modernization is the process of the modification of the society and the culture, be it by its assimilation of the characteristics of the present society and culture of the western industrialized countries, or by the incorporation of some of the fundamental elements of these industrialized societies and the modification under the influence, of their own elements, in the development of variations that do not coincide totally with "Western Modernization." (12)

The attempts at modernizing housing production and programs are frustrated by government's insistence on achieving a new physical environment by traditional paternalistic means. The clientele of municipal and national housing agencies is shifting from upper and middle income groups towards the lower income ranges. Innovations in program orientation promoting self-help, sites-and-services schemes, and barrio rehabilitation are examples of the reorientation

(11) Mojica, G., The Economic Development of Colombia, p. 64.
(12) Cardona, Ramiro, Urbanizacion y Marginalidad, p. 75.

required to accommodate the new clientele and its particular limitations. Other changes, however, are needed that deal with tenure, job creation, financing of loans, technical assistance, public utilities, and community services. Cardona states that the political system has been building without acknowledging the process of urbanization. The political system has been structured to consider this phenomenon as negative, maintaining a stereotyped image of what development and in particular housing should be.

Change varies in rate, in degree, and by promoter according to the political system under which it is to take place. Political decisions include decisions concerning cost of a dwelling, the control of land speculation, standards for space, materials, and house type, and allocations of money and technical facilities to housing. These decisions are based on national and individual limits in terms of finances, technology, and information and involve the degree of governmental ownership of land and the kind of control of entrepreneurial profit motivated construction. Positions on these issues provide a basis for building a viable housing policy with the essential tools and resources needed for implementation. The lack of an empirical data base for low income families and professionals inexperience in the "culture of poverty" must be rectified if effective policy is ever to be generated. Technical and financial resources must be allocated to promote better design and development of low income barrios based on barrio demands with the aim of eliminating traditional casualties caused by financial burden and social alienation.

2.151 ATTITUDES TOWARD THE PUBLIC SECTOR'S EFFECTIVENESS IN HOUSING

The need for social and institutional change has been thrust into full view of governments whose urban centers have centralized and made visual what had been before dispersed rural poverty. The addition by the public sector to the available housing stock, described above, has been given a mixed reception. Those operating under the physical and legal restrictions of the public sector and within the limits of the available financial resources of the ICT laud their effort as an important proportion of the total construction volume. Others, however, view the results as a meager realization of the public sector's potential.

> It is worth asking if the little energy this is available for solving the housing problem in a definitive form should be spent on such a minimal percentage,

> leaving the rest without solutions. Instead, the same energy could be used to solve for a considerably greater percentage their housing needs in a more humble form, creating for a maximum of people at least, a condition that is tolerable....(This sentiment is substantiated by the fact that) in the period 1960-1967, there had been an increase of 69,244 families, of which 18,396 or 26.5% had received solutions from the ICT and the BCH. (13)

The traditional demand for houses has been undermined by the new arrivals' need for shelter that is generally different than the type tnat the legal housing system is geared to provide. The recently arrived in-migrant is limited financially. This does not allow him to meet the requirements of securing tenure, to finance construction of his home, to pay the quotas for the installation and the maintenance ofthe basic public and community services. According to Pro-Vivienda, the in-migrant's limited education does not allow him to compete on the job market or take any real advantage of technical and social assistance available to the new urban citizen, made marginal by the society of which he wishes to become a part.

> We feel that the ICT is limited because it tries to be too many things--planner, financeer, constructor, and collector, competes at time with local institutions on problems of the same type. Sometimes the ICT does not act because it supposes that the problems are solved by the local government and institutions. In other words, the actual policy of the ICT of investing simultaneously in profit making housing and subsidized housing is only a form of redistributing the wealth, without promoting development. (14)

(13) Cardona, Ramiro, Migracion y Desarrollo Urbano, pp. 223-263.
(14) Ibid., p. 263.

Colombia Housing Projections Until 1977

Budget in Thousands of Pesos	% of Total Housing Construction	Number of Houses	Cost Per Sq. Mtr. in Pesos	Total Cost in Pesos	Total Sq. Mtr.
- 20	4.9	6,755	226	128,345	513,308
20- 50	27.3	37,632	240	1,426,252	5,005,056
50-100	16.2	22,330	309	1,563,240	3,997,428
100-200	10.1	13,923	462	1,966,623	3,146,598
200+	31.5	43,423	496	3,695,297	5,514,721
multi-family	10.0	13,785	669	1,400,556	1,750,695
Total	100.0%	137,850	2402	10,180,313	19,927,878

Source: Plazas, Jorge, Alternativas para el Desarrollo de Bogota D.E., p. 92.
Note: Cost does not include lot. It is estimated at 1/3 of house cost.

2.152 THE LEGAL COMMERCIAL SECTOR

The private sector of the building industry of Bogota is composed of the architectural, construction, and finance companies, whose major areas of activity are high rise office buildings, apartment houses, four story walk-up apartments sold on a condominium basis or rented, private homes, and the sprawling "urbanizaciones" (subdivisions) typical suburban housing projects in the United States. The expansion of the northern and western sectors of the city by the development of low density single family homes has pushed the actual metropolitan area beyond its legal jurisdiction to control the expansion. Basically, the problem of metroplitan areas consists of the expansion of neighboring urban centers usually of different size and importance within the same geographic area that is subdivided into various municipal jurisdictions. This fact affects land use allocation, distribution of public services, allocation of educational, recreational, assistance, cultural transportation and security facilities. The 70% of the housing stock produced by the private sector is invested in low risk, high gain ventures that serve the upper middle class and higher. The "urbanizaciones" advertised in the

newspapers locate the development for the prospective client, as well as present plans of the room layout and their sizes. "The investment in housing of worker type (less than 50,000 pesos ($2500 US) in 1966) in 1960 was 20% of the total investment in construction. In 1966, more than 60% of the investment in housing was made in construction whose budget was greater than 100,000 pesos." (15)

PROJECTED HOUSING TYPES

After a study of the existing housing market, CID proposed five housing types for the city and established criteria for determining the type and quality of each unit based on the cost of the dwelling, the income level the unit is designed for, and the ability to acquire the unit. These types are listed below.

Type A: corresponds to a unit whose price is approximately 30,000 pesos, which is the responsibility in part of some of the programs of the ICT. The average size of these houses is $100m^2$ and the cost per m^2 for construction is 265 pesos. The 1967 resolution #50 established as a unit price for this type of construction 250 pesos per m^2. For this study we have chosen an average size of $85m^2$ and a cost per m^2 of 270 pesos, that corresponds to a unit whose cost is approximately 23,000.

Type B: under this type of unit those dwellings of sales price of approximately 61,500 have been grouped. According to the statistics, the average size of single family units of this type is $150m^2$ and the cost per m^2 for construction is 410 pesos; for multifamily units the average size is $95m^2$, and unfortunately no reliable data on the costs for this type exists. The amounts established by the Public Works Department are 350 pesos and 500 per m^2. For this study we have chosen the average sizes of 110 and $90m^2$ and unit costs of 400 pesos per m^2 for single family units and 600 pesos per m^2 for the multifamily units, that is construction costs of 44,000 and 54,000.

Type C: under this type of unit those dwellings of sales price of approximately 90,000 have

(15) Plazas, Jorge, Alternativas Para el Desarrollo de Bogota D.E., p. 90.

have been grouped. According to the statistics, the average sizes for single and multifamily units are 185 and 120m^2, respectively, and the unit costs for the single family unit if 485 pesos. There is not any reliable data for multifamily buildings. The quantities established by the Public Works Department are 550 and 760 pesos for single and multifamily units. For this study we have chosen the average sizes of 125 and 110m^2 and unit costs of 500 and 700 pesos per m^2 for the single and multifamily units, that is 63,000 and 77,000.

Type D: this type of unit would have a sales price of 138,000 pesos and would correspond to the units built by the BCH and private initiative. According to the statistics, the average sizes for single and apartments are 195 and 115m^2 and the unit costs are 550 and 480 pesos per m^2. From the tax rates costs per m^2 have been established at 700 pesos for single family units and 950 for apartments. For this the average sizes of 140 and 180m^2 and costs of 700 and 900 pesos have been chosen, that is dwellings whose costs for construction are 98,000 and 117,000.

Type E: in this type of unit are the units whose price is approximately 187,500 pesos. This type of unit pertains to the socio-economic groups of the highest incomes. But as one can see, this is not a luxury house, since in this study, as appears further on, the construction of luxury housing and housing of the poorest classes is not included. The last group, the poorest classes, should accommodate themselves in the dwellings left by the working classes of the highest incomes who, if possible, should receive financing for new homes. The first group, those of the highest income group, should finance directly their own home. The average size of this kind of home is 210m^2 for a single family unit and 110m^2 for apartments, with unit costs for construction of 600 and 620 pesos per m^2. Costs according to the Public Works Department established by resolution #50 are 800 and 1,050 pesos for single and multifamily units. For this study we have chosen units of the average sizes of 160 and 150m^2 and costs of 850 and 1,050 pesos for single and multifamily units respectively. (16)

A comparative listing is presented in the following graph.

(16) Ibid., pp. 132-33.

HOUSING TYPES--A COMPARATIVE LISTING

Type of Housing	Class	Constructed Area	Cost/M^2	Construction Cost	Lot Cost	Total Cost
A	Single Family	85	270	23,000	10,000	33,000
B	Single Family	110	400	44,000	17,500	61,500
	Multi-Family	90	600	54,000		
C	Single Family	125	500	63,000	27,000	90,000
	Multi-Family	110	700	77,000		
D	Single Family	140	700	98,000	40,000	138,000
	Multi-Family	130	900	117,000		
E	Single Family	160	850	136,000	51,500	187,500
	Multi-Family	150	1,050	158,000		

Source: Plazas, Jorge, Alternativas para el Desarrollo Urbano de Bogota, D.E., p. 135.

The housing market presented above constituted of dwellings from both the public and the private sector excludes that portion of the population earning less than 11,000 pesos which is 42.5%. (17)

The low income population coming to the major urban centers of Bogota, Medellin, Cali, Barranquilla, etc., are denied access to the housing market legally. They have established their own housing methods and these reflect standards and styles and are more responsive to the in-migrants capacities to finance and build homes. This system conflicts with the legal housing system and constitutes the "Illegal Housing Market."

2.160 THE LEGAL HOUSING SYSTEM: SUMMARY

1. Governmental controls, both national and local, dictate to a large extent the quality and standards for housing. The basic concerns are for health and safety.

2. Housing is the most important of the construction areas, accounting for 80% of the total building activity in Colombia.

3. Single detached houses constitute the bulk of new housing, sprawling in low densities in the north and west sector of Bogota.

4. In-migration will be replaced by the natural growth of the existing inhabitants as the major source of housing demand.

5. In the period of 1960 to 1967, the BCH has been involved in the production of 41,857 units.

6. In the period of 1960-1967, the ICT has produced 105,319 units that accommodate a middle class clientele.

7. The Caja has been responsible for the projects of Los Laches (488 units), the [illegible]

(17) Ibid., p. 193.

rehabilitation of the barrio Las Colinas, and Las Lomas (800 units).

8. The BCH and the ICT's combined production in housing is 26.5% of the housing market.

9. Obstacles that limit the contribution of governmental housing agencies in solving the problem of low income group housing are the size of the demand, difficulties in financing the construction, and the agency viewing the housing demand as a quantity to produce and not an ongoing process.

10. The private sector sometimes operates outside the controls of the local zoning board due to jurisdictional problems over contiguous areas under development.

11. The 70% of the housing stock produced by the private sector is invested in low risk, high gain ventures that serve the upper middle class and higher.

12. The price range of the governmental and private housing markets is 30,000 to 187,500 pesos per unit, this excludes 42.5% of the population.

13. The greatest problems facing the public housing sector are:

    1) Difficulty in qualifying for loans
    2) Lack of savings on the part of subscribers
    3) Decapitalization of the value of loan payments due to inflation
    4) A general over-extension of services on the part of institutional housing agencies

2.200 THE ILLEGAL HOUSING, WHAT IT IS AND WHO SQUATS

2.210 DEFINITION OF SQUATTING

There is no single definition for squatting. Each definition establishes some basis with

which to distinguish what unique and common characteristics squatting has with the "legal system." When one compares definitions, it seems the differences are not as clear as first appears. A United Nations bulletin on urban land policies gives the following definition:

> Squatting is the appropriation of another's land for one's own use without title or right. It may occur on either public or private property, since a building generally becomes part of the landowner's realty the squatter will use materials of little or no value in the construction of his shelter, or he may move into uninhabited buildings owned by others. Squatting may take the form of open or furtive mass movements or of individual operations. It is the illicit consequence of struggle for shelter... sometimes it is denounced...often it is tolerated for want of a practical alternative. (18)

As inadequate as this definition is, there are several undeniably true aspects: insecurity or illegality of tenure, the implicit tone of struggle or hostility, improvised environments, and a general feeling of uncontrolled settlement tradition.

John Turner, a noted researcher of squatter problems, has offered an alternative definition which sees squatting as a more positive phenomenon. He uses the term autonomous urban settlements to include squatting traditions.

> By "Autonomous Urban Settlements" we mean urban settlement whatever its duration or expectations may be, that takes place independently of the authorities charged with the external or institutional controls of local building and planning.... We do not consider the existence of urban settlements to be the problem, but the fact that they are uncontrolled and that their forms are so often distorted. "Autonomous Urban Settlements" is the product for dwellings and those supplied by institutionalized society.... (19)

(18) U.N. Committee on Housing and Town and Country Planning, Urban Land: Problems and Policies. Bulletin 7, St/SOA/Ser. C/7, 1953, p. 12.

(19) Breese, Gerald, The City in Newly Developing Countries: Readings on Urbanism and Urbanization, article by John Turner, Englewood, 1969, pp. 507-530.

Turner feels the basic problem of the slums is not how to eradicate them, but how to make them more livable. The settlement must become a vehicle for social change--and change for the better. These viewpoints each contribute some fractional portion of an extremely complex series of determinants making up the total squatting problem.

2.220 AN INTERNATIONAL PROBLEM--THE MAGNITUDE OF WORLD WIDE SQUATTING

Squatting is not an urban phenomenon alone, nor unique to Colombia. It exists in varying degrees in most parts of Asia, Africa, and Latin America--in fact, wherever there has been a mass movement of people to cities and insufficient shelter.

> There are now some 240,000 squatters units (gececondu) in Turkey. Squatters make up about 45% of the population of Ankara....They are 21% of Istanbul's population and 18% of Izmir's. In 1951, they numbered sixty thousand in Bagdad and twenty thousant in Basra, Iraq. In Karachi, squatters represent about a third of the population. Squatters account for at least 20% of Manila's population and in Davao squatters have taken possession of the whole parkway area running from the city hall to the retail center....In Tunis, the squatters live in caves dug out of hillsides. Around the edges of Johannesburg, South Africa, sprawl squatter colonies that are a chaos of shacks and hovels pieced together by the homeless and destitute. In India's larger cities, squatters can be found hanging on to their provious hovels in old forts or wherever they can acquire a foot hold....Almost 150,000 squatters live in Delhi, about 90,000 of whom are on public land.
>
> Urban centers in South America are also experiencing a flood of migrant squatters. In Venezuela the population of squatters (rural and urban) is more than 65% of the total population, with a 35% growth rate for Caracas and 50% for Maracaibo. Cali, Colombia has a squatter population that makes up 30% of the total figure. In Santiago, Chile, squatters represent an estimated 25% of the population... (20)

It would be misleading to create the image that although squatting is a world-wide practice

(20) Abrams, Charles, Man's Struggle for Shelter in an Urbanizing World, pp. 13-14.

it is restricted to large urban centers only. Our survey of ten Colombian cities for the International Center for Housing (CINVA) in Bogota, indicated that considerable squatter activity exists in cities of populations of less than 100,000 persons. The pueblo's act as regional market areas and sometimes transportation exchanges. The growth of commerical establishments as well as the accompanying educational and possible work opportunities attract many. The squatting problem is both world wide and present at every level of urbanization.

2.230 TWO GENERAL TYPOLOGIES OF SQUATTER SETTELEMENTS

Up to this point we have presented some basic definitions of what squatting is. There is now sufficient evidence that the squatting problem is neither limited to one country nor an isolated event of few participants. It is necessary for the reader to see who squats and what factors motivate this process. Accordingly we will present two current systems that classify squatters, first according to tenure form, and second, as to their forms of development. The reader will quickly realize that all squatter settlements are not alike and that their needs are quite distinct from one another. We imply also that there is no one solution to their problems.

The first system is provided by Charles Abrams and was organized in response to a United Nations request for world survey. It includes several typologies not generally found in Colombia; however, the system is preserved in its entirety:

> The types of squatter tenure are not uniform and may generally be classified as follows:
>
> Owner Squatter - owns his shack, though not the land; he erects the shack on any plot he can find. Public lands and those of absentee owners are the most prized. The owner squatter is the most common variety.
>
> Squatter Tenant - is in the poorest class, does not own or build a shack, but pays rent to another squatter. Many new in-migrants start as squatter tenants, hoping to advance to squatter ownership.
>
> Squatter Holdover - is a former tenant who has ceased paying rent and whom the landlord fears to evict.

Squatter Landlord - is usually a squatter of long standing who has rooms or huts to rent, often at exorbitant profit.

Speculator Squatter - is usually a professional to whom squatting is a sound business venture. He squats for the tribute he expects the government or the private owner to grant him sooner or later. He is often the most eloquent in his protests and the most stubborn in resisting eviction.

Store Squatter or Occupational Squatter - establishes his small lockup store on land he does not own, and he may do a thriving business without paying rent or taxes. Sometimes his family sleeps in the shop.

Semi-Squatter - has surreptitiously built his hut on private land and subsequently comes to terms with the owner. The semi-squatter, strictly speaking, has ceased to be a squatter and has become a tenant. In constructing his house he usually flaunts the building codes.

Floating Squatter - lives in an old hulk or junk which is floating or sailed into the city's harbor. It serves as the family home and often the workshop. It may be owned or rented, and the stay may be temporary or permanent.

Squatter "Cooperator" - is part of the group that shares the common foothold and protects it against intruders, public and private. The members may be from the same village, family, or tribe or may share a common trade. (21)

The owner squatter and the squatter tenant are by far the most common types; only the floating squatter is rare to Colombia. From the classifications it is interesting to note that squatting has strong commercial or entrepreneurial implications. The myths that these slums are "dens of iniquity" are misleading when viewed as an entire economic system. One can begin to appreciate the legal, political and social consequences that these settlements play. A second system for classifying squatters comes from John Turner. Turner's work stems from a number of years of work in the barriadas (Peruvian word for slums) in and around Lima, Peru. His

(21) Ibid., pp. 21-22.

typology matrix ranks levels of physical development against the full range of tenure and provides a useful tool for clarifying issues related to squatter settlement:

					LEVELS OF PHYSICAL DEVELOPMENT
			complete semi-squatter	complete legal	COMPLETE
		incomplete squatter	INCOMPLETE SEMI-SQUATTER	incomplete legal	INCOMPLETE
	incipient tentative squatter	INCIPIENT SQUATTER	INCIPIENT SEMI-SQUATTER		INCIPIENT
	PROVISIONAL TENTATIVE SQUATTER	PROVISIONAL SQUATTER	PROVISIONAL SEMI-SQUATTER		PROVISIONAL
nomad	TRANSIENT TENTATIVE SQUATTER	transient squatter			TRANSIENT
ITINERANT	TENTATIVE SQUATTER	ESTABLISHED SQUATTER	SEMI-SQUATTER	LEGAL OCCUPANCY	
DEGREES OF SECURITY OF TENURE (22)					

(22) Turner, John,"Uncontrolled Urban Settlements: Problems and Policies," article published in City in Newly Developing Countries, p. 508.

This matrix shows those interrelated development and tenure combinations that are most common. Each level of development is defined: COMPLETE, structures and utilities that meet modern standards; INCOMPLETE, structures or utilities incomplete but built to modern standards. INCIPIENT levels are construction of potentially modern standards, while PROVISIONAL indicates construction of low standards or impermanent materials. The least developed state is the TRANSIENT; they are temporary and easily removed shelters. This very scale indicates that the stereotype images of hillside shacks may not give an accurate description of the range of squatter developments found today.

When cross relating the developmental levels with the levels of tenure, the reader becomes immediately aware of the possible legal complications. Forms of tenure range from LEGAL OCCUPANCY with institutionally recognized forms of tenure (freehold, lease, or rental), to SEMI-SQUATTER states without full recognition of tenure but with some rights. ESTABLISHED SQUATTERS with de facto and secure possession but without legal status are by far the most common to Colombia. TENTATIVE SQUATTER occupancy are those without any legal status or guarantee of continued tenure. This type is often found where in older barrios there has been little or no development apparent but sufficient time and resource to do so. The ITINERANT type has transient occupancy with no intention of permanent tenure. As the matrix indicates, many intersections do not produce cases that have been encountered. The most important contribution this typology scheme makes is that of reinforcing the correlation between increased states of tenure and the willingness of squatters to invest in the development of their own communities. We will further deal with this correlation when we talk about the developmental indices of neighborhoods and the problem of creating tenure programs to justify the development of the barrio.

2.240 COLOMBIA'S "ZONA DE TUGURIOS"

Tugurios is the Colombian word for slums. Reinaldo Posada states:

> The explosive growth of the cities has occurred in a disordered form, without doubt owing to the lack of a policy of prevention for the peripheral properties.

> The influx of the rural poor, who arrive with some economic means to the city, has given to land speculators that "urbanize" property in the encircling areas, without services of any kind and sell to these naive people small lots, layed out in square blocks formed by straight roads, many times without recognizing the character of the site. These zones, at times eroded, sterile or prone to flooding, constitute the cheapest land reserves for the speculator in urban neighborhoods.
>
> There exists also the case of spontaneous groupings of houses that have been organized without recognizing a rational loting system nor defined roads. These occur in sub-urban farms or on public lands that are slowly subdivided, at the road crossing where there are incipient groups of housing and on the slopes of the mountains that suddenly are seen covered by huts and improvised housing. A common case and perhaps the worst is the case of the "colonists" or "invaders" that massively take lands of semi-official and private lands and construct in a night their barrio. The improvization and haste causes them to form disordered groupings of "ranchos," "favelas," "bohios," or "chozas" (built from scrap material), that makes difficult the arrival of vehicles and the installation later of public services. This is how housing settlements are being formed--without communal services, open space or green areas. (23)

Posada's viewpoint as an architect accurately describes two distinct aspects about the tugurio formation in Colombia. First, that it has been largely a consequence or urban areas failing to establish measures of control. A second point is that these settlements are forming rapidly and are perpetuating a clandestine planning process. What this implies is that the solutions lie in purely architectural and environmental policies. Let us now look at the three principal classes of tugurios in Colombia: the casas de inquilinatos, barrio piratas, and the invasion barrios. Their presentation will demonstrate that no single corrective solution will presolve their formation.

(23) Posada, Reinaldo, Apuntes Sobre Agrupanciones de Vivienda, p. 122.

2.250 CASAS DE INQUILINATOS

Casas de inquilinatos refer to rented, usually center city, high density rooming houses. Inquilinatos generally take the form of a very large "casas coloniales"that have been subdivided to accommodate anywhere from four to ten times their original number of occupants with generally at least one family per room. Characterized by extreme rents, transient tenants and further complicated by a general overall lack in housing, the casa de inquilinato serves in many cases as a reception area for new in-migrants seeking employment. They provide central access to the job market and do not force long term tenure commitments upon their tenants. This is a necessary prerequisite for housing where spatial mobility is of prime importance in finding work. On the other hand they are the most abusive in rent structure, overcrowding and in general health conditions. These tugurios can be found in Bogota in areas surrounding Plaza de Espana in center city and in a number of peripheral sites--Barrio Perseverancia, Las Aguas, and La Concordia.

It is difficult to estimate the percentage of this subsistence level population; however, a reasonable estimate is somewhere in the area of one fourth the total low income sector housed in urban center inquilinatos.

2.260 BARRIOS PIRATAS

A second form of tugurio in Colombia centers around a legal restriction for construction. It is the stated law that the construction of a dwelling can not take place on land without the basic services of water, light and sewer. Barrios piratas result from legal owners of land building without obtaining a permit. These are usually granted upon the presentation to the housing authorities of a set of drawings indicating both the intended structure as well as proof that basic services are available. Our case studies include one such settlement, El Encanto. It must be remembered that the issue here is services, in all cases the owner has legal title to the property.

Historically, the barrio piratas handled most of Colombia's need for inexpensive housing in the 1950's. Privately sponsored popular housing associations sold titles to small lots on

privately held lands requiring minimal long-term payments within financial reach of all but the poorest. Open land throughout the city was sold in this manner. Being privately owned, most of it lay outside the effective authority of the planning commission, and had few basic services.

In 1960, rigid controls were placed on the Asociaciones by the municipal government. This action came after much of the available private land had already been sold off; however, according to the ICT, this practice heralded the beginning of large scale squatting in the city. (24)

There is another form of the barrios piratas, less wide spread than those already described, but worth mentioning. Often called "Urban Farmers," these settlements are usually peripheral, large lot properties, without basic services, in which the owners grow supplementary food either for their own use or for sale. The urban farmer appears in mid-city locations at times and receives this name more as an indication of the lot size and agrarian land use. Because of the large lot sizes, urban farmers often re-subdivide their properties; this accommodates several additional houses and greatly increases the densities. Such re-use of a lot plays an important role in the economics of any developing barrio and is a common speculative practice.

Common areas around Bogota for barrios piratas and urban farmers include the entire southeast quadrant of the city. The most prevalent areas are Barrios El Encanto, La Victoria, San Miguel, La Gloria, Altamira, and sections along the road to Villavicencio.

2.270 INVASION BARRIOS

The third and most dynamic from the standpoint of acquisition of housing is that of invasion barrios. These settlements are those in which people occupy land (generally public) for the purposes of establishing some form of tenure and creating a shelter. Invasions can take place either by single individual efforts or through highly organized and pre-planned seizures of

(24) ICT, Seminario Sobre Turgurios, p. 10.

land. Some of the most notable and well organized have been documented by John Turner in his study of Peruvian barriadas. The high degree of organization which William Mangin writes about in Lima--surveying teams that surreptitiously mark out each street and lot with chalk lines and flags shortly before the invasion is scheduled to take place (25)--is not common in Colombia. John Powelson, however, provides us with a description of the invasion of what was to be called Nueva Colombia, Cali and suggests to what lengths some invasion leaders have gone:

> Prior to the invasion in September 1963, the leader of Nueva Colombia had made a careful study of the city's development plan with a group of assistants to determine which unoccupied lands on the outskirts lay in the path of projected roads into the city. After the invasion site was chosen, the word was passed. Inverviews and meetings with families were held and listings were made placing each family to a lot. Early in the morning the families lined up along invisible streets and were spaced regularly on lots of about twenty by sixty feet. By night fall all had staked out their claims and drawn boundaries with string or wire, or by digging a shallow ditch. When all the lots had been allocated, a short meeting was held at which a few simple rules were announced. There would be no liquor on the premises, no violence, and all disputes were to be settled by the governing council (a junta directiva). Law and order was the responsibility of fifteen men selected as the Brigada de Orden. (26)

It was reported that within a few months upwards of twenty thousand people had crowded into an area of 136 acres. Nearly all the invaders were from Cali, many had lived with relatives as Inquilinates. In Bogota, in the southern portion of the city adjacent to several abrupt slopes, the largest single invasion was established at Las Colinas (The Hills). After having been driven from the site by the army the first time, a second invasion a month later proved successful. Organized by La Central Nacional Pro-Vivienda, more than 1500 persons found housing in November of 1960. Pro-Vivienda, a chief sponsor of invasions, promoted another large center

(25) Mangin, William, "Squatter Settlements," Scientific American, (217,4) October 1967, p. 23.
(26) Powelson, John P., The Land-Grabbers of Cali, pp. 30-31.

city invasion on a proposed hospital site. This barrio, Barrio Policarpa, was met with considerable resistance from the police who used tear gas, rifle shots, a bulldozer, and attack dogs to expel the invaders. One person was killed and the invasion made the headlines of the news. Since the site was a central location, special plans were made for the invasion. The invaders secured an adjacent site and prefabricated pole framed houses with stretched construction tar paper to form walls and the roof. Measuring some ten feet square, only five to ten men were required to carry and run with it to the site during the invasion. Under the direction of an alignment man, blocks of houses were literally planked in place before the confrontation with the police took place. A number of tense moments and the destruction of several houses brought the leaders into direct negotiation with the authorities. A hopeless relocation program and an unfavorable press coverage concerning the police action used eventually secured the site for the invaders. Because Pro-Vivienda has played such an important role in organizing invasions in Bogota, we have included a description in this report on their activities.

Not all invasions are recent, however, some have been well established from the late 1940's and early 50's. One such settlement is Barrio Siloe, a hillside invasion in Cali of over 22,000 persons. This barrio is known as the "Hotel" since 30% of its residents move out each year and are replaced by new dwellers. The more permanent residents live near the bottom of the development; and the transients in cardboard and banana leaf huts near the top. (27)

Since this turnover in residents is an important factor in both the economic dynamics of the barrio and represents a possible vertical mobility for the renters or sellers we will deal more closely with this aspect later. Suffice it to say that high turnovers in invasion barrios are common.

According to Colombia law, invasions of land come under a set of codes that relate to "complication of the process of eviction with the passage of time." From the beginning of an invasion, involving either public or private land, it is under the jurisdiction of Public Order. The

(27) Eder, Richard, New York Times, February 23, 1963, p. 29.

invasion continues to be solely a matter of public order for the first thirty days from the day in which a nuisance or "embarayo de la posesion o de la mera tenecia" is filed (Article No. 64 of the Police Code of Bogota). If the police do not achieve eviction within this period the invaders can not be evicted by force unless the authorities have a subpoena from a civil judge pronounced in a legal process (Decreto No. 992, Article No. 30 from 1930 of the police agreement no. 15 to law 57, 1905). (28)

Since the legal entanglement requires time in which to secure the necessary subpoenas, many invasions are impossible to evict because of the well-joiners that are attracted to the invasions successful first days. These well-joiners often double or triple the original invasion size, creating immense and often unexpected problems of sub-division design.

2.271 INVASION BARRIO FUNCTIONS

The primary function of the invasion barrio is to secure land and create a dwelling shelter. Whether or not the cultural preoccupation of owning land outweighs the need for shelter, one fact remains certain--invading is a discovered and popular technique for circumnavigating a system that has turned its back on in-migrants' needs. According to Turner (29), the frustration of people's capacity to invest money and work on a house is the main reason for invasions. Even when migrants can afford it, they are reluctant to buy a long-term mortgaged house because the title will not be secure for years. Though invasion squatters do not possess legal title to the land, they are unlikely to be challenged unless the land is very valuable. This is one reason that well-organized invasions typically select public property and sites that developmental costs in the normal land market system would be prohibitive.

> Those who invade land have a particular importance in the urban development of our (Colombian) cities, since their spontaneous housing developments constitute approximately 25% of the settlements of the city, a proportion that is growing since the rate

(28) Cardona, Ramiro, Las Invasiones de Terrenos Urbanos, p. 75.

(29) Turner, John C., "Uncontrolled Urban Settlements: Problems and Policies," unpublished University of Pittsburg Conference paper, 1966.

of growth of the city is from 6% to 7% annually, while that of these developments is from 12% to 15% annually. (30)

The central postulate concerning the creation of invasion barrios is that they are not institutions created to mitigate problems of personal adjustment to the new urban setting, but rather that these initial problems have been resolved through prior socialization either in the inquilinatos or in smaller urban stepping stones. The process of tugurio formation begins when one recognizes that the existing social, economic, and legal structure will not allow upward mobility to migrants or already urbanized subsistence level families to fulfill their aspirations and expectations. "The barriadas principally represent a massive expression of a desire for self-improvement and security as persons seek to move from the inner city slums and the burden of increased rents to better conditions and the chance for eventual home-ownership in areas of land which they can appropriate without payment." (31) Although Manaster was speaking of the Peruvian squatter invasions, the same desire for self-improvement is true in the case of Colombia. Considerable sacrifice and risks are involved in the invasion process which prove the urgency of demand. Many families voluntarily suffer more economic depravation than in the slums to provide costs for transportation, water, and building materials because here at least their work and suffering will net them or their children a better life in the end.

2.272 THE PROMOTION OF INVASIONS

We include within the description of squatter invasions some comment on their promotion. Enormous profits can be made in the organization of these squatter invasions. Besides the small scale land speculator there are organizations who see the invasion as a form of mobilizing people politically as well as economically through housing issues.

(30) Cardona, Ramiro, Las Invasiones de Terrenos Urbanos, p. 36.
(31) Manaster, Kenneth A., "Squatters in the Cities," unpublished thesis, p. 28.

As a result of our field work (summer 1970) in barrios piratas and invasion sites of Bogota, a tentative hypothesis was reached explaining the high number of well organized "professional" invasions and a lack of spontaneous small scale efforts. It is believed that the general practices of land speculation and the barrios piratas attract many of these economically well off enough squatters. These persons generally have sufficient urban acculturation and mobility--steady job perhaps--and they do not consider invasion worth it. They see a guaranteed title as realizable and therefore buy a legal plot. This leaves the not-so-well-offs without leaders from their own background. This leadership void is filled by professional invasion organizers such as Pro-Vivienda. In countries like Peru, there is such a gap between the legal housing system and the next alternative for housing that squatter invasions organized from within are more common.

From a purely economic standpoint, many land speculators promote invasions of property that they do not own because for a minimal effort of subdivision layout and community development, enormous profits are to be made by charging a basic service fee. It is not unreasonable to claim that when peripheral sites are changing from rural to urban uses invasions are sponsored in order to create centralized sources of cheap labor at the doorstep of a future industry.

On the other hand, it is clear that in Colombia the more sophisticated organizations, such as the Central Nacional Pro-Vivienda, have both economic as well as political motivations. Their basic Marxist philosophy of community development employs housing as a catalyst for ideological promotion and has played a significant role in providing housing.

2.273 CENTRO NACIONAL PRO-VIVIENDA

Perhaps the most unique "institutionalization" of the invasion process in Colombia is reflected in the organization called Central Nacional Pro-Vivienda. To date, their activities represent more than 35,000 member families. Generally limited to the greater Bogota Metropolitan Region (which contains 10% of Colombia's total population), their basic service is the organization of invasions and community development programs. Some of their most notable accomplishments include the successful invasions of Las Colinas, the expansion of Juan XXIII, and Policarpa,

all in Bogota. (Las Colinas and Juan XXIII will be thoroughly discussed in the next section.) The first two barrios have been included as case studies in this report. Their goals are best characterized in their slogans:

We will fight:

- for our home without initial down payment and payment over a long period of time
- against speculation and raises in the rent
- for a democratic urban reform
- for the organization and defense of "inquilinos" (rooming houses)
- for the unity and defense of the homeless in Colombia
- for the unity of action, for the unity and solidarity with the worker's movement

Pro-Vivienda's basic service lies in their ability to organize families who subscribe, through dues and active participation in their programs, to their technical and organizational services for acquiring and maintaining housing. In this capacity they are responsible for identifying invasion sites with high potential for subsequent tenure and the lot subdivision of the new site. As "urban planners," they designate to what land uses the invasion site will be put, the locations of streets, lots, public spaces and services. In some cases technical problems are resolved on a consultant basis outside of Pro-Vivienda. Their degree of organization is reflected in the high number of successful invasions centered around public lands; invasions on private land are exceptions.

It is important to remember the group effort's importance at this early stage. Besides the cooperation required to initially settle the land such as the building of temporary houses, providing basic water sources, and establishing roads and pathways, there is the more basic element of survival of the invasion effort. When confronted by the police (as in the case of Policarpa) large numbers of well organized invaders generally insure a peaceful confrontation with police

and local authorities. This also reinforces their "bargaining position" for tenure in the event there is local resistance to the invasion by neighboring barrios.

In general, however, there is little known about the internal organization of Pro-Vivienda. The most enlightening source is an open letter from Pro-Vivienda entitled "Some Organizational Aspects of the Barrio Policarpa Salavarrieta," (32) which discusses the use of barrio commissions to administer cultural activities, hygiene, educational needs, bario protection, and maintenance. This also indicates that they recognize that housing is only one necessary part of forming a new community. It is our feeling that Pro-Vivienda is providing a very worthwhile service and that labels such as "communist" are attempts by the governmental housing authorities to minimize their value as a productive group. To provide the reader with some comparative basis for judging their effectiveness in low cost housing, the following chart illustrates the total family incomes of 495 interviewed Pro-Vivienda subscribers.

Pro-Vivienda: Membership Income

Dues/Month (in Pesos)	No. of Persons	%
1- 50	2	0.4
50- 100	5	1.0
100- 200	24	4.8
200- 300	33	6.6
300- 500	111	22.8
500- 800	103	20.8
800-1,300	69	13.9
1,300-2,000	11	2.2
2,000-3,000	3	.6
no response	61	12.3
not working	73	14.7
	495	100.0%

Source: Las Invasiones de Terrenos Urbanos, p. 20, Table 7

Note that the highest income percentages center around 500 pesos per month. This is half of what the average ICT subscriber pays each month for housing alone. One can easily see the attraction of Pro-Vivienda.

In our opinion, Pro-Vivienda has recognized both the financial limits of the highest housing demand and that housing, although it initiates development, is but one of the wide range of services required. The Pro-Vivienda system overcomes many barrio frustrations by providing a local power structure. Besides the "committee's" task of resolving problems, they focus on and direct complaints within the barrio. In Policarpa there is full knowledge of the system, (who is responsible

(32) Cardona, Ramiro, Las Invasiones de Terrenos Urbanos, p. 40.

for what) and a direct access to those responsible for action. Also helpful is that there are no social class barriers between the user and the service group, a problem that many barrio members have when they deal with the "corbatas" (bureaucrats, characterized by their white shirts and ties). We will return to the Pro-Vivienda example of development when we discuss possible models for large scale low income community development.

2.280 SOME CONSEQUENCES OF SQUATTING

2.281 SHELTER, A PHYSICAL PLACE

A primary drive of any squatter is the securing of an inexpensive shelter; for the shelter will become a place in which to consolidate both his family with its extended relationships and his possessions. There must be sufficient space or land in which to create a dwelling. This may mean, as the case studies will show, literally carving out a small plot from the mountainside or filling in an entire swamp.

Economically speaking the shelter represents a number of resources to a squatter family. Because it is their single most expensive possession, and consumer of energy and time, it serves to focus the family's attention economically for some years to come. The financial commitment in this respect is stabilizing and progress is made on a pay-and-do-when-you-can basis.

The investment in the shelter, if met with a sufficient level of tenure, can establish the house as a source of income. Many families rent out portions of their house. This may also play an important role in determining which spaces will be built first. Court areas, roofs, and unused lot space may all be potential rentable areas. Because the house represents long term expense, it acts as a forced savings program. Those that establish small businesses insure further their own security and continued development. A small shop or store nets income from space that can double as living quarters by night and store by day.

An important aspect of a squatter's house is that is represents a totally self-determined environment. In a sense it is a "non plan" in which an optimal house is created expressing

the character of its occupants in the uses to which spaces are put, room sizes, and design (finishes, and the materials used). In this respect, squatter housing offers a positive solution to real housing needs. Often government programs attempt to create housing for low income families, they often frustrate and kill the owner-occupant's involvement by competing with skills that the squatter already has. The squatter is quite capable of generating his own house design for he knows the relationships and priorities he wants to establish. While talking about the problems of development in the villas miserias of Buenos Aires, L. Wilson points out:

> It is not the discomfort of the physical situation of the people of the villas (the villas miserias of Buenos Aires) feel most bitterly. It is the humiliation of being denied the opportunity of doing for themselves what they are quite able to do. (33)

In some areas the squatter may not have the technical skill nor experience to do what he wants, but he is capable of finding others who do. In this sense he acts as a general contractor. The use of indigenous material greatly increases the probability of success of his self-help program because the squatter deals with materials and techniques which are readily available and with which he may have some familiarity. A structure conceived in these terms remains alive forever for it can be continuously changed as requirements dictate.

2.282 TENURE, SECURITY OF OWNERSHIP.

Closely linked with the shelter are the problems of securing tenure. Tenure is the greatest concern to a squatter for it regulates the future commitment that he as a home builder will make. Tenure is that legal or de facto security that will justify initiating or continuing investments of time and money in the house. There has always been a direct correlation between these two.

(33) Wilson, L.A., Voice of the Villas Socio-Economic Analysis of the Residents of Villas in Parque Almirante Brown, p.

As we pointed out in the historical evaluation of cities in Colombia, there has always been a cultural preoccupation with holding title to the land. The land was the source and maintenance of power. This tradition also is prevalent today where a title insures ownership and acts as a status symbol. The value of ownership is that it acts as a vehicle for social mobility by resale and renting of commercial establishments, and thus adds a new dimension to housing capabilities. Whereas for middle class residents, class movement is dependent upon education, for the squatter the sale of his house or at least having prepared the way for his sons and daughters to improve their social class.

> The failures of the official projects based on the construction of dwelling units, and the success of the "Barriadas" show that the in-migration to improve and to invest in the surrounding development is proportional to the social security that these settlements offer to their occupants and not as assumed in the popular housing policies to the standards of physical comfort. (34)

2.283 LOCATION

Location serves two important needs. First it is important to secure a location that will provide inexpensive access to the job market for all family members. Because the cost of commuting regulates the number who can work at any time, it is imperative to secure locations that minimize these expenses. In Bogota, the urban sprawl and characteristic low densities is making the job market inaccessible. The foothills of the mountains offer some of the last remaining convenient sites.

Location also plays an important role in securing basic services. If sites are too far out, water must be bought from vendors, electricity may be bought locally instead of pirated, and public transit lines may not extend to the developing area.

(34) Rojas, Ernesto, "Urbanismo y Migracion," article from Migracion y Desarrollo Urbano, p. 189.

The actual situation contradicts the above criteria for locational choice because lack of control of land speculation isolates large segments located near job sources and main line utility access. The high density low income barrios of blue collar workers are located away from job sources and work sites, increasing the problems of transportation and providing public services.

2.290 SUMMARY--ATTITUDES TOWARDS SQUATTERS

If squatting is seen as a problem solving process, one of getting inexpensive housing, we must ask what other problems are created by this process in terms of their effect upon the city that are most detrimental in the long run. The answer to this question depends on the specific case in question; however, by and large, they resolve more problems than they create. Our survey of 15 squatter settlements in 10 Colombian cities indicates that since most squatting has taken place on non-agricultural land, has been limited to marginal properties (very steep hills or swamp land), they have been more of an asset to the city than a detriment. The problem arises when their settlements have not reserved sufficient space for communal facilities or have created such an illogical distribution of densities and a random spatial array of houses on the site that the installation of future services is permanently prevented.

Many of the most likely invasion sites in Bogota are in the steep foothills; site protection problems become enormous. Squatters begin cutting and filling these slopes to prepare a plot large enough to accommodate a house. Besides the reshaping of the contours, the disturbed soil and stripped vegetation accelerates erosion. In many cases the site erodes faster than the squatter community is able to invest in protective infrastructure, such as retaining walls, pavement and stairway, that over time they create unrepairable problems. Some of this having ecological repercussions as well. Our experiences in Barrio Las Colinas, Bogota, will give a particular example of how interrelated these problems become. Barrio Las Colinas, for instance, must relocate 119 families who have built under a major power line. Since this was not considered when the barrio was designed, there will be enormous relocation problems because the site has already expanded to its limits. Many of the relocatees will be asked to

relinquish central sites under the wires for sites at the top of the hill. Their lower slope neighborhoods which have already been developed with water readily available, stairways installed and homes established must be relocated. Who will repay them for their efforts?

Consider this situation from a political point of view. These 119 families could be unified to protect their own interest and form a voting block in the barrio affairs to prevent their eviction. Since the municipality has established formal technical services with the field office of the La Caja de la Vivienda Popular, the city could insist that no further monies be allocated the barrio until an easement is created. It's not hard to see the battle grounds being formed already. Fortunately these families have agreed to relocation in a neighboring barrio called Las Lomas; however, many other barrios do not offer such easy options.

It must be pointed out that the barrios have many techniques for coercing members to adhere to the barrio's rules. In Las Colinas, families that became problemmatical had their water rights taken away. The expense and labor involved in circumnavigating this is usually more than any single family can take, so it is very effective.

Coastal invasions provide still further examples of the pitfalls of promoting clandestine planning practices. In Cartagena for instance there are literally thousands of squatters who have invaded the tidal basin areas and built upon land that is at sea level. These areas are constantly threatened by flooding not to mention the impossible task of providing sanitary drainage.

Criticisms launched against squatter settlements do not attack their purpose so much as their processes for development. For example, Jacques Mosseri, Director of the Center for Planning and Urbanization at the University of Los Andes, Bogota, in referring to the self-help housing process used in all the squatter settlements, says:

> Auto-construction (self-help housing), as a system to generate work, solves nothing either. It is only a method for salvaging the best part of a bad situation without improving it. It is one of the answers that the people themselves give owing

> to the bad situation and the duty of the state is not to stimulate it and direct it, but to improve the general situation: Self-help is a disguised employment. The time, the energy and the money that the individual spends in building his home (badly constructed, because he is not a builder, and even though he learns in the process this new capacity will be lost if he does not continue to dedicate himself to it), he should dedicate himself to learning some trade to better be able with his income to pay a qualified worker--creating at the same time a new source of work--and he has assured not only a house but also a constant source of income. (35)

Mosseri's hypothesis overlooks two very important factors. Firstly, most squatters have considerable experience in construction and are in many cases employed as construction laborers. Secondly, Mosseri ignores the whole economics of the house. It's not a matter of just outright buying a shelter, the slower self-help method allows the squatter to invest when he can and not commit himself to the regular payments of the ICT or private developer housing. The most important aspect of self-help is the significant cost saved in labor and in the use of local technologies and materials. This helps to stabilize and create barrio level economics, whereas contracting to outside groups does not bring a cash flow into the barrio in terms of wages. We feel that Mosseri's observations have not included the demonstrated success that self-help has brought to Bogota's own squatter settlements. Las Colinas has an extremely high level of development. Three story brick houses with cantilevering second floors are common. The main point here is that building a house is not just an attempt to create a shelter, it is also an elastic investment program.

The repercussions of clandestine planning can be seen in their effect upon the city.

> The location of nearly all squatter communities is presently unrelated to the plans for future growth of urban centers. These communities often spring up over night on land that has been reserved for future use as parks, recreation areas, roads, and public facilities. As a result, squatter communities often block the rational extension of the city and warp the direction of its growth,

(35) Mosseri, Jacques, "La Vivienda Come Factor del Desarrollo Urbano: Hacia una Nueva Politica de Vivienda," article in Migracion y Desarrollo Urbano, p. 265.

leaving many areas unserved by needed amenities and services. (36)

For example, Barrio Policarpa was an intended hospital site. Even as well-organized as this invasion was, such an oversight is unnecessary.

In the preceeding sections of the illegal housing system, we have pointed out some of the more important problems and issues that the growing tugurios represent. We wish to summarize here some of the most important:

> Squatting is defined as some form of illegal tenure. Descriptions of the building, public services, etc., are indications of the poverty level and the degree of community. Although an insecure tenure may precipitate these low levels of development they, in themselves, are not grounds for classifying a development as squatter.
>
> Squatting is a world-wide practice and problem, prevalent in every country in the world, varying in degree only. It may account for up to one half the total housing stock in some cities.
>
> Squatting is not limited to great metropolitan areas. It is a common practice in small towns and villages.
>
> The growth of tugurios is a result of the lack of urban policy concerning their control and growth and the inability of institutions to promote programs that realize the magnitude and limits of their clients.
>
> Colombia has three basic forms of tugurios: the casas de inquilinos, the barrios piratas, and the invasion barrios. Each serves a distinctly different function in the housing system and must be dealt with in its service-context to its users.
>
> Land invasions of public properties and subsequent barrio growth are by far the largest and most successful, in terms of securing shelter. They are generally

(36) Mitchell, Neal B., Squatter Housing: Criteria for Development, Directions for Policy, p. 11.

large in membership, well-organized and launched against public properties. Invasions of private properties are exceptions.

Invasions are promoted by land speculators and politicians for profit and ideological motivations. The most complete models for both housing and community development have been established by politically motivated groups such as Centro Nacional Pro-Vivienda. Their success is due in part to their making housing of prime developmental concern in a much larger program of community mobilization.

Invasions are acts against the Public Order. If not successfully removed from the land within 30 days of the first complaint, it becomes a legal eviction process handled by the civil courts. Evictions are an exception, however, there have been cases where police action has brought invaders to open armed conflict: i.e. Policarpa.

The formation of invasions is not a process of urbanizing rural in-migrants or of training for the lower classes for urban life, but they are composed of stable families leaving the center city rental slums and is therefore a process of consolidation.

The invasion process must solve to some degree three separate but related problems: identification of a site that will allow for housing; identification of a site that will secure either de facto or legal tenure; and identification of a site must satisfy the locational demands of job market and services. The degree of invasion organization and planning determines their success in solving these three areas.

In addition to securing shelter, squatting has many commercial, entrepreneurial, and political motivations. It is part of a much broader social-economic process and must be considered in its context.

The acquisition of a house is but one function of squatting. The house is a vehicle for social and economic mobility. Its development is a consolidation of family and property.

Attitudes differ considerably concerning squatting practices. There is no national policy toward them. Each city creates its own.

Squatting creates two types of problems. In the first instance they often do not perceive the implications that their increasing numbers represent to themselves and to the cities they invade. Secondly, since squatting takes place outside the normal planning process, they often create impossible situations from the point of services and the logical extension of the city.

Case studies indicate that the squatter settlement is a place for potential leaders to assume community development. In this capacity their experience is a substitute for formal training and allows them at least some representation in urban politics.

CONCLUSION:

Squatting represents at least a transitional solution to the problem of supplying low cost housing.

CHAPTER 3

FOUR CASE STUDIES--A CROSS SECTION OF INSTITUTIONALIZED HOUSING

3.000 FOUR CASE STUDIES=-A CROSS SECTION OF INSTITUTIONALIZATION

In the beginning of this report, we have presented to the reader background material to view Colombia's, and more specifically Bogota's, growth. In the second chapter we examined the two-part housing system--its legal and illegal aspects. We will now present four detailed case studies of barrios in Bogota, each of which represents an increasing level of governmental assistance. By presenting a cross section of empirical data on specific topics, we will compare the relative merits of each developmental process.

3.100 THE CASE STUDY METHODOLOGY

3.110 INTENDED USE

We are concerned with answering the following questions:

What are the essential differences in environmental quality that increased levels of institutionalization provide?

What areas of community development are best served by local barrio level administration and which can be better handled through some governmental process?

What are the relative merits of long-term development and short-term modernization?

What consistency is there between the established legal standards for building and the practiced tradition?

What are the implications of a mis-match in the two building standards?

What measures can be taken to incorporate tne popular building tradition into an orderly process in order to increase the quality and quantity of nousing?

Implicit in the above questions are several facts that will reappear throughout tnis section. First, there seems to be a lack of empirical data about low-income housing. This is particularly true for illegal settlements. As we mentioned earlier, invasion barrios and barrio piratas account for up to one third the total urban area of most Colombian cities. This is a large sector and the city must assume the responsibility of creating logical extensions of municipal services. An inadequate appreciation of barrio needs and capacities can (and often has) undermine tne most elaborate of "plans"; recall the results of "Plan Piloto" and "Plan Regulado." We see our responsibilities as two-fold: first, to establish wnat housing and community development processes successfully operate, legally or illegally, and under what circumstances; second, to suggest wnat developmental forms can be adapted and/or created to order and make more successful tne tremendous housing demands of the lower income sectors.

3.120 CRITERIA FOR BARRIO SELECTION

There were essentially five criteria for the selection of our four case study barrios:

That the barrios selected be representative of a cross section of institutional support

That there exist for eacn barrio some nistorical data concerning population, initial barrio organization, etc.

That the barrio is not a significant source of basic employment, that is to say that the city itself provides significant new monies into the barrio economy

That the barrio be located on a sloped site in wnich the grade is of significant degree so as to create a restraint upon building form and barrio layout.

The first criteria limited our field of choice significantly for one of our main purposes in the case study methodology is to compare housing and community development procedures wnile

varying the level of institutional control. It is here that we can establish the relative merits of eacn. The second constraint is merely a practical limitation on our data. Our study was limited to barrio families earning from subsistence to tnree times subsistence level incomes. These incomes are typical of tne highest demand sector and they include technological and administrative restrictions of interest to us.

Our reasons for selecting barrios which do not provide all, or most of, tneir basic employment was a spatial consideration. It was considered that the importance of location is felt most significantly where daily expenses occur in commuting to and from work. We were furthermore interested in the future of open lands adjacent to the city in which existed reasonable access to basic employment sources. It is a fact that the low income settlements compete witn each other in securing labor intensive jobs and insecurity and competition in the job market nas a great deal to do with the home and community development process. If barrios were their own source of significant employment they would not reflect completely a spatial economic dependence upon tne cities.

The last item of criteria deals with a condition most typical in Bogota and other cities. Steep central sites are natural targets for squatters because they are sites that can not be economically brougnt into the normal land market. These sloped sites have often acted as delimiters for the cities' growth and offer those squatters who can overcome the physical problems of building a site usually very near job centers. Our interest in sloped sites is more than passive for we consider tneir impositions upon tne home builder and the community designer to be extremely important. The slope forces problems upon its inhabitant that must be dealt with in a semi-ordered sequence and with varying levels of communal cooperation. Slopes that have nad a reasonable influence on barrio design are generally in the 30 to 50% range. In much the same way that housing acts as a unifier in invasion planning, the slope unifies the communities' efforts in community development in the early years of settlement.

3.130 CASE STUDY DATA STRUCTURE

Recognizing both the limited sources of data concerning the housing types we were most

interested in and realizing that what data has been compiled is often intended for sociological or political purposes, we created a structure more useful to physical planning and the administration of programs concerning it. For simplicity and accuracy, we have divided our information into physical, socio-political, and economic determinants. Each of these areas were in turn subdivided again into more specific data areas. Appendix C presents an outline of the entire structure used throughout each case study.

The physical determinant was divided into the following sections:

Physical location
Historical retrospect
Site plan
Site analysis
Dwelling unit description
Sponsoring agency retrospect

The socio-political and economic determinants were divided as follows:

Basic demography
Community organization
Programs of tenure

3.140 THE SELECTED BARRIOS

Three barrios were selected on the bases of the criteria listed above. A fourth was added in the process of developing the first three for it was felt that this barrio in particular might suggest an alternative process for developing sloped sites. The barrios selected were Juan XXIII, Las Colinas, Los Laches, and El Encanto. These locational descriptions are provided in the introductions to each case study; they are collected here to immediately orientate the reader:

JUAN XXIII

Juan XXIII is a small, old squatter settlement located on a steep hillock originally

owned by the military in the north sector of the city. The barrio is economically isolated, situated in a middle and upper income area that has grown around it as the city expanded north. The settlement is well-defined by roads that form a triangle around it. The major entry is Calle 65, that continues on to form one of the barrio's boundaries. It changes from a concrete to a dirt surface at the limit of an encroaching middle class development. The site is situated between Carreras (streets that run north and south) 3A and 2A, and Calles (streets that run east and west) 64 and 65. The barrio, composed principally of small lots situated on slopes of 51% average grade, occupy a site of 1.4 hectares of land approximately 6 kilometers from the center of the city. For all intents and purposes Juan XXIII has received no governmental support for they have settled on military property. They will act as one extreme when comparing varying degrees of governmental support.

LAS COLINAS

Las Colinas is a large, ten year old squatter settlement located on the steep slopes of a reentrant valley in the southern sector of the city. The land was originally owned by Hospital San Carlos. It is a barrio economically integrated into the southern half of the city, a sector composed of the lowest income groups. The major entry is Calle 34 south. The barrio is bounded by the development "Gustavo Restrepo" to the north at Calle 34; to the west, the Avenida Caracas; to the east the property of Hospital San Carlos; and to the south the Barrio Resurrection. The settlement is composed of lots of 80 to 90 meters square situated on slopes of an average of 45% and occupies a 12.16 hectare site 5 kilometers from the center of the city. This barrio has had institutional assistance only after their invasion. It will serve as an intermediate level of governmental support.

LOS LACHES

Los Laches is a large low-income housing project built by the Colombian housing agency, La Caja de la Vivienda Popular (Caja). The development is situated on extremely steep

slopes in the south-east sector of Bogota. The site was partially settled by a squatter settlement of dubious fame before the Caja began to redevelop the site. Los Laches is economically integrated into the surrounding worker barrios. The major points of entry are: Calle 6A which becomes Diagonal 4B and 5A as it winds through the barrio. The barrio itself is bounded by the circumferential road to Villavicencio on its south and east, to the north by El Rocio, and to the west by El Guavio. The project is composed of 86 meter square lots and is on an intermediate slope of 10 to 20%. The entire barrio is 1.6 kilometers from the city and offers a central location to its residents. Los Laches is completely institutionalized project and will serve as an opposite extreme to barrio Juan XXIII.

EL ENCANTO

El Encanto, an extension of barrio San Isidro, is a small linear development located in the southern sector of the city on a site whose slope at the base is flat and dramatically increases until it is almost vertical. The land was developed by its owners as a "barrio pirata," or lots sold to occupants without services. It is economically well integrated with the surrounding worker barrios. Principal entry is through the only spine road 6A. Natural slope boundaries define the east and western sides and the Barrio San Isidro to the north. Lot sizes are generally 128 meters square, the barrio itself is approximately 4 kilometers from the center of the city.

JUAN XXIII

3.200 INTRODUCTION

Juan XXIII is a small, old squatter settlement located on a steep hillock, originally owned by the military, in the north sector of the city. The barrio is economically located, situated in a middle and upper income area that has grown around it as the city expanded north. The settlement is well-defined by roads that form a triangle around it. The major entry is Calle 65, that continues on to form one of the barrio's boundaries. It changes from a concrete to a dirt surface at the limit of an encroaching middle class development. The site is situated between carreras (streets that run north and south) 3A and 2A, and calles (streets that run east and west) 6A and 65. The barrio, composed principally of small lots situated on slopes of 51% (1) average grade, occupies a site of 1.4 hectares of land approximately 6 kilmeters from the center of the city.

3.210 HISTORY

Juan XXIII was settled in 1953 by invasion. Its population is growing by accretion, and its development, initially in the areas of La Planicie and La Lema, can be characterized as follows:

> Two thirds of the houses had only one room at the time of the invasion. Only 9% of the houses are in the same condition as the initial construction. That is, approximately twice the houses have a room and kitchen and five (5) times more houses with two rooms have appeared if one compares them with their state in the first stage.

Two recent invasions, in 1969, have occupied the land remaining within the triangular site. The newly constructed units are located adjacent to the paved road that leads to the Colegio, situated directly behind the barrio. Provisional houses, built quickly to stake out claims, are being replaced by dwellings of permanent materials.

(1) Goethert, Reinhard, "Reference Data: Juan XXIII and the Development Area," Civa/MIT, Cambridge, 1969, p. 15.

3.220 THE LOCALITY (See following photo essay)

A. Map locating barrio in city
B. Site in surrounding area
C. Site plan

3.230 THE INHABITANTS

The population of Juan XXIII, in 1967 of 737 persons, with its wide based age-sex pyramid (see Age-Sex distribution chart) is typical of low income urban populations in developing countries. Characteristics of the pyramid include 1) the small percentage (2.3%) of persons over the age of 61 and therefore out of the range considered to be economically active. 2) the large percentage (44.5%) considered productive, of which more than half are women whose work is occasional if at all (2).

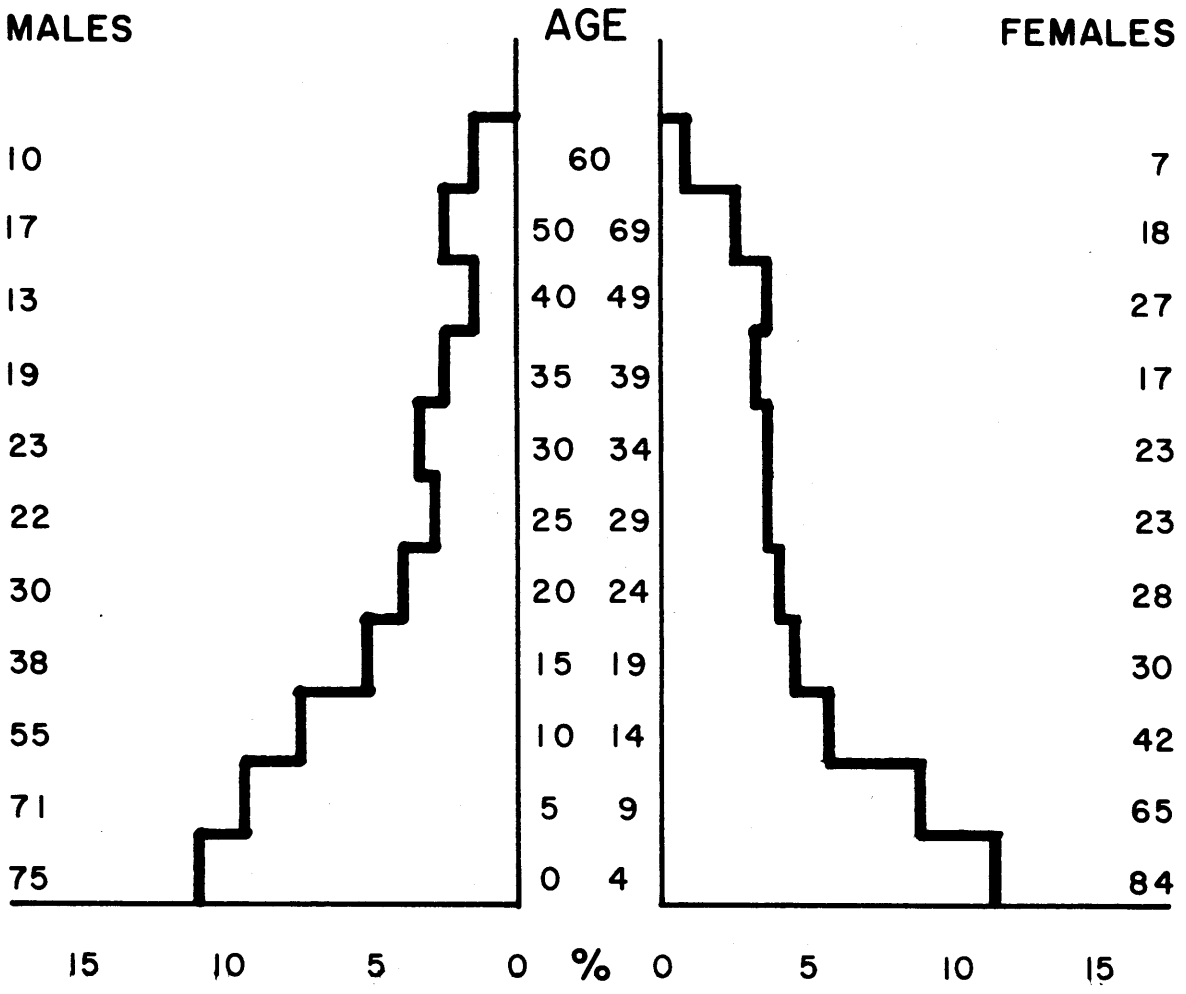
The 124 families surveyed in 1967, each with his own lot, occupy three-quarters of the 1.4 hectare site. This produces densities of 89 dwellings per hectare and 551.8 people per hectare. Since that time two groups of approximately 15 to 20 families each have occupied what remained of the site. The population estimated for 1970 is 154 families composed of 917 persons.

3.240 SITE ANALYSIS

The site of Juan XXIII is situated at an altitude that runs from 2660 to 2685. There is little vegetation to naturally control the drainage and run-off from the slopes whose average inclination is 51%. As a consequence, there exists a serious problem of erosion. The run-off flows freely through the site, particularly down the public stairs that pass through the barrio. Climatically, Juan XXIII is typical of Bogota, having an average temperature of 14 degrees centigrade; 191.4 days per year of rain; and 936.9 milimeters of rain per year. (3)

(2) Cardona, Ramiro, "Las Invasiones de Terrenos Urbanos, Elements para un Diagnostino," Tercer Mundo, Bogota, p. 50.
(3) Goethert, Reinhard, "Reference Data: Juan XXIII and the Development Area," Civa/MIT, Cambridge, 1969, p. 12.

JUAN XXIII : AGE SEX DISTRIBUTION



TOTAL MALES = 373
= 50.6%

TOTAL FEMALES = 364
= 49.4%

TOTAL POPULATION = 737

PERCENTS TAKEN OF TOTAL POPULATION IN 1967

Juan XXIII: Age Sex Distribution for 1967

Total Males			Total Females	
%	No.	Age	%	No.
10.2	75	0- 4	11.4	84
9.6	71	5- 9	8.8	65
7.5	55	10-14	5.7	42
5.2	38	15-19	4.1	30
4.1	30	20-24	3.8	28
3.0	22	25-29	3.1	23
3.1	23	30-34	3.1	23
2.6	19	35-39	2.3	17
1.8	13	40-49	3.7	27
2.3	17	50-60	2.4	18
1.3	10	60+	.9	7
50.7%			49.3%	

Source: Ascofame Report #19

Access to the barrio is principally through the Calle 65. The settlement can be approached through Carrera 1A, and Calles 59, 60, 62 and 64 also. The possibilities of growth and expansion of the barrio are controlled more by the social pressure of the surrounding middle and upper class barrios than by a lack of physical space on which to expand. The undeveloped land to the south is gently sloped; land to the north is steeply sloped. The military, the owner of the land to the north, is openly hostile to the community and does not consider expansion onto their property to be in their interests.

3.241 LAND USE

The land use pattern of Juan XXIII responds organically to community felt needs, supplying over time a wider range of community facilities as the community clarified the status of the barrio's existence. The following graph shows the approximate land use distribution established to date.

Land Use Distribution, Juan XXIII: 1970

Land Use	Area (Sq. Mts.)	%
Circulation	4,300	30.7
Community Space	1,400	10.0
Commercial	600	4.3
Residential	7,700	55.0
Total	14,000	100.0%

Source: Author's Field Survey, 1970

The growth of commercial facilities, in the form of shops functioning in the homes, and of community space, in the form of day-care centers, consumer cooperatives, and education and health facilities, has been accretive. Of the present population, 22.8% arrived before 1960 and own 50% of the stores. The attention focused on the barrio because of its proximity to tne upper middle class neighborhoods has resulted in the variety of facilities in the barrio.

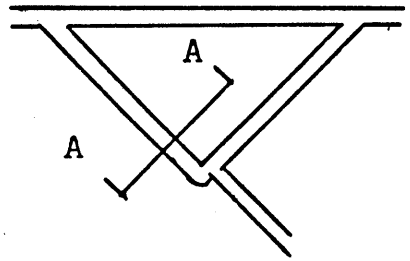
These facilities were installed without training the barrio's residents to maintain them. Many of the activities and services have ceased to function, indicating general unwillingness, lack of interest, or inability to make them work. Certain redundancies in available community facilities have been simplified: for example, the consumer cooperative no longer functions; it operated at the expense of the traditional, though limited, market that takes place in a vacant field adjacent to the barrio. Walkways most frequently used have been maintained; others have been abandoned. Funds that might have been used in site protection schemes were diverted to the other projects initiated in the barrio by the priest and foreign groups.

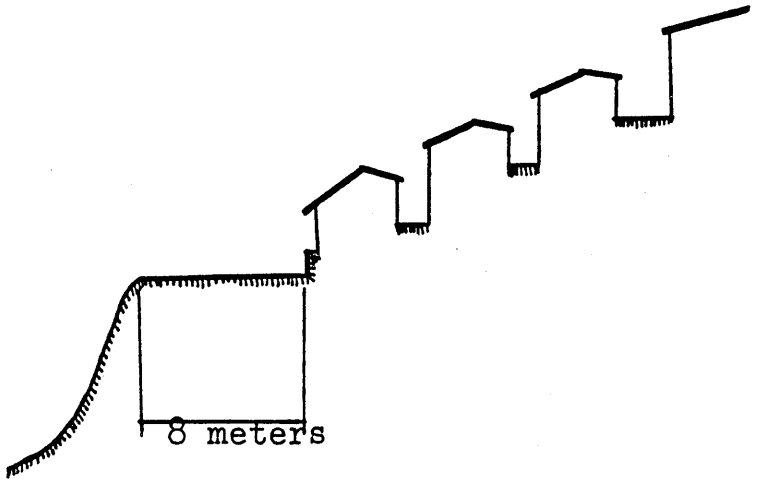
3.242 CIRCULATION

The following graphic description of the component parts of the circulation system illustrates both topographical and dimensional characteristics of the barrio:

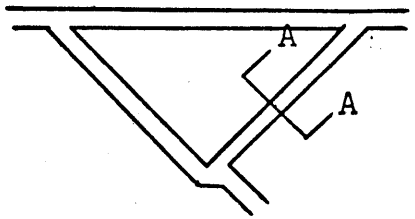
1. Streets

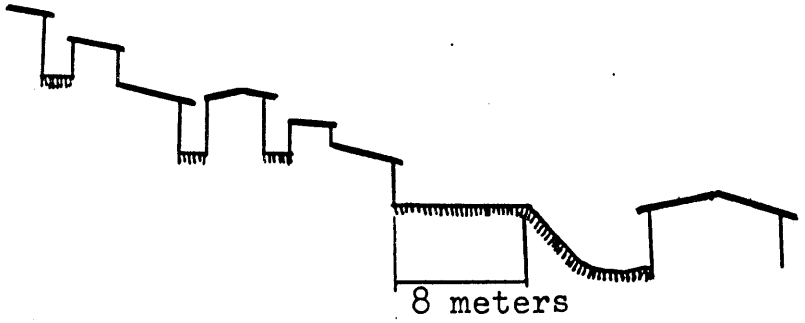
a. to the north, the dirt-surfaced road has a slope of 19% average





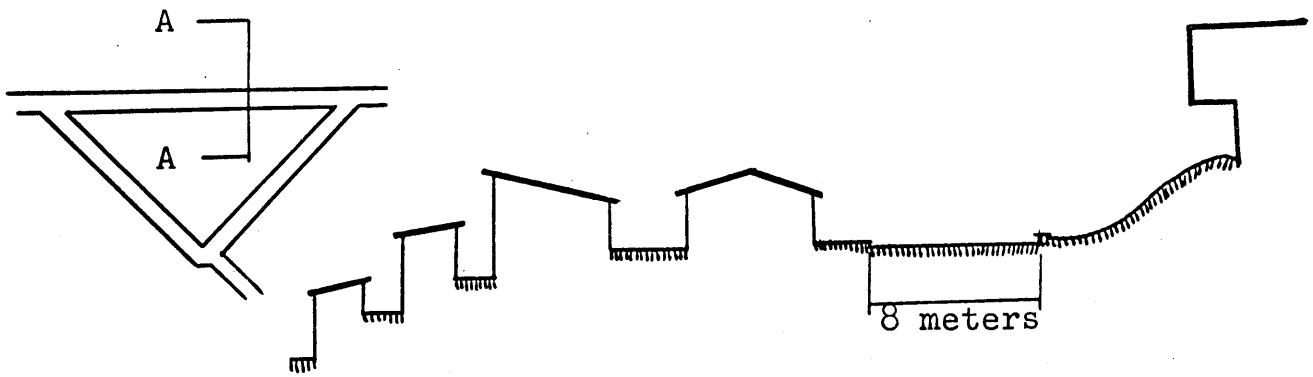
b. to the southwest, the dirt-surfaced road has a slope of 12%





SECTION AA

c. to the east, the concrete surfaced road has a slope of 7-20%



SECTION A-A

2. Pedestrian Ways

a. the pedestrian ways that pass through the barrio have a maximum slope of 51%, minimum slope of 23%, and an average of 32%. (4)
The surface of the patns is generally dirt. Public stairs are carved from the hill, although some areas are concreted or bricked, especially private stairs that lead to the dwelling.

COMMENT:

The effect of developing the vehicular and pedestrian circulation systems would be a great aid in site protection. Site protection is a critical problem.

3.243 INFRASTRUCTURE

The infrastructure, meaning light, water, sewage, telephone, and community space and facilities, has been solved by ad hoc and "pork barrel" methods. Electric power, pirated from nearby power

(4) Ibid., p. 15.

lines meant to serve the secondary school located behind the barrio, reaches 73.4% of the dwellings. Water has been made available by tapping into the city's aqueduct network. There were 44.3% of the units that have a tap inside; and 24.% have water outside the dwelling; 31.2% of the units have no water and either borrow or buy their daily supply. The sewage line installed as a community project serves 58% of the units. It dumps its waste in a vacant lot adjacent to the barrio. There are 10% of the units that have a latrine on their lot and 31% of the houses have no sanitary facility at all. (5)

The surrounding open fields alleviate some of the problems of discarding the concentration of waste. Services such as telephones do not exist in the barrio. Other community services do exist, however, they do not function any longer and the structure has not been reallocated to any other function. The barrio has some permanent facilities, such as a day care center, a community center, a beer-case repair workshop, a health center and an under-construction school of two classrooms to accommodate 50 students, and a tejo court on an adjacent site. Open space within the triangular site is limited to a plaza around which cluster the day care center, police station, and the school. The surrounding slopes are used by the children to play on. The paths and small stores that sell beer and soft drinks provide spaces for leisure conversation among the residents of the barrio. There is no garbage collection service.

3.250 SOCIO-ECONOMIC DESCRIPTION

3.251 INCOME

The range of income in 1967 as presented below did not pass 700.00 pesos/mth.

Juan XXIII: Total Family Incomes in 1967

Incomes in Pesos	%
0-400	58.6
400-600	20.7
600+	20.7
	100.0%

Source: Reference Data: Juan XXIII and the Development Area, p. 39

(5) Ibid., p. 27.

For the same year, the family head averaged 339.00, the range was:

Juan XXIII: Incomes of Family Heads 1967	
Income in Pesos	%
0-200	25.3
200-300	26.1
300-400	32.4
400+	16.2
	100.0%

Source: Reference Data: Juan XXIII and the Development Area, p. 39.

These charts indicate that only 20% of tne wage earners in Juan XXIII had incomes high enough to meet the costs of food, clothing and shelter. In all cases, savings were impossible. The economically active segment of the population was 42.1% including temporary and permanent employment. The occupations held by those working include artisan, construction worker, street vendor, re-seller of scrap collected from the streets (bottles, paper), domestic work, mechanics and workers at the beer crate repair shop within the barrio. These labor intensive jobs are highly competitive and require a great deal of personal mobility to maintain them.

3.252 EDUCATION

The general level of education in Juan XXIII is shown in the following breakdown:

Juan XXIII: Education 1967	
Years and Type	%
None	16.0
1-2 yrs.	19.2
3-4 yrs.	42.2
Finished Primary	18.4
1-6 yrs. Secondary	2.4
Vocational Training (SENA)	1.6
	100.0%

Source: Reference Data: Juan XXIII and the Development Area, p. 40.

Although this chart indicates that 42.2% of the barrio has had from 3 to 4 years primary education, the effective level of literacy is extremely low.

3.253 COMMUNITY ORGANIZATION

The community organization of Juan XXIII is described in Ramiro Cardona's study of the barrio:

> The leader of the barrio is the priest of the Dominican order Domingo Effio; ordained in Peru, he began to work with the community nine years ago (1958). All the work that has been done there is directed by him, with the help of a body of volunteers.
>
> The worker priest, as they call him, has achieved an awakening in the inhabitants of Juan XXIII, a conscience of cooperation and, at the same time, has spread the responsibility of the community to the point of establishing a service of vigilantes for the barrio.
>
> The maximum authority in the barrio is a junta composed of some of the inhabitants who work under the orientation of the priest.
>
> The foundation, "Paz en la Tiera," formed in its greater part by people who live in the neighboring residential barrios work in favor of the improvement of the barrio since 1966. This organization was conceived by the priest who, since two and one-half years ago, awoke an intent in the more economically stable families of the sector towards the problems of the population of this marginal zone. Through this interest he has achieved the implementation of many communal works....It is important also to note that the results achieved to the moment have been supported by Colombian and American social workers, powerful business as Bavaria, Croydon, Cementos Samper, Ponque Ramo, Silka Ltda., Central de Mezclas and the economic support of the protestant community in the neighborhood. With all the explained above, the marginal community that initially was born, in actuality is found incorporated in the social structure, with a great sense of its works and a slow evolution that from the chaos and the passivity has achieved the establishment within a quite acceptable level of conscience of mutual cooperation. (6)

(6) Cardona, Ramiro, Juan XXIII, ASCOFAME, Bulletin No. 19, Bogota, 1968, p. 4.

Cardona's positive description of the barrio organization is no longer valid. Plagued by intervention of foreign and Colombian private and governmental agencies, promised a multitude of things by politicians, and studied by national and foreign students investigating urban and social problems, the barrio wants to be left alone to work out its own problems. (7)

A barrio improvement program proposed by the Caja was refused. Pro-Viviendo has collaborated with tne barrio junta by helping to plan two small invasions to occupy the land that has remained after the initial invasion. The priest, after some problems over the disappearance of barrio money, and pressures exerted by foreign and national groups, has left the barrio. The consumer cooperative no longer is functioning due to lack of funds, lack of interest, and lack of leadership necessary to sustain the operation. The priest and foreign groups did not want to encourage or allow community control of barrio programs, so barrio residents were not trained to assume responsibility for a project's initiation. Paternalism is the bane of community responsibility. It worked against development; the goal voiced by the contributing groups. Senor Velasquez, a Peruvian living in the barrio, has assumed a position of leadership and responsibility. He orients a junta still within the old paternalistic pattern, but now leadership and orientation are derived from barrio level.

3.254 TENURE

Tenure is still a problem that plagues the community. As an invasion barrio the inhabitants still have no legal claim to the land until after twenty years of occupation the land becomes the property of tne occupant. Barrio residents, however, are under tne impression that after five years the land becomes the possession of the occupant. The threat of eviction retards growth and only because eviction is politically disastrous have the residents survived tne repeated attempts to clear them out. This was one of the principal reasons for rejecting the Caja's program that would have legalized the barrio having the resident buy his lot. The community thinks they have the right to their lots and therefore own them; the government does not.

(7) Conversation with barrio residents.

3.260 THE DWELLING UNIT

3.261 THE FAMILY

The social and physical components of the barrio are described in terms of the family groups or those who eat out of the same pot, and in terms of the dwellings. The typical social unit is a nuclear family, that is, parents (mother and father) and siblings whose average size is 6.2 persons. (8)

In Juan XXIII, family types are:

Juan XXIII: Family Structure Types 1967

Relationships	% of Families
Nuclear, Father, Mother and Children	55.7
Father and Children	1.6
Mother and Children	11.3
Children Only	.8
Other Types	30.6
	100.0%

Source: Cardona, Ramiro, Las Invasiones de Terrenos Urbanos, p. 53.
Note: 124 Total families in the barrio

57.3% of the families are headed by the father, 11.30% by the mother, and 31.40% by other persons (aunts, stepmothers, etc.).

3.262 THE DWELLING

The 124 dwellings are characterized by a survey of 58 of the units:

(8) Goethert, Reinhard, "Reference Data: Juan XXIII and the Development Area," CINVA/MIT Cambridge, 1969, p. 37.

Juan XXIII: Permanence of Dwellings 1967	
Condition	% of Structures
Permanent Materials	2.7
Partly Permanent	12.4
Major Part Not Permanent	48.7
Not Permanent at any Level	36.3
	100.0%

Source: Cardona, Ramiro, "Las Invasiones de Terrenos Urbanos," p. 73.

Even though Juan XXIII is the least secure tenure of the cases we will present, more than half of the families are complete nuclear units.

OPEN AREA/LOT

Juan XIII: Lot and Constructed Areas 1967			
Lot Size (Sq. Mts.)	% of Houses	Constructed Area (Sq. Mts.)	% of Houses
0-15	28.8	0-10	26.6
15-24	21.2	10-19	38.5
25-39	26.9	20-29	18.4
40+	23.1	30+	16.5
	100.0%		100.0%
Average Lot Size 32.3 Sq. Mts.		Average Constructed Area 21.7 Sq. Mts.	

Source: Cardona, Ramiro, "Las Invasiones de Terrenos Urbanos," p. 75.

AREA/PERSONS

3.5m^2 of constructed area

ROOMS AND ROOMS SIZES

Juan XXIII: Dwelling Descriptions 1967

Room Types	% of Dwellings with Types of Rooms
One Room W/O Kitchen	8.6
One Room W/ Kitchen	56.9
Two Rooms	8.6
More Than Two Rooms	25.9
	100.0%

Source: Goethert, Reinhard, "Reference Data: Juan XXIII and the Development Area," p. 25.

CONSTRUCTION MATERIALS

Roof:	Asbestos cement sheets, tin sheets, metal scrap, asphalt paper (weighted extensively with stones, wood, etc., or secured with nails)
Floor:	Earth, cement, wood
Walls:	Bamboo, mud packed bamboo slats, asphalt paper, cement blocks, brick
Wall Surface Finishes:	Plaster of cement and mud, exposed bamboo, blocks, wood slats
Doors:	Wood, metal
Foundations:	Stone, wood, fill

The high percentage of buildings made with non-permanent materials can be directly correlated with the lack of tenure and unwillingness to invest in an uncertain situation. There has been an increase in permanent structures since 1967. Some of the buildings of durable materials are community facilities such as the day-care center and the clinic.

3.263 DESIGN AND DEVELOPMENT

The plan established in 1953 by the invasion oriented the lots parallel to the contours in linear blocks that climb the hill. Cut and fill is the most common system used to establish the base on which the houses were built. However, stilt construction techniques were also used. In general, the lots were very small; the houses covering a great part of the lot (if not all) were built by the occupants or in groups. Outside support helped finance the community facilities.

Conversations with the residents indicate that they consider "the hill" as a single block that is well defined by the three streets that surround it. The level summit, location of the day care center and other community facilities, is the focal point. From this point walkways penetrate the housing areas and connect the upper and lower sectors. The paths, cut into the slope, are steep and although they appear to be labyrinthian, are very logical. The turns and switchbacks facilitate vertical movement.

The barrio has been territorially contained because hostile neighbors have built fences around the vacant land adjacent to the barrio. These neighbors have also encouraged and instigated governmental harrassment and threats of eviction. The Collegio says it allows the "poor children" to attend their primary school, but excludes them from the secondary school by financial requirements of tuition, uniforms, etc., that barrio families can not afford.

The majority of improvements and modifications in the barrio are related to the construction of the house.

MODIFICATIONS

The construction of the house has been classified in various stages:

a. The first consists of the arrival at the site and situating the family in a room made of scrap or non-permanent material such as beams of wood, walls made of sheets of bamboo, and roofs with scrap metal or at times protected with asphalt paper.

b. The second stage consists of enlarging the house, constructing other rooms and perhaps a kitchen accompanied by improvements in the construction of the first stage, such as covering the walls of mud-packed bamboo with a coating of cement.

c. The third stage consists of constructing a house of durable materials (bought secondhand). These materials are generally products of demolished buildings.

COST

The cost incurred by the barrio is mostly for the materials bought for improvement and expansion of dwelling units. For those who contract local construction workers the pay scale is:

12 pesos/day for a laborer
25 pesos/day for a foreman.

Construction materials available at 1970 prices are:

1.	Brick	350 pesos/1000 bricks-8x12½x25
2.	Split Bamboo	8 pesos/1 foot diameter roll, 4-5 feet long
3.	Cement	22 pesos/50 kilo bag
4.	Corrugated Tin	75 pesos/1.8x90 cm. sheet
5.	Asbestos Cement	28 pesos/1.8x90 cm. sheet
6.	Cement Blocks	2000 pesos/1000 blocks, 10x20x40 cm
7.	Clay Tile Block	1200 pesos/1000 blocks, 10x8x25 cm 1600 pesos/1000 blocks, 40x8x25 cm

JUAN XXIII PHOTO ESSAY

BARRIO JUAN XXIII

CITY SECTOR

0 50 100 200 400 800

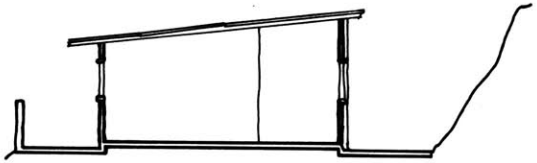
SCALE IN METERS

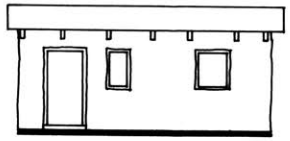
BARRIO JUAN XXIII

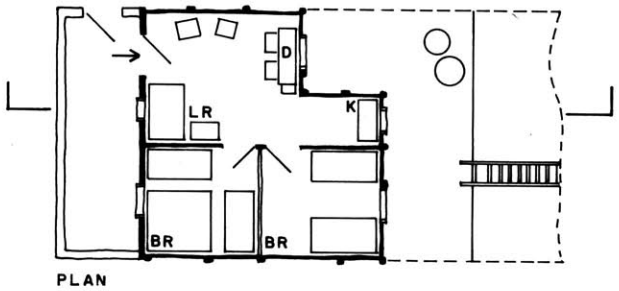
BARRIO PLAN

0 10 20 30 40 50 100 200

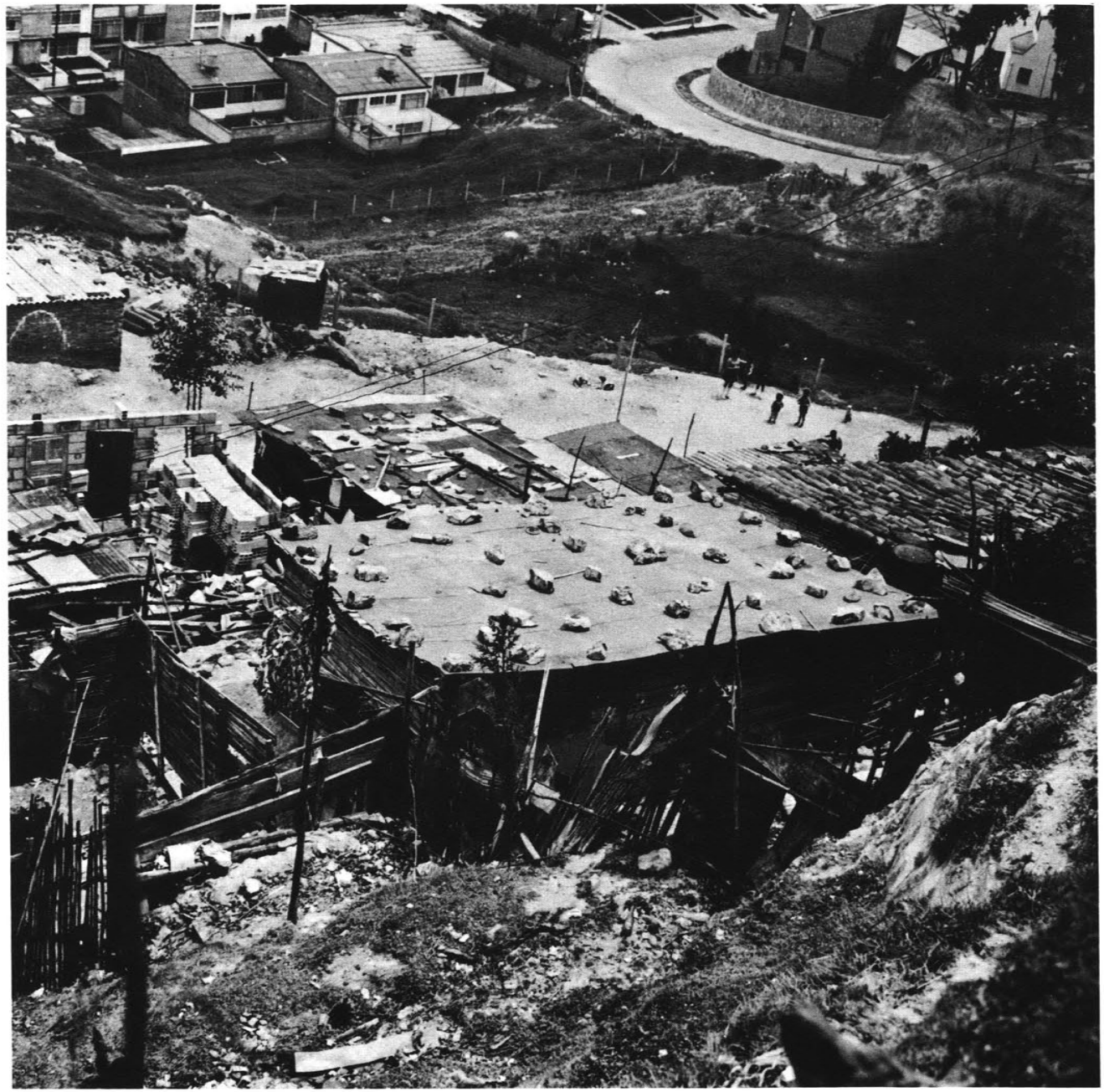
SCALE IN METERS

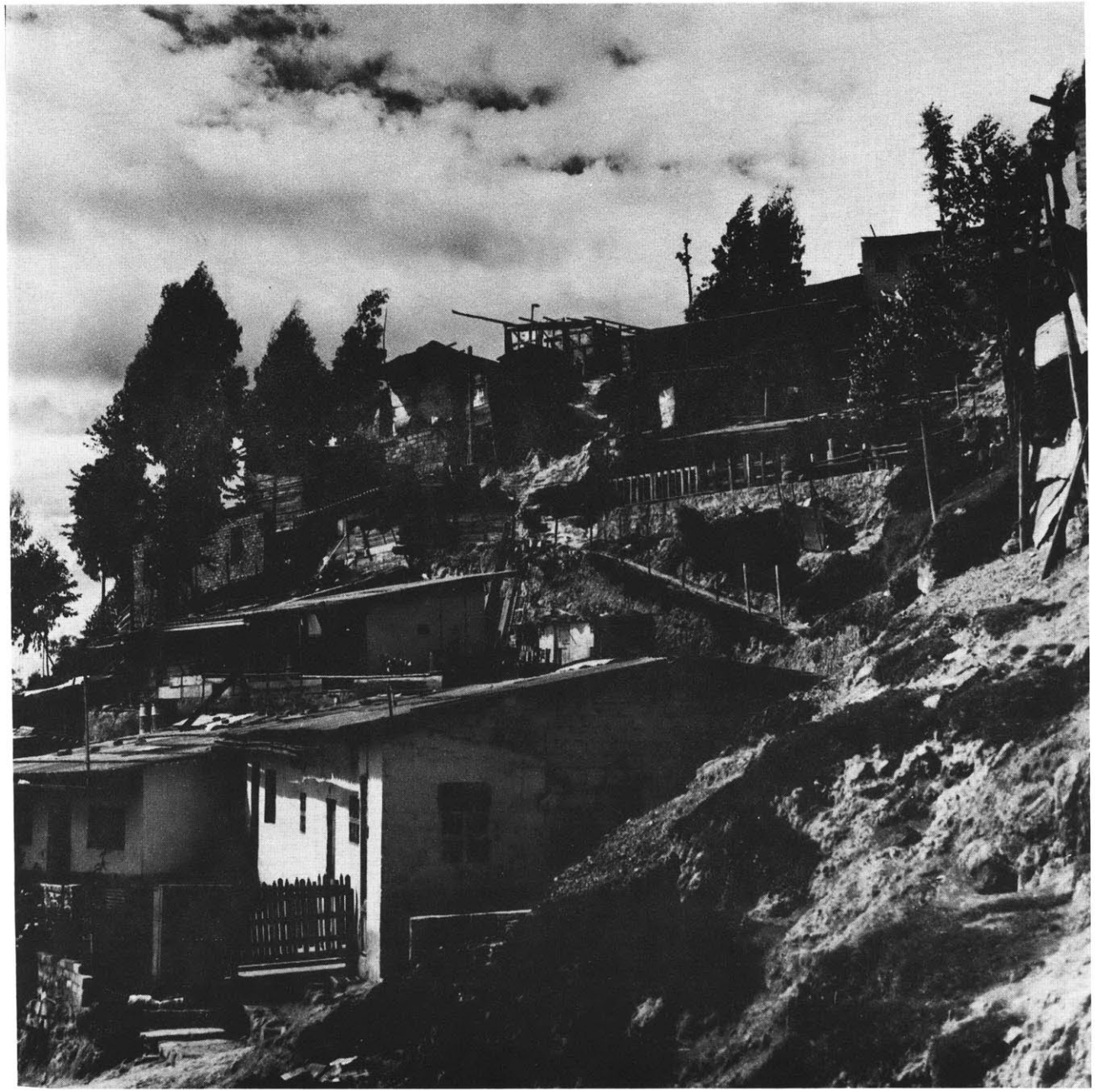


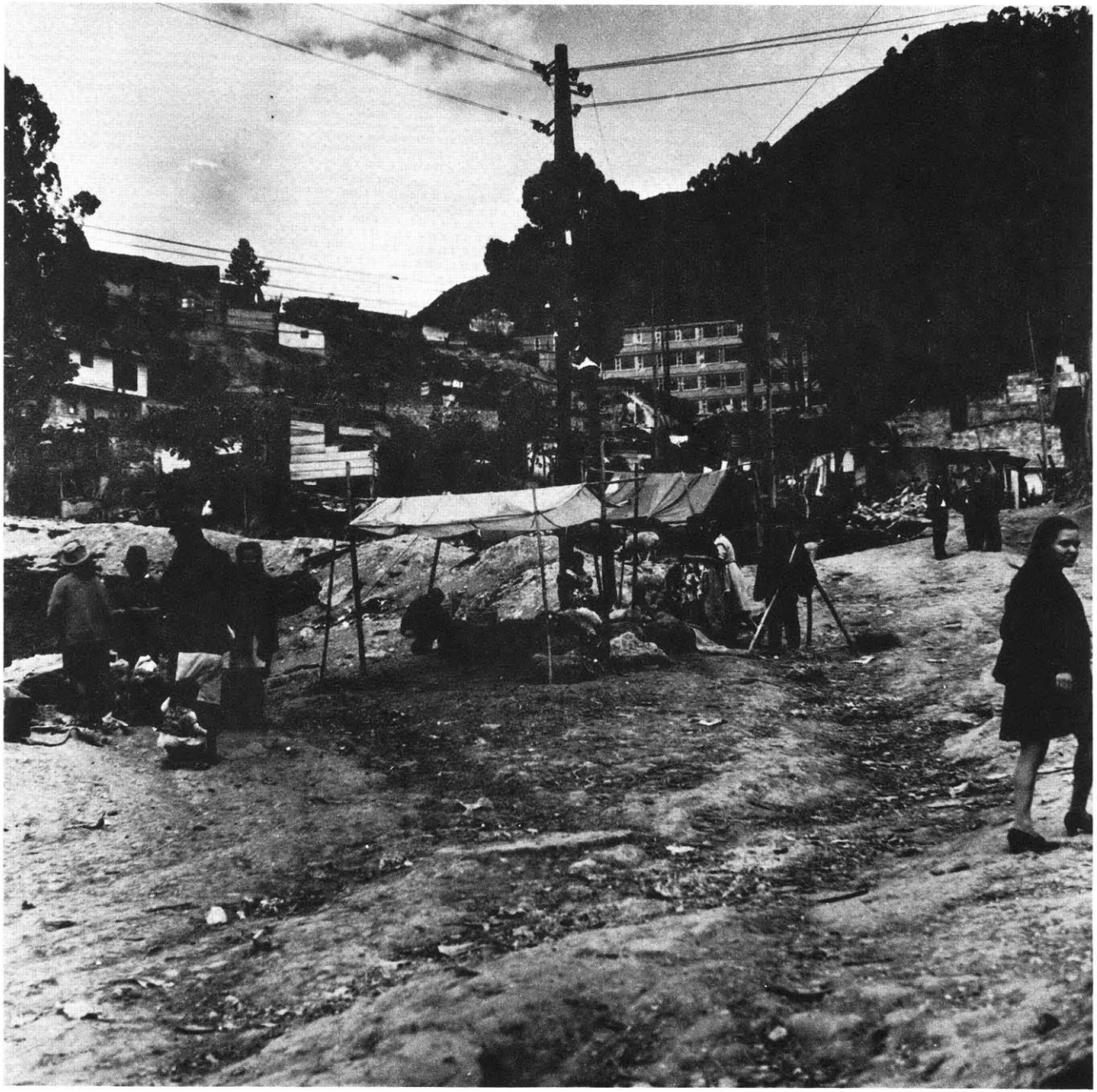




BARRIO JUAN XXIII
TYPICAL DWELLING







LAS COLINAS

3.300 INTRODUCTION

Las Colinas is a large, ten year old squatter settlement located on the steep slopes of a re-entrant valley in the southern sector of the city. The land was originally owned by the San Carlos Hospital. It is a barrio economically integrated into the southern half of the city, a sector composed of lowest and low income groups. The major entry is Calle 34 south, which is the principal and paved road of the barrio as well. The barrio is bounded by the development "Gustavo Restrepo" to the north at Calle 34; to the west, the Avenida Caracas; to the east the property of the San Carlos Hospital; and to the south the Barrio "Resurrecion." The settlement, composed of lots of 80 to 90m^2, situated on slopes of 45% average slope, (9) occupies a site of 12.16 hectares of land approximately 5 kilometers from the center of the city.

3.310 HISTORY

Las Colinas was settled in November of 1960 by a well coordinated invasion organized by La Central Nacional Pro-Vivienda. (The National Center for Housing, Pro-Vivienda.) A first attempt was expulsed by the army but not the second that took place one month later. Its development, also well planned and administered by Pro-Vivienda, can be characterized as follows:

> The majority of the inhabitants of Las Colinas established their claim from 1963-1964, although there was a considerable increase from 1965 to 1967 which tells us that before arriving at Las Colinas they arrived at another place in Bogota. (10)

The population continues to grow. When the Caja de la Vivienda Popular (the Caja) arrived in 1968 to begin a program of barrio improvement, site protection, and infrastructure installation, "there was only one vehicular dirt road without any maintenance and pedestrian ways

(9) Florey, Victor M., Dr.,"Plan de Habilitacion Urbana Barrio, 'Las Colinas,'" ASCOFAME, Bogota, 1969, p. 12

(10) Caja de la Vivienda Popular, an unpublished study of Las Colinas, 1968.

equally uncared for. There was potable water from 42 community water faucets of rationed service and a school of 12 classrooms constructed by the District Administration. There are 940 substandard units constructed in most part of provisional materials." (11)

3.320 THE LOCALITY

A. Map locating barrio in city
B. Site in surrounding area
C. Site Plan

3.330 THE INHABITANTS

The population of Las Colinas in 1967 was 6,236. (12) As shown in the Age-Sex Distribution Chart, it has grown dramatically, as indicated in the following chart:

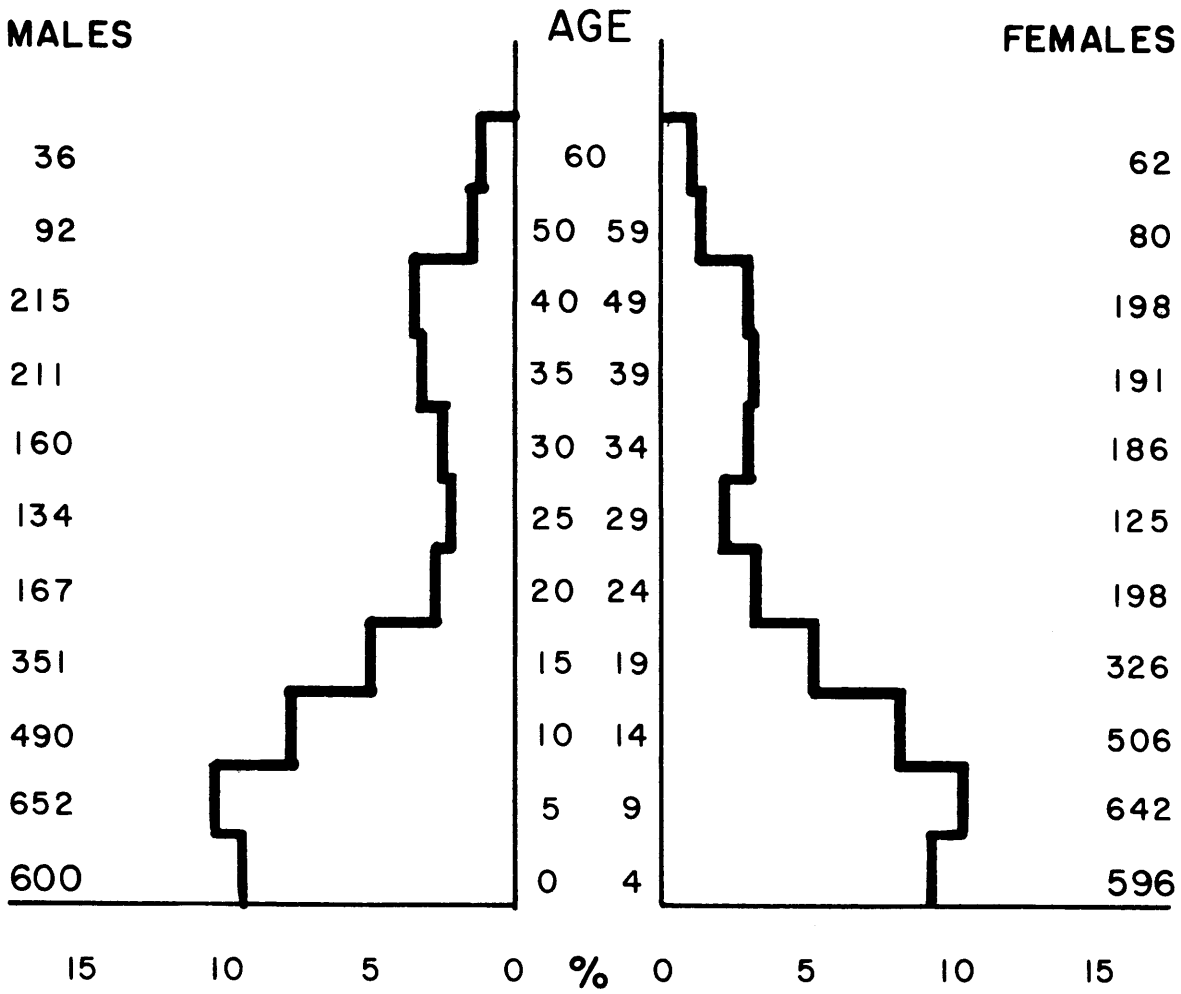
Las Colinas: Age Sex Distribution for 1967

Total Males			Total Females	
%	No.	Age	%	No.
9.6	600	0- 4	9.6	596
10.5	652	5- 9	10.2	642
7.8	490	10-14	8.2	506
5.0	351	15-19	5.2	326
2.6	167	20-24	3.2	198
2.1	134	25-29	2.0	125
2.5	160	30-34	3.0	186
3.5	211	35-39	3.2	191
2.2	125	40-44	1.9	120
1.4	90	45-49	1.3	78
1.1	67	50-54	.8	49
.4	25	55-59	.5	31
.8	50	60+	1.4	87
50.5%			49.5%	

Source: ASCOFAME Report #19

(11) Ibid.
(12) Andrade, Gabriel. L., Habilitacion de un Barrio de Invasion en Bogota. Las Colinas in Migracion y Desarrollo Urbano, Ramiro Cardona (ed.), ASCOFAME, Bogota, 1969, p. 243.

LAS COLINAS : AGE SEX DISTRIBUTION



TOTAL MALES = 3,048
= 48.8%

TOTAL FEMALES = 3,188
= 51.2%

TOTAL POPULATION = 6,236

PERCENTS TAKEN OF TOTAL POPULATION IN 1967

According to the 1967 data the population between 15 and 60 years of age is 41.46%; those under 15 years of age are 55.8% of the population; and those over 60 years old are 1.58% of the population. This distribution is typical of low income settlements. The economically active segment is responsible for three other persons than himself.

The barrio contained 940 families in 1967, each with his own lot. This number will be reduced to 821 families, a number established by the Caja. The 119 units to be eradicated are built under high tension lines and considered unsafe. (13)

The densities produced by the 1967 data are 77.5 dwellings/ha. and 512 people/ha. The dwelling unit density established by the Caja is 67.4 dwellings/ha. The estimated population for 1970 has grown to 10,000 people. It can be attributed to natural increase and to the rental of newly constructed rooms added to a dwelling to help pay for the construction of a home of permanent materials.

3.340 SITE ANALYSIS

The site of Las Colinas is situated at an altitude that ranges from 2595 to 2670. A heavy mat of grass grows from the solid packed base that has helped to absorb much of the rain and control the drainage. This is especially important since Las Colinas has slopes up to 75% grade and a 45% average. (14)

This cover has been disturbed and in places destroyed by construction allowing the runoff to mud-coat stairs and streets. Erosion will not be a serious problem, however, for the high priority of site protection has established programs of retaining walls and public stairs now

(13) Caja de la Vivienda Popular, "Tratamiento de Asentamientos Urbanos Subnormales, una Experiencia, Barrio" Las Colinas, Caja de la Vivienda Popular, Bogota, 1969, p. 10.

(14) Florey, Victor M., Dr.,"Habilitacion de un Barrio de Invasion en Bogota, Las Colinas," in Migracion y Desarrollo Urbano, Ramiro Cardona (ed.) ASCOFAME, Bogota, 1969, p. 228.

under construction. Climatically, Las Colinas is typical of Bogota having an average temperature of 14 C. Access to Las Colinas from the Avenida Caracas at Calle 34 and by pedestrian ways that pass through the barrio Resurrection. The possibilities of growth and expansion will be in the densities achieved as the dwellings increase in height. The only available land onto which the barrio may expand is where it abutts with the hospital lands; however, it has not spilled over from pressures of accretive growth, indicating the strength of the police power being exercised to control the barrio's expansion east.

3.341 LAND USE

The land use pattern of Las Colinas has been influenced by three groups: 1) it was established by Pro-Vivienda, 2) then changed by private initiative supplying an expanding range of shops and of services, 3) then changed again by a governmental barrio improvement program that is promoting a site protection project and home improvements. Represented in the following graph in approximate terms is the land use distribution to date:

Las Colinas: Land Use Distribution 1968

Land Use	Area (Sq. Mts.)	%
Circulation	24,500	21.4
Community Space	12,500	9.1
Commercial	------	---
Residential	84,600	60.5
Total	121,600	100.0%

Source:

Commercial activities take place in homes and from stalls or tables set up at the entrance of the barrio and along the principal street. A wide range of services and merchandise is offered daily to the barrio's inhabitants. Daily, 52.80% of the community use the facilities for their market needs. (15)

Other community facilities are proposed and under construction by the Caja. The barrio's acceptance of the Caja and its program is

(15) Andrade, Gabriel L., Habilitacion de un Barrio de Invasion en Bogota, Las Colinas, in Migracion y Desarrollo Urbano, Ramiro Cardona (ed.), ASCOFAME, Bogota, 1969, p. 243.

being rewarded by a considerable investment in community facilities and site protection as public stairs and retaining walls. Circulation within the barrio has begun to be redistributed, as the public stairs built of permanent materials replace abandoned stairs carved into the earth. The steeper inclines had been abandoned due to rain and neglect.

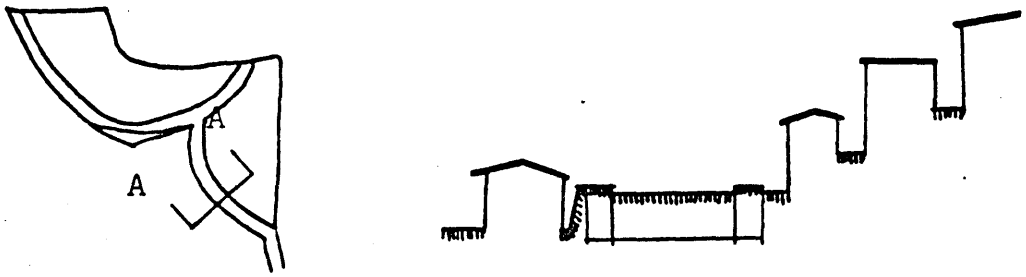
The legally and physically secure site facilitates development and maintenance of pedestrian and vehicular circulation. Development is encouraged by financial programs offered by the Caja.

3.342 CIRCULATION

The following graphic descriptions of the component parts of the circulation system illustrates both topographical and dimensional characteristics of the barrio:

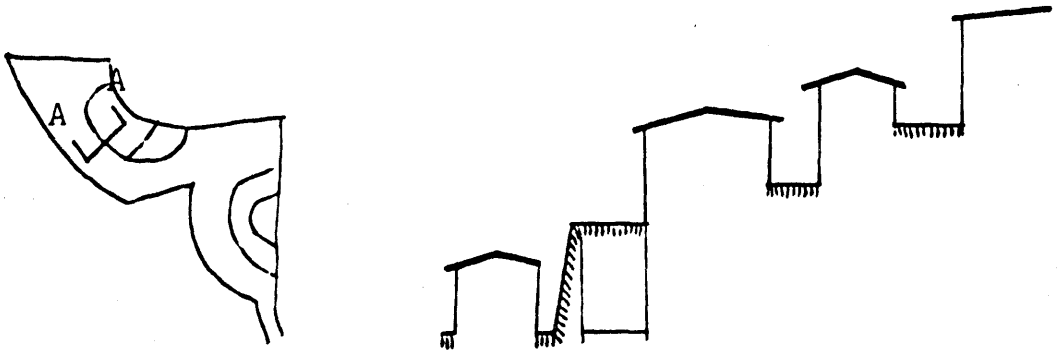
1) Streets

a. the principal street is concrete surfaced and has a 0-5% slope



Section AA

a. the secondary streets are dirt surfaced



Section AA

2) Pedestrian ways

a. for horizontal circulational the streets serve as pedestrian ways
b. for vertical circulation the pedestrian way is a public stair built of brick

Section A-A

COMMENT

The program of building pedestrian and vehicular circulation ways of permanent materials now under construction is a major factor of site protection that is needed due to the slope and the erosive effect of the rain.

3.343 INFRASTRUCTURE

Las Colinas has resolved its problem of infrastructure through its own resources, politically motivated projects, and programs of the Caja. As part of the program initiated by the Caja, electric power lines were built along the paved principal road to serve the houses fronting the street. Current has been pirated from the main line by a spectacularly chaotic web of clandestine wires spreading over the barrio. There is 74.10% of the barrio which has electricity installed in the houses. (16)

In an attempt to win favor with the community and gain support in the coming elections, the municipal government installed 42 public faucets in 1968. The faucets serve 93.43% of the barrio. (17) A sewer system linked to the citywide network did not exist before the Caja arrived. A sewage system was installed by the Caja in 1969 as the first part of a barrio improvement program. Before that 63% of the units had an outside latrine and 17% had septic tanks. (18)

The inhabitants are served by four public telephones located conveniently at the school.

The community is expanding its facilities. Including the facilities now under construction and programmed by the Caja there is an eighteen (18) classroom school now functioning, a

(16) Ibid., p. 241.
(17) Caja de la Vivienda Popular, an unpublished study of Las Colinas, 1968.
(18) Andrade, Gabriel L., Habilitacion de un Barrio de Invasion en Bogota. Las Colinas in Migracion y Desarrollo Urbano, Ramiro Cardona (ed), ASCOFAME, Bogota, 1969, p. 241.

twenty four (24) classroom school to be ready in late 1970, a "centro de integracion communal" that will be a health daycare and adult education center upon completion, a café and social gathering place, an artisan instruction center and a large multipurpose room, a basketball, volleyball, and tejo court. There is now an inadequate garbage collection and medical service. Open spaces within the barrio, other than those associated with the school complex, are limited to the tejo court and private terraces, public stairs and streets. The fact of the slope helps to relieve the crowded feeling in areas of similar densities but built on flat sites. The Caja's plan calls for the eradication of the 112 units under the high tension lines, thus creating a large open space that has to date been described as a "green zone." No plans for the area's development have been presented.

COMMENT

The area under the high tension lines, if it continues to have no plan for its use and maintenance will become a huge dump.

3.350 SOCIO-ECONOMIC DESCRIPTION

3.351 INCOME

The Income Distribution Chart shows the economic capabilities of the barrio's inhabitants. According to 1967 data, the segment of the population economically active (21-55 years old) is 40%, of which 14.59% have permanent work; 9.2% have temporary work; 14.43% are occupied in non-productive activities as house-wife; 20% are students; and 2.52% are unemployed. (19) The approximate distribution of funds is the following: food--50%; housing--20%; clothing--10%; miscellaneous--20%. The average family income is $600 pesos/family. (20) Those

(19) Ibid., p. 245.
(20) Ibid., p. 246.

Las Colinas: Income Distribution 1967

Income/Month (in Pesos)	No. of Families	%
0- 200	37	4.8
200- 400	153	19.8
400- 600	212	27.5
600- 800	109	14.0
800-1,000	112	14.5
1,000-1,200	53	6.8
1,200-1,400	25	3.2
1,400-1,600	19	2.4
1,600-1,800	9	1.6
1,800-2,000	18	2.3
2,000+	25	3.1
Total	772	100.0%

Source: Micracion y Desarrollo Urbano, p. 247

Note: Subsistence level income is 600/mo.

working are either self-employed or employed by someone as musicians, brick layers, shoemakers, merchants, street vendors, or unskilled laborers.

3.352 EDUCATION

The general level of education in Las Colinas is relatively high. There are 13.95% of the population who know neither how to read or write; that is 7.81% of the men and 13.20% of the women older than 7 years old are illiterate. Of those 21-55 years, 9.8% are illiterate; and of those 7-15, 8.21% are illiterate, of which the percentage of illiterate women is approximately double the number of men. (21)

The definition of just what exactly is a literate person is not clear. To be functionally literate is one defintion. It means that a person can sign his name, but no more.

3.353 COMMUNITY ORGANIZATION

The residents of Las Colinas were first organized for their invasion by the Centro Nacional Pro-Vivienda (Pro-Vivienda). The leaders of the barrio after the invasion were members of Pro-Vivienda. The organization collected three pesos as monthly dues and payments on the 800.00 pesos charged for the lot by the Pro-Vivienda organizers. The community, tired of paying, became dissatisfied with their leaders. The municipal government, to gain favor and

(21) Ibid., p. 244.

votes in the area became involved in the barrio's politics. They initiated an official group, the Junta de Accion Communal, encouraging the dissident group to split from the original organization and join it. The barrio was thereby divided into three components--the small, well organized Pro-Vivienda group, the much larger but less organized Junta de Accion Communal, and the large indifferent group that represented the majority of the population.

This was the situation until the Caja arrived in 1968. Following the recommendation of the Centro Colombiano de la Construccion's report, a new organization was imposed on the barrio by the Caja that chose to ignore those groups already existing. The orientation of the new organization was to organize the barrio spatially by sector, not socially according to familial group or cultural ties. The Caja named sector leaders who were not necessarily the same as the barrio leaders. The result was to further complicate an already confused situation by alienating the barrio leaders and causing a vacuum at the community level in leadership. The barrio still lacks the leadership to unify its fragmented structure.

Funding agencies and other groups that worked in the barrio and are presently involved in the barrio's development are:

A.
1. In Caja de la Vivienda Popular--those responsible for execution of the plan.
2. El Centro Colombiano de la Contruccion--Assessor in the technical and social field.
3. El Departamento Administrativo de Flaneacion Distrital.
4. La Universidad de la Salle, with 4 students in their last year and a supervision of field work in community action projects.
5. La Associacion Colombiana de Facultades de Medicina ASCOFAME, with a representative in the field of health.
6. Las Dependencias y Entidades Distritales when a function or operation fall within their jurisdiction.

B. The agencies next to become involved:
1. Sena. Teaching Basic skills

2. In Superintendencia Bancaria - COOPS.
3. El Centro Marista de Accion Social
4. El Instituto de Capacitacion para el Trabajo
5. Caritas Nacional
6. PAO. Working through the world food plan
7. Empresa Comunitaria de la Estradita
8. Brigada de Institutos Militares. With labor for the construction of relocation shelters in an area different than the Barrio Las Colinas for the 119 families that have to move from under the high tension wires.

3.354 TENURE

The problem of tenure in Las Colinas is being resolved as a part of the program sponsored by the Caja. Families are purchasing their claimed lot under a program of supervised credit. The acceptance by the barrio of such a credit program is met, however, with considerable resistance. "In the legal aspects, besides that which has been mentioned about the settling, the problems of the situation in general, it seems appropriate to mention 90% of the families want to obtain title to their lot, but 100% reject the idea of buying what for so long had been considered theirs." (22) It is perhaps the 10% who did not want to obtain title to their land who are still holding out against the Caja's program.

3.360 THE DWELLING UNIT

3.361 THE FAMILY

The social and physical units that compose the barrio are described in terms of family and by dwelling. A typical social unit is a nuclear family with an average size of 7 persons. In Las Colinas, 87.66% of the families are composed of father, mother, and children (a number considerably higher than that of Juan XXIII). 73.26% of the heads of families are men and 24%

(22) Florey, Victor M., Dr., "Plan de Habilitacion Urbana Barrio, Las Colinas," ASCOFAME, Bogota, 1969, p. 14.

are women. The civil status of the population older than 15 is:

Las Colinas: Civil Status 1967	
Status	%
Free Union	6.23
Widows	5.12
Separated	1.76
Married	60.07
Bachelors	27.67

Source: Migracion y Desarrollo Urbano, p. 243

3.362 THE DWELLING

The range of dwelling unit types existing in the 940 units are classified and presented according to the rancho, its dimensions and elements, and the unit, built of permanent materials financed and proposed by the Caja.

Element	Rancho		Caja
lot size	6x15m. approx. 90m^2, for 32% of the units		7x14m. approx. 80-90m^2
constructed area/lot	20m^2 average for 605 of the units		60-65m^2
open area/lot	50m^2 approx.		10-20m^2
area/person of constructed area	10m^2 and more	1.63%	8m^2
	5-10m^2	12.16%	
	3-5m^2	35.95%	
	0-3m^2	44.26%	

element	rancho		Caja		
rooms and rooms sizes	only one room	61.59%	liv.-din.	4x4m	
	two rooms	28.00%	bedrooms	3x3.5m	
	three rooms	7.61%	bath	2x2m	
	four rooms	2.28%	terrace	1.5x3m	(23)
CONSTRUCTION MATERIALS					
roof	asbestos cement	26%	asbestos cement		
	paper or cardboard	20%	concrete slabs		
	tin sheets	17%			
	scrap metal	14%			
floor	earth	55%	cement		
	wood	35%	brick		
	cement	10%	cement tile		
walls	bamboo	35%	brick		
	bahareque	29%	cement blocks		
	wood	16%			
	scrap tin and wood	9%			
	brick	5%			
windows	wood shutters		metal frames		
	wood and metal bars		with glass panes		
	metal frames with glass panes				
doors	wood		metal		
	metal				

(23) Andrade, Gabriel L.,"Habilitacion de un Barrio de Invasion en Bogota. Las Colinas," in Migracion y Desarrollo Urbano, Ramiro Cardona (ed.), ASCOFAME, Bogota, 1969, pp. 239-241.

element	rancho		Caja
foundations	wood	41%	stone
	fill	24%	
	stone	11%	
	earth	9.5%	
	bamboo	8.0%	(24)

There is a great deal of activity going into building dwellings of permanent materials.

3.363 DESIGN AND DEVELOPMENT

The plan established in 1960 by Pro-Vivienda was of blocks parallel to the contours, subdivided into lots 6x15m.; approximately 32% of the lots are of this dimension. The dwellings were constructed by individual families who contracted builders, or by "mingas"--groups made up of members of different families. The program established by the Caja defines responsibility for particular improvement and the developer of those improvements, promoted in the barrio. "The position of the Caja and its program is the following.

1. The projects should adjust themselves to the minimum standards required and respect, as much as possible, the existing structures.
2. In the situation of a high density population, the projects will have to be accomplished in a manner that allows the normal rhythm of the barrio's activities to continue, that is to accomplish the equivalent of a delicate operation without anesthesia.
3. To establish sales price of the land it was necessary to utilize a system that permits the differentiation between lots according to their ease of access and location."

(24) Ibid., p. 241.

3.364 THE CAJA'S PROGRAM

The following description of the Caja's program was translated from a technical bulletin on Las Colinas. We retain, as nearly as possible, their language and self-image:

"1. The specific sources of work were established considering the nature of the actions of the different aspects of the plan in the following manner:

a. In policy making: Administrative (at the level of fixing the objectives and problems--The Director). Establishment of priorites of action. Establishment of systems of work. Arrangement for equipment. Establishment of standards and controls.

b. In the legal-administrative aspect: (at levels lower than the Director). Pricing the lots and the dwelling units. Establishing title to the land, arranging loans, rehabilitating the roads.

c. In the physical aspects: (at levels lower than the Director). Pricing the lots and the dwelling units.

c. In the physical aspects. 1. (Projects produced by contract)

a. paving the principal roads
b. construction of the sewage system
c. construction of the water system. Construction of the electric system. Installation of public telephones.
d. enlarging the school
e. construction of a Centro de Integracion, fixing up green zones.

2. (Projects to be built by the Caja in collaboration with the community)

a. fixing up of secondary roads
b. fixing up pedestrian ways and public stairs
c. relocation of dwelling units in the way of stairs, streets or power lines
d. relocation of families
e. construction of sanitary units

3. (Projects accomplished by the community with assessing by the Caja and physical improvement to the dwelling unit and lot.)

   d. In the social aspects
   Development of the community through strengthening the sense of community. Cooperatives, employment office, various social aids.

   Classification and the resulting treatment of groups and cases. Classification and the resulting treatment of structures and motivation of groups for the community efforts and to improve the physical situation of the barrio." (25)

MODIFICATIONS OF THE BARRIO

The majority of improvements effected in the community before the intervention of the Caja were effected by the brave, who proceeded to begin building a permanent structure without the security of tenure. The rancho was used as dormitory and storehouse. Around it, as time and money permitted, a structure of brick rose. When the unit was completed the rancho was destroyed carefully to be able to utilize the still useful parts as windows, doors, roofing material, etc. The process is common and functions well, taking best advantage of the families' available resources. The process was, however, short circuited by the Caja's program of barrio improvements. The program, proposed by the Centro Colombiano de la Construcion under contract of the Caja, outlining a rigid set of priorities and procedures. The priorities were 1) at the family level the construction of a sanitary and kitchen unit, and 2) at the community level, the construction of services and pedestrian and vehicular circulation as part of a site protection program. The Caja backed the construction program with a financial scheme that was offered to those who wished to take advantage of it. The residents preferred, however, to build their dwellings but were in agreement as to the need for site protection. One family demonstrated the more pressing need of an adequate shelter by moving into their bath kitchen unit upon completion. The Caja's architect in charge of the project, German Ruiz, initiated a much more flexible program of loans and technical aid for the dwelling unit as well as the sanitary

(25) Florey, M. Victor, Dr., "Plan de Habilitacion Urbana Barrio, Las Colinas," ASCOFAME, Bogota, pp. 7-8.

unit. A service was established to help the residents interpret their ideas of what they wanted for this house with architectural plans that local contractors or a family would build. The construction of public stairs is being built by barrio labor following plans designed by the Caja. There is a great deal of work happening in the barrio supported by financial and technical services that enourage community participation.

COSTS

The project costs to the community are for the lot, installation of services, construction materials, labor and interest on loans sponsored by the Caja. Prices established by the Caja for lots, including the paved street and services for that lot, are:

a. for the lots that are the highest up the slope and furthest from the main circulation are priced at 45.50 pesos as the maximum price per m^2.

b. for the lots that are most central and closest to the main circulation are priced at 45.50 pesos as the maximum price per m^2.

c. the other lots fall between these prices per m^2.

The installation costs for services from the main line to the unit are 63 pesos for light and 2,000 pesos for water. There is no charge for the sewage connection.

Construction materials are available at the following prices for 1970:

		pesos
1.	brick, 8x12½x25cm.	350/1000 bricks
2.	split bamboo roll, 1 ft. diameterx4-5 feet long	8/roll
3.	cement, 50 kilo bag	22/bag
4.	corrugated tin, 1.8x.90m sheet	75/sheet
5.	asbestos cement, 1.8x.90m sheet	28/sheet

6.	cement block, 10x20x40cm.	2,000/1000 blocks
7.	Clay tile block, 10x8x25cm. increasing to 40x8x25cm.	1,200/1000 blocks increasing to 1,600/1000 blocks

Labor is calculated by the Caja as 20% of the loan of the dwellings. The terms of payment for the loan supervised by the Caja are established according to capacity to pay. The factor that allows flexibility in the payment schemes is time. Loans are also made in two parts, the second part contingent upon the termination of the project built with the first loan. The ceiling on loans has been raised recently to accommodate more ambitious projects undertaken by the residents.

The value of the average loan for the first stage is 6,000 pesos with 8 years of amortization. It is for the projects of the sanitary unit, the infrastructure and site protection and the lot. The second stage of the loan for the progressive development of the dwelling unit is 9,000 pesos with 8 years to amortize the loan. (26)

The previously established ceiling of 15,000 pesos has been raised to 17,500 with monthly quotas fixed according to financial capacity. Caja monthly loan quotas residents for 1970

	2 Programs	
loan in pesos (1 peso=$.06 US)	quota/mo. for 10 yr.	quota/mo. for 20 yr.
6,000	-----	73
12,000	133.22	85.97
15,000	-----	111.00
17,500	194.28	125.37

Interest on the loan is 6% due to use of monies borrowed by the Caja from the ICT, the national housing agency.

(26) Ibid., p. 11.

LAS COLINAS PHOTO ESSAY

BARRIO LAS COLINAS

CITY SECTOR

0 50 100 200 400 800

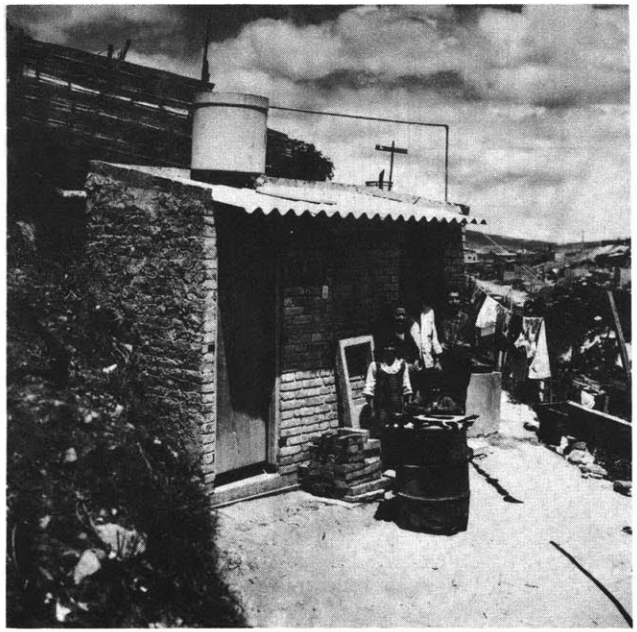
SCALE IN METERS

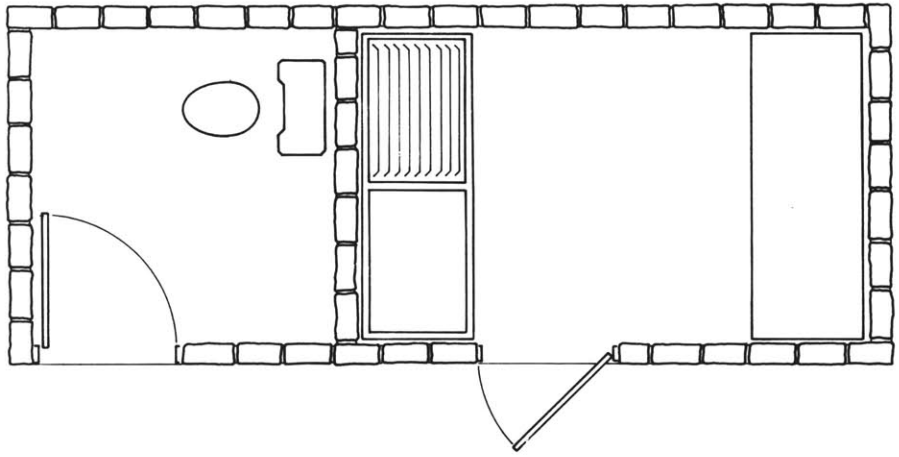
BARRIO LAS COLINAS

BARRIO PLAN

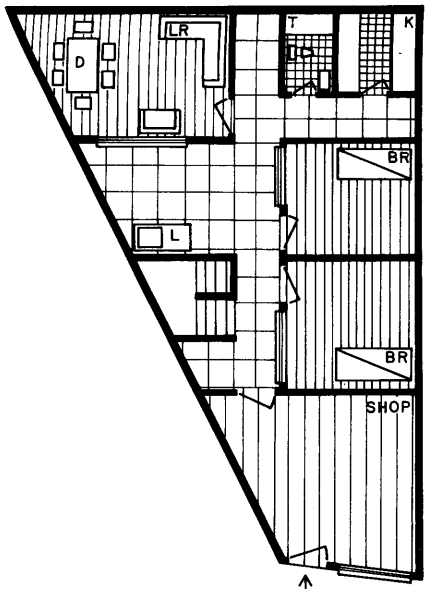
0 10 20 30 40 50 100 200

SCALE IN METERS

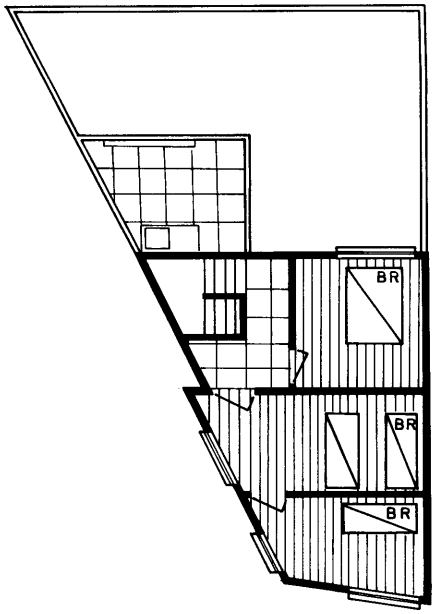




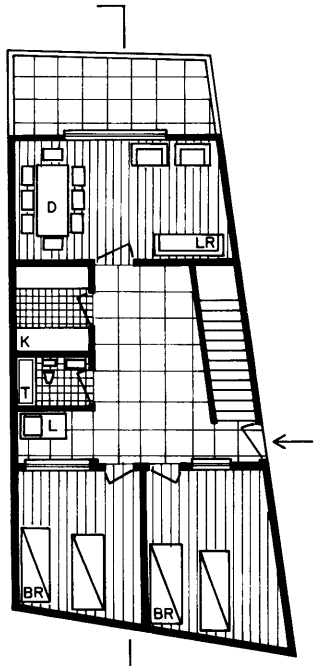
BARRIO LAS COLINAS
TYPICAL KITCHEN BATHROOM UNIT



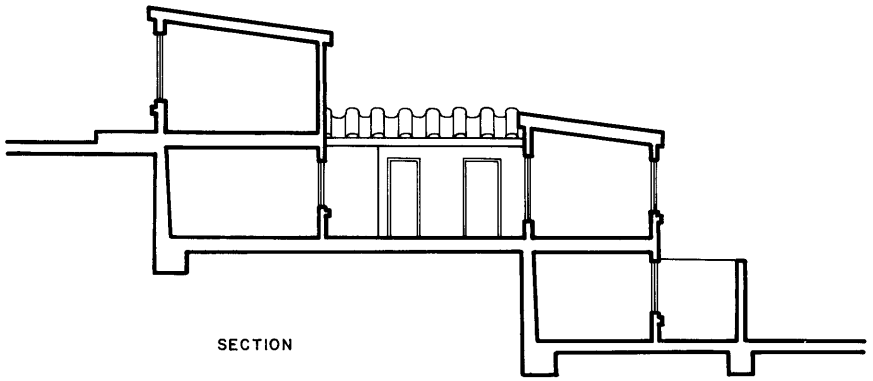
PLAN, FIRST FLOOR



PLAN, SECOND FLOOR

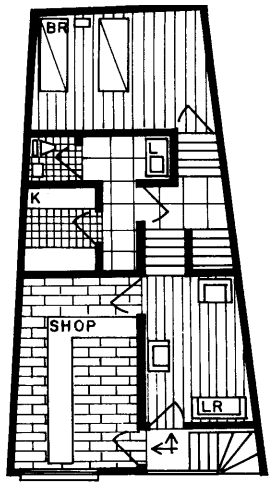


PLAN



SECTION

BARRIO LAS COLINAS
TYPICAL DWELLING



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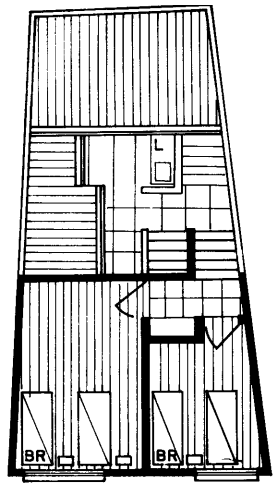

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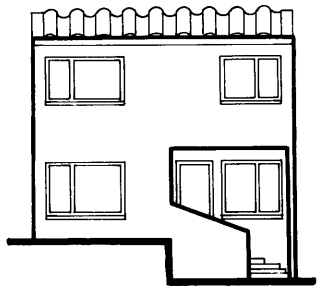
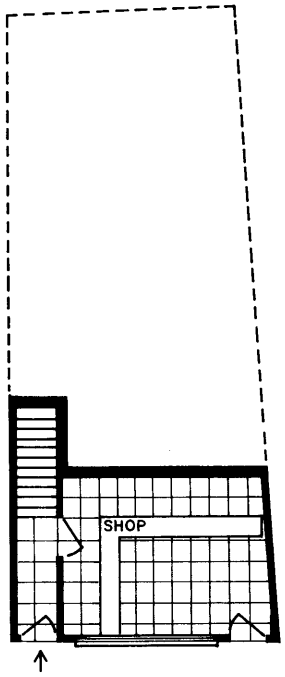


ELEVATION



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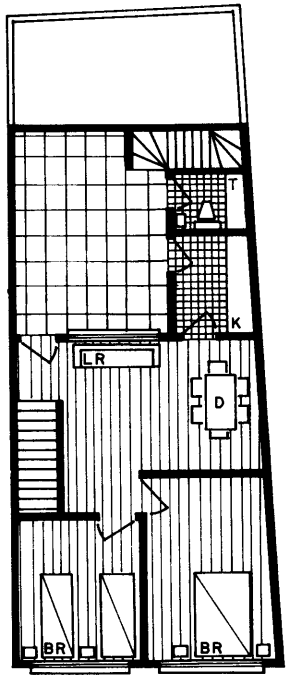

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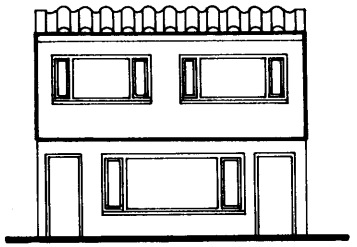
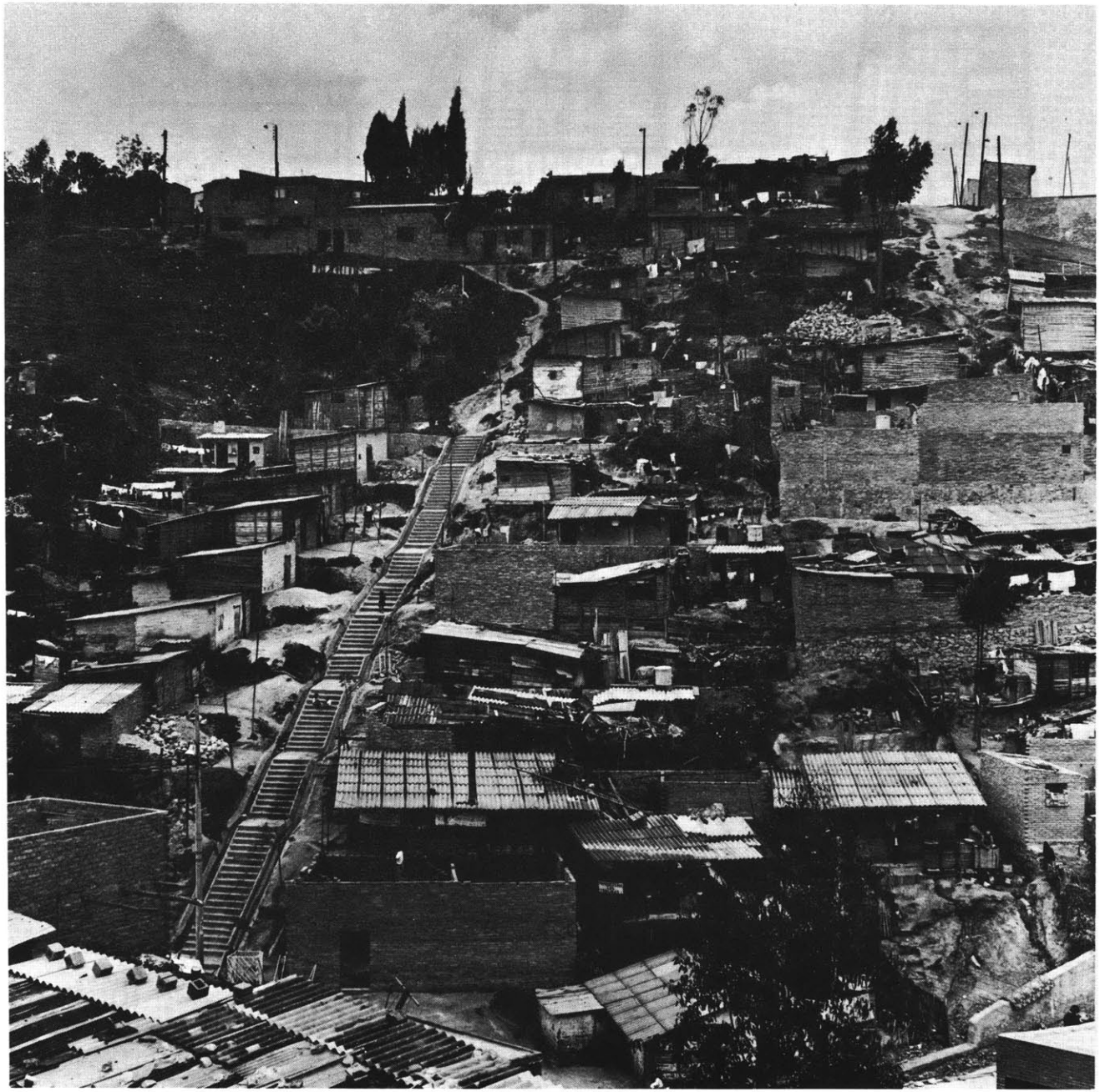
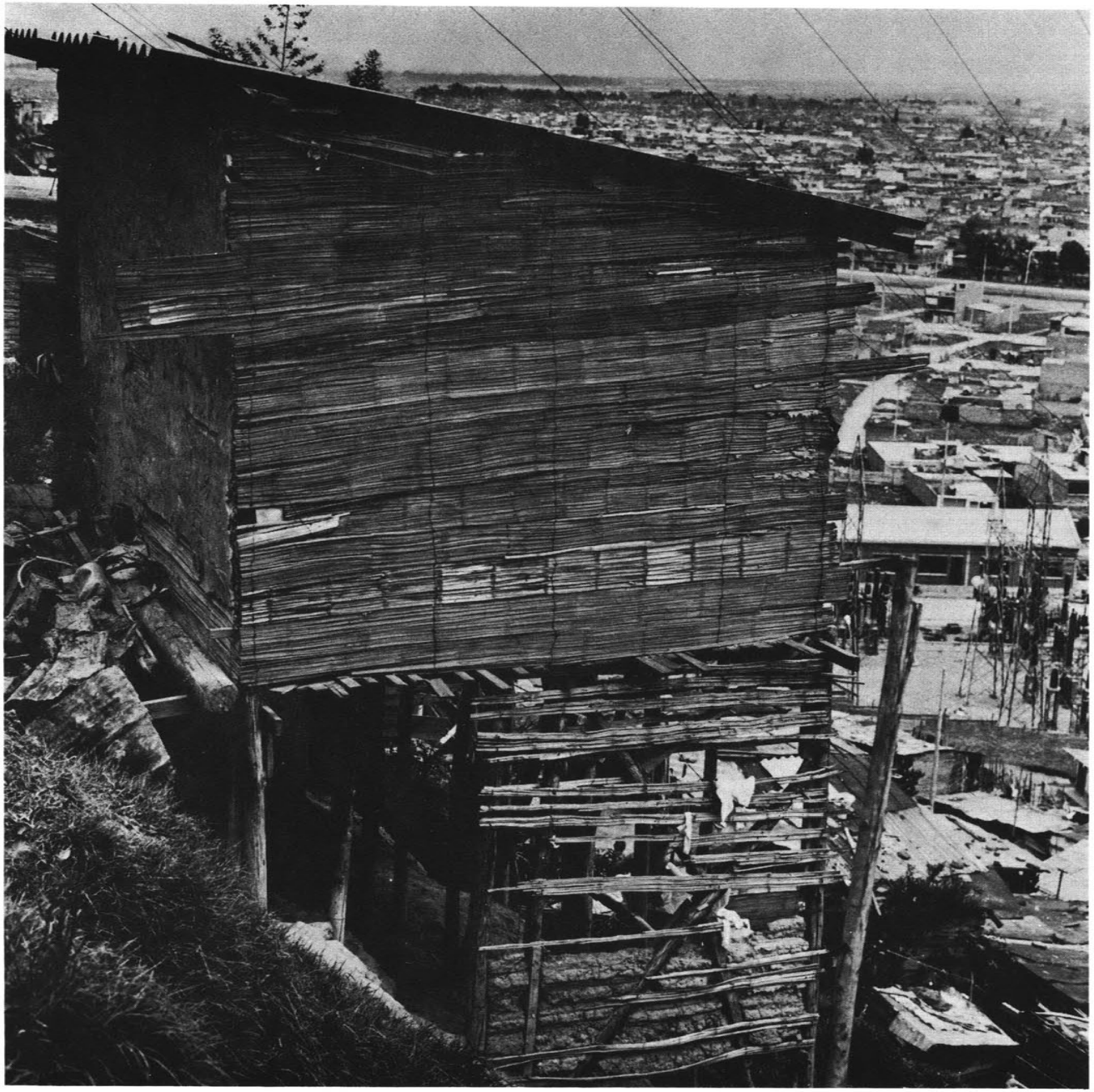


ELEVATION

BARRIO LAS COLINAS
TYPICAL DWELLING





LOS LACHES

3.400 INTRODUCTION

Los Laches is a large low-income housing project built by the Caja de la Vivienda Popular, (Caja). The development is situated on steep slopes in the southeast sector of the city. The site was partially settled by a squatter settlement of dubious fame before the Caja began to redevelop it. Los Laches is economically integrated into the surrounding worker barrios. The major entry is Calle 6A, which becomes Diagonal 4B and 5 as it winds through the barrio as the principal street. The site is bounded by the circumferential road to Villavicencia to the south and east; to the north, El Rocio; and to the west, El Guavio. The project is composed of lots 5x17.3m. or 86.5m^2. It is situated on slopes of 10-20% average grade that leaves the vast majority of the steep site vacant. Los Laches occupies a site of 38.8 hectares of land approximately 1.6 kilometers from the center of the city.

3.410 HISTORY

Los Laches was settled initially by invasion. Its population grew by accretion to about 190 families. The condition of the barrio was described in the report sponsored by the Caja.

> The construction (of the dwellings) consists of a room made of boards and sheets of scrap metal and paper cartons. These rooms serve as bedroom, kitchen, and washroom, etc.
>
> The occupations of these people are newspaper and lottery ticket seller, brickmason, shoemaker; only six persons of the community work in the District, many are petty thieves; this is deduced from the fact of the lack of employment. They live without any sanitary provisions and free union dominates as the civil state. (27)

(27) Caja de la Vivienda Popular, unpublished, "Informe de las Actividades desarrollad as por estudiantes de trabajo Social de la Universidad Nacional en practicas, en el Barrio 'Los Laches' durante los anos de 1967-1968.

The Caja began its program of eradicating the old barrio and constructing a new development of 500 units in 1962. The construction of the units and the installation of services is complete.

3.420 THE LOCALITY

a. Map locating the barrio in the city.
b. Site in surrounding area
c. Site plan

3.430 THE INHABITANTS

The population of Los Laches in 1968 was 3,220, as shown in the Age-Sex Distribution chart; it is characterized by under employed and low income permanently employed urban populations. (28) The economically dependent segment of the population includes those under 15 years old and those over 60 years who make up 59% and 1.26% of the population respectively. The economically active segment of the population is 39.59%, of which more than half are women

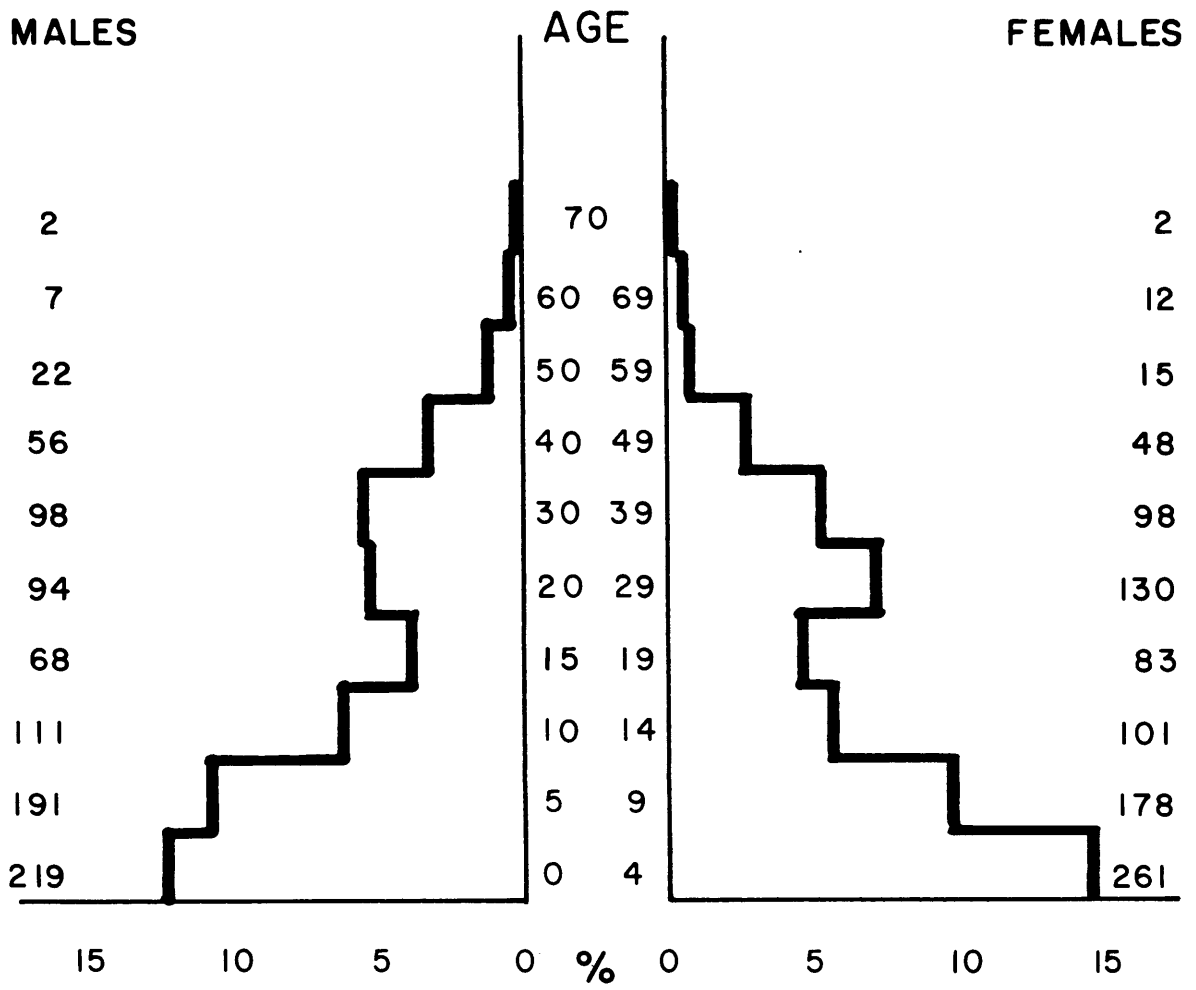
The barrio is composed of 488 families, (29) each with his own lot. The densities that result from the 1968 data are 12.8 dwellings/ha. and 90.2 persons/ha. The estimated population in 1970 of 3,600 is attributed to natural increase and the limited construction of additional rooms.

3.440 SITE ANALYSIS

The site of Los Laches is situated at an altitude that ranges from 2,756m. at the Carrera 9AE to 2,874m. at the circumferential road (a difference of 118 meters). Before the project was initiated the site was covered with eucalyptus trees. These were subsequently cut down

(28) Ibid.
(29) Ibid.

LOS LACHES : AGE SEX DISTRIBUTION



TOTAL MALES = 1,555
= 48.3%

TOTAL FEMALES = 1,670
= 51.7 %

TOTAL POPULATION = 3,220

PERCENTS TAKEN OF TOTAL POPULATION IN 1968

because of the difficulties in laying out the barrio. A heavy mat of grass still covers the extremely steep slopes of the ravines that form the major portion of the site. The grass in the areas whose slope is 10-20% grade has been stripped away and little site protection work has been done to control the erosion. There is a system of canals that pass through the ravines collecting the runoff from the hills. The canals do not, however, collect the water from the streets. The climate of Los Laches is cooler than the center of the town, and there is an almost continual mist.

Access to Los Laches is principally through Calle 6A that becomes Diagonal 4B and Diagonal 5 as it winds through the barrio as the principal street, as well as accessible by the Carrera 10 and 9AE, through the barrio San Cristobal, Choache, Calle 5 and 9. There is access by municipal bus, Fontibon - Engativa, that arrives at the central plaza. Possibilities for growth and expansion are good. Some 500 units are planned for a zone to the northwest of the present barrio. (30)

3.441 LAND USE

The land use pattern designed by the Caja is presented in the following chart:

	m^2	%
Residential	44,807.00	11.53
Circulation	20,520.00	5.28
Community Space	16,700.00	4.39
Commercial	----	---

Of the total area of the site, 388,309.00m^2 or 38.8 ha., only 21.20% or 82,127.00m^2 is developed, leaving 78.8% or 306,182.00m^2 of the site undeveloped. (31)

(30) Ibid.
(31) Ibid.

The priorities of physical and special needs of the community are reflected in the maintenance of the existing facilities. The option of substitution and initiation of other facilities work as corrective factors on the orientation provided by barrio governmental planning groups.

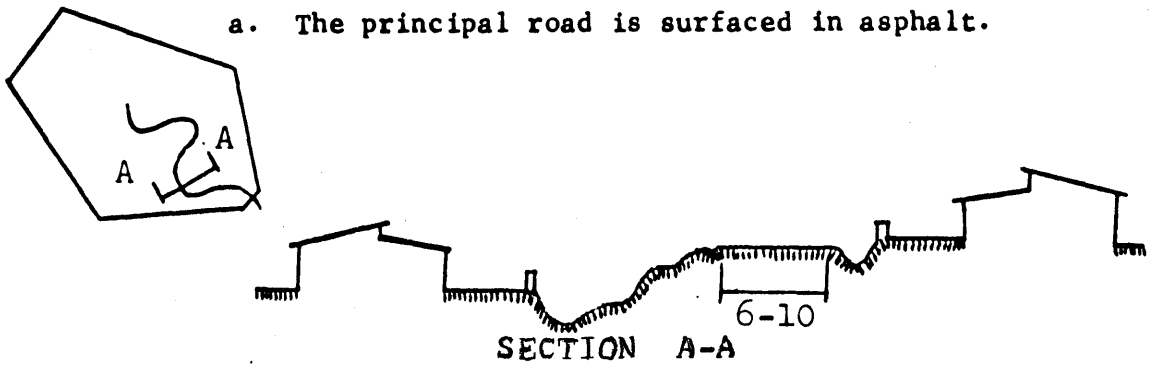
The community has exercised its options of developing facilities other than those that the Caja has provided. Commercial activity, not included in the Caja's land use plan, abounds in the barrio. Small shops occupy rooms designed as living rooms, and from a growing number of stalls in the central plaza, people sell everyday items and prepared foods. There are also more specialized enterprises such as a bakery, a construction materials store, etc. Shopping for items not available in the barrio is done in the center, a 7-12 minute bus ride to the San Victorino market or a 10 minute walk to the market in the neighboring barrio, Egipto. Recreation space has also been developed by the addition of three "tejo" courts.

The inappropriate amount and scale of the circulation has been altered by selective maintenance. According to use and available economic resources certain paths and streets receive the necessary care and attention to keep them serviceable. The other areas suffer neglect and eventually change use, usually to a dump, or abandoned space. Maintenance of the dwelling and its modifications will be described later, but it suffices to say that this has received the majority of attention given to the barrio at the expense of its overall development.

3.442 CIRCULATION

The following graphic descriptions of the component parts of the circulation system illustrate topographical and dimensional characteristics of the barrio.

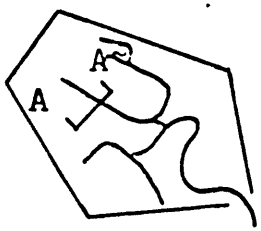
1. Streets
   a. The principal road is surfaced in asphalt.

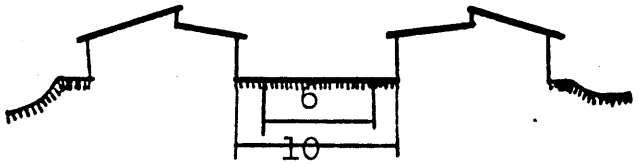


SECTION A-A

2. Pedestrian Ways

a. The pedestrian ways occur in the space allocated between dwellings that may be a street as well. The families have developed their own sidewalk form.





Section AA

b. There are two runs of public stairs of approximately 8 risers each for the entire development.

COMMENT

The Caja's preoccupation with the dwelling unit has left the development of the internal circulation to the efforts of the community. The physical results vary from well conceived stairs sidewalk arrangements to unit/street relationships crudely solved, if at all. Pedestrian and vehicular rights-of-way exist that allow for future development in a site protection program. None as yet has been proposed or implemented. There is the need to revise the circulation plan in a more sensitive solution to the terrain. One vehicular road is sufficient if it follows the contours and maintains a slope that allows the buses and other service vehicles to climb the hill.

There is a tremendous lack of pedestrian infrastructure such as stairs, sidewalks, and flat rest areas. The need for public spaces at the level of the block and the community is great. An opportunity was lost to use the deep ravines that had no possibility of urbanizing as parks and recreation spaces. The lack of the provision for adequate schools clearly shows that the Caja's priority is the dwelling unit.

3.443 INFRASTRUCTURE

The infrastructure provided in the project developed by the Caja is restricted to a traditional definition of infrastructure--limiting it to the services of light, water, sewage, and public telephones. These facilities are connected to the dwellings when a family pays the installation fees for that particular service. It is considered that 100% of the barrio have these services, but in fact, that is not the case. There exists a cluster of provisional houses serviced by a public faucet away from their development. The cluster has no light or sewage facility. Community service and space are not well provided for. Of the 12,000m^2 of parks provided for in the land use plan, one sees very little developed. Of the sites that could be part of the provided recreation space, there is a small sloped, fenced off area of swings and a merry-go-round, but it is locked except on Sunday. The community has provided a few tejo courts, creating the only real flat sites used for recreation in the barrio. There is

a large, flat site that could be developed. At present, this site is used as a bus stop. There are a few stalls that sell groceries and prepare food, there is an open air structure constructed by Accion Communal that fronts on this site and telephone service. An overall plan is needed for this space. There is no primary school. That age group of students must attend classes in the neighboring barrios. A secondary school has classes up to the third year and functions on a split-day session. There is also a health center and a co-op drug-store, and a church.

COMMENT

Regarding the health facilities, there are persons who do not use them because of the five peso charge and the obligation to buy medicine there. An alternative is to bus to the center to a clinic operated by a political party that charges 3 pesos and distributes medicine free. (32) The garbage collection service is not very effective nor consistent in its arrivals. The open slopes of the ravines have been utilized as dump areas.

3.450 SOCIO-ECONOMIC DESCRIPTION

3.451 INCOME

The incomes of the inhabitants of the barrio ranged between 200 and 1,000 pesos/month. 11.33% of those employed earn 1,000 pesos or more. The family head earns up to 600 pesos/month. The segment of the population economically active is 20.67%; of those employed, 49.8% are working in temporary capacities and 41.68% working permanently as domestics, employees in small offices and shops, construction workers, neighborhood enterprises such as bakers, cooks, shop-keepers, policemen, professional soldiers, etc. (33)

(32) Conversation with barrio residents.

(33) Caja de la Vivienda Popular, unpublished, "Informe de las Actividades desarroll ad as por estudiantes de trabajo Social de la Universidad Nacional en practicas, en el Barrio 'Los Laches' durante los anos de 1967-68."

3.452 EDUCATION

The level of education is high. There are an estimated 68% of the school-aged population enrolled in primary school.

3.453 COMMUNITY ORGANIZATION

The organization existing in the barrio was first based on the special concept of "manzanas" or blocks. The blocks were organized into committees with a block president who serves as liaison between the block and the agency. Each block was organized to construct the units they would eventually live in. Blocks instead of lots were assigned, and upon completion the units were awarded by a lottery system.

3.454 TENURE

Tenure is not a legal probelm in Los Laches, it is an economic one. Entry into the barrio and access to a lot was accomplished through a process of selection from applications of potential occupants. Applications were received after a public announcement of the proposed project. They were then judged according to socio-economic criteria, on the orientation of the project, and on the political connections of the applicant. The monthly quota can become a burden if a family is only temporarily employed or earns a subsistence wage that has no emergency funds available. Unpaid installments can cause eviction or the sale of the dwelling. Resident turnover is a problem due to economic pressures brought to bear on marginally employed reisdents. (34)

3.460 THE DWELLING UNIT

The social and physical components of the barrio are described in terms of family groups and dwellings defined in the preceeding case studies.

(34) Conversation with barrio residents.

3.461 THE FAMILY

The average size of a typical family is 6.6 persons/nucleated family. 87.33% of the families have a male at the head and 12.64% of the families have a female as head.

THE DWELLING

The stock plan for the 488 units built has the following characteristics:

element	dimension
lot size	5 x 17.30m., 86.50m^2
constructed area/lot	5 x 9m. approx., 44.50m^2 or 51.4% of the lot
open area/lot	42.00m^2 or 48.6% of the lot
area/person	6.7m^2 of constructed area
rooms and room size	living room--2.57x5.35m-13.75m^2 dining bedroom(s) 2.43x2.68-6.5m^2 master bedroom 3.23x2.60m-8.4m^2 bath 1.32x1.48m-1.95m^2 kitchen 1.75x2.17m-3.8m^2 wash area 1.99x1.75m-1.9m^2 terrace 1.75x.66m-1.15m^2

CONSTRUCTION MATERIALS

element	material
roof	asbestos cement sheets, wood beams, optional dropped ceiling of pressed wood panels
floor	cement, wood, cement tile
walls	brick, cement block

element	material
wall surface finishes	exposed brick, cement plaster
windows	painted metal frames, glass panes
doors	metal (sometimes painted)
foundations	stone, cement

The barrio units are 98% permanent materials. (35)

3.462 DESIGN AND DEVELOPMENT

The plan established in 1968 was designed and developed by combining efforts of the future occupants, the army used as a labor force, and private contractors. What one can say of the site plan, from the point of view of the Caja, is that the lack of direction has caused problems with the construction of the houses and the laying out of the blocks. As noted earlier, the dense growth of eucalyptus trees until cut down made surveying difficult. The project architect stated that the site plan was significantly changed by the construction foremen at the site without the Caja's consent or knowledge. The project's development was accomplished by various groups responsible for a particular part of the program as follows:

a. A compulsory ten hours/week was the time the community had to work, or, usually the weekend. The efforts were aimed at the building of foundations, floors and the roof.

b. During the week, soldiers of the Colombian army worked on the same construction as the community, that is, the foundations, the floors, and the roof.

c. The Caja contracted brick layers to build the walls. (36)

(35) Caja de la Vivienda Popular, unpublished, "Informe de las Actividades desarroll ad as por estudiantes de trabajo Social de la Universidad Nacional en practicas, en el Barrio 'Los Laches,' durante los anos de 1967-1968."

(36) Conversation with architect of Caja.

MODIFICATIONS

The majority of improvements and modifications are concentrated in the development of the house. Design and development of the pedestrian circulation was the responsibility of the community. The variety of individual solutions to house fronts, front yards and sidewalks represents the majority of construction activity in the barrio. Examples are: one continuous sidewalk that runs the length of the block; wooden stairs that climb to the units; gardens that are at the level of the floor built on fill, well built and maintained; simple dirt terraces contained by roughstone foundations, etc.

Few of the units spaces have been modified. Of the few that have modifications, the chances have been the addition of a second floor, the form of the roof, and the sometimes exotically painted doors and windows.

The modifications of the patio are generally the construction of new rooms of one or two floors; paving the patio surface with cement or cement tile; and provisions built for keeping and breeding animals.

COSTS

The project costs to the community are for the lot, installation of services, construction materials, labor and the interst on loans sponsored by the Caja. The lots, uniformly sized, are uniformly priced too. The cost of the 5 x 17.30m. lot is 2,800 pesos. The installation costs for services from the main line built by the governmental agencies are 63 pesos for light, and 2,000 pesos for water. There is no charge for the sewage connection.

The approximate cost breakdown of the unit is the following:

element	cost in pesos
walls	3,000
roof	2,900 at 165 pesos/m^2

element	cost in pesos
doors	500
windows	1,000
bath fixtures	500
floor	1,350
	14,000 total (37)

Costs for circulation, that is, paved streets, paths and brick stairs is 40 pesos/m^2, including labor and materials. The contract signed for the construction of the brick walls between the Caja and the brick layer was 9 x 500 pesos/unit.

The terms of payment for the loan supervised by the Caja range from 60-120 pesos/month with no initial quota required. The interest on money loaned by the Caja is 4%. For the majority of the project the Caja is the financing agency as well as directing the work. Their money has run out and the (ICT) assumed responsibility. The interest rate charged by the ICT is 6%. There is a problem, however, with the payments. It is that many of the families are behind on their monthly installments. The law says that after three months of not paying the family can be evicted from the house. This has not yet occurred.

(37) Conversation with Architect of ICT at Cinva.

LOS LACHES PHOTO ESSAY

BARRIO LOS LACHES

CITY SECTOR

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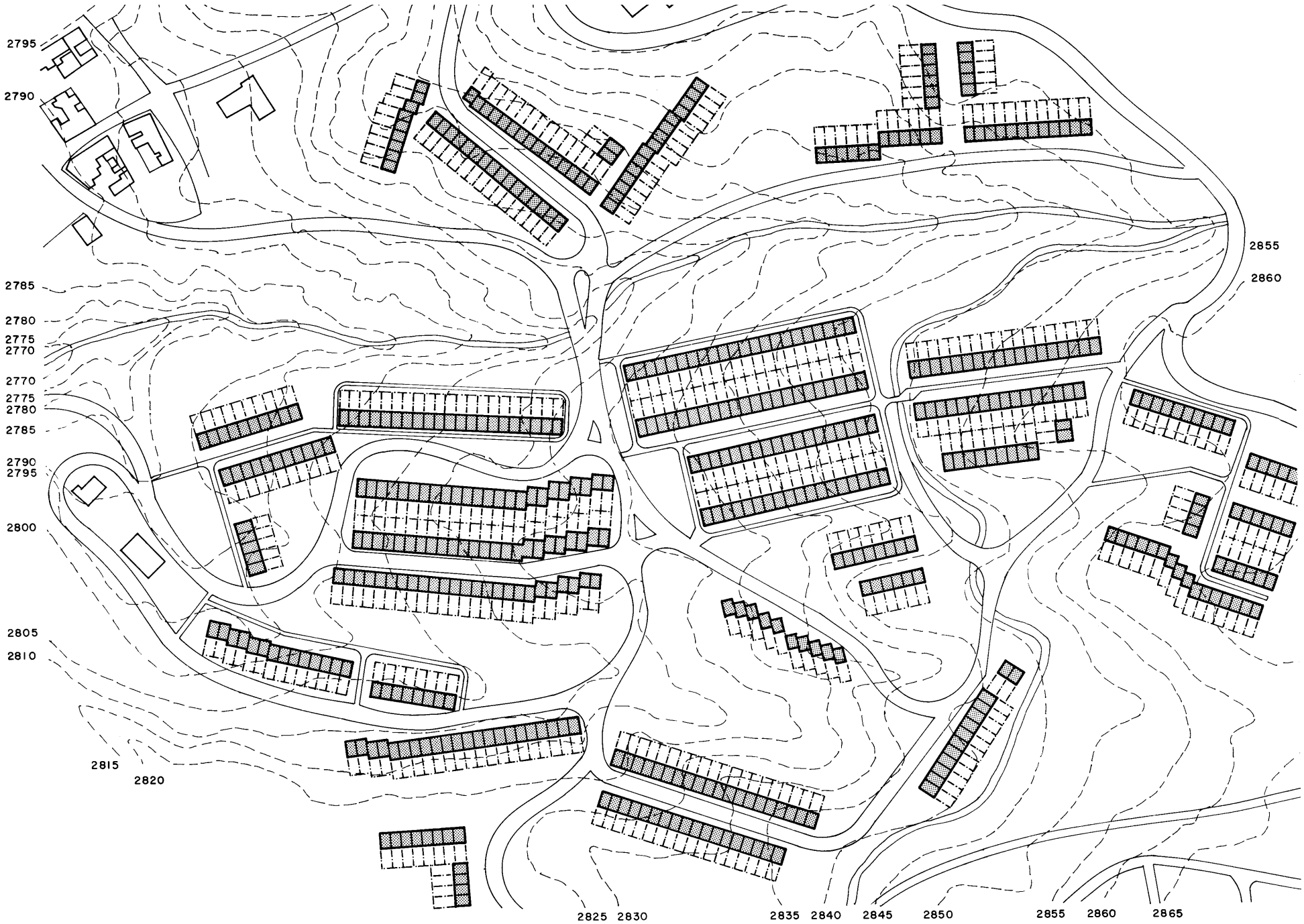
SCALE IN METERS



BARRIO LOS LACHES

BARRIO PLAN

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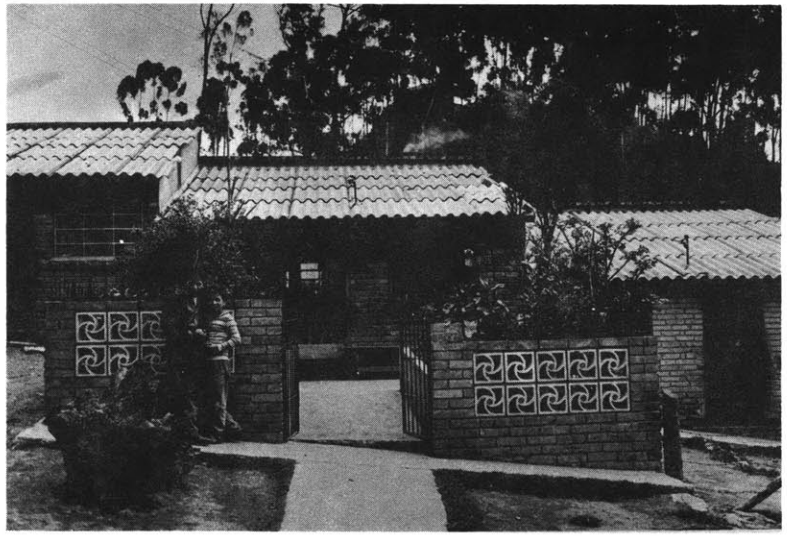
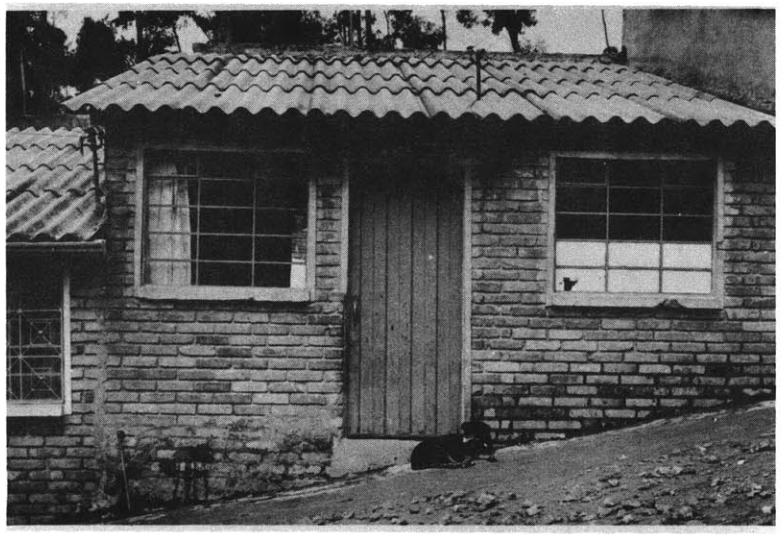
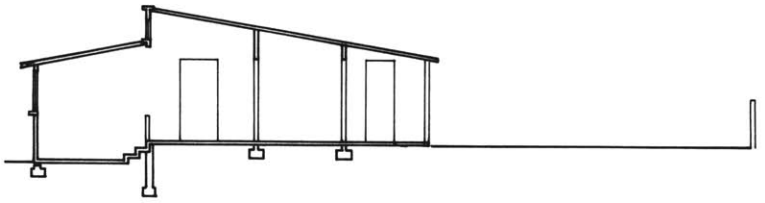
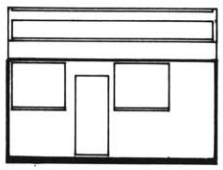
SCALE IN METERS



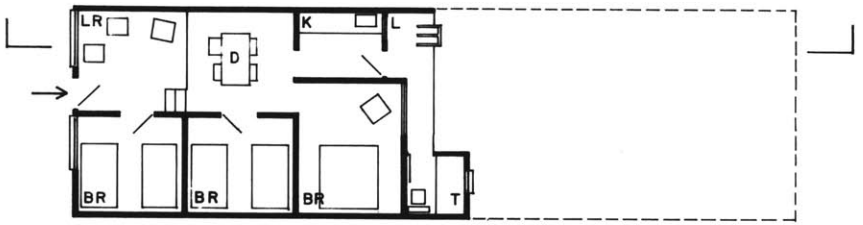




SECTION

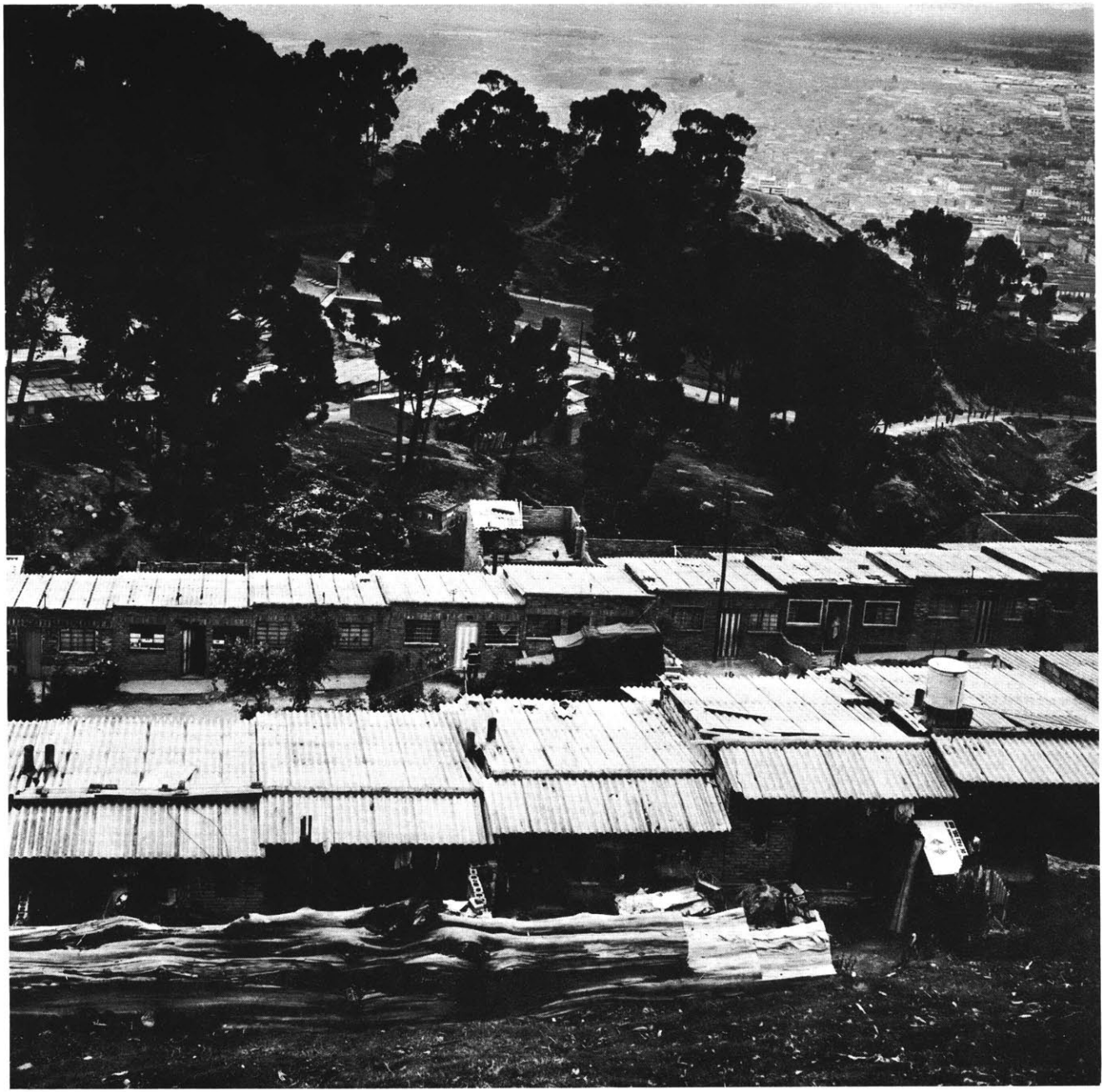


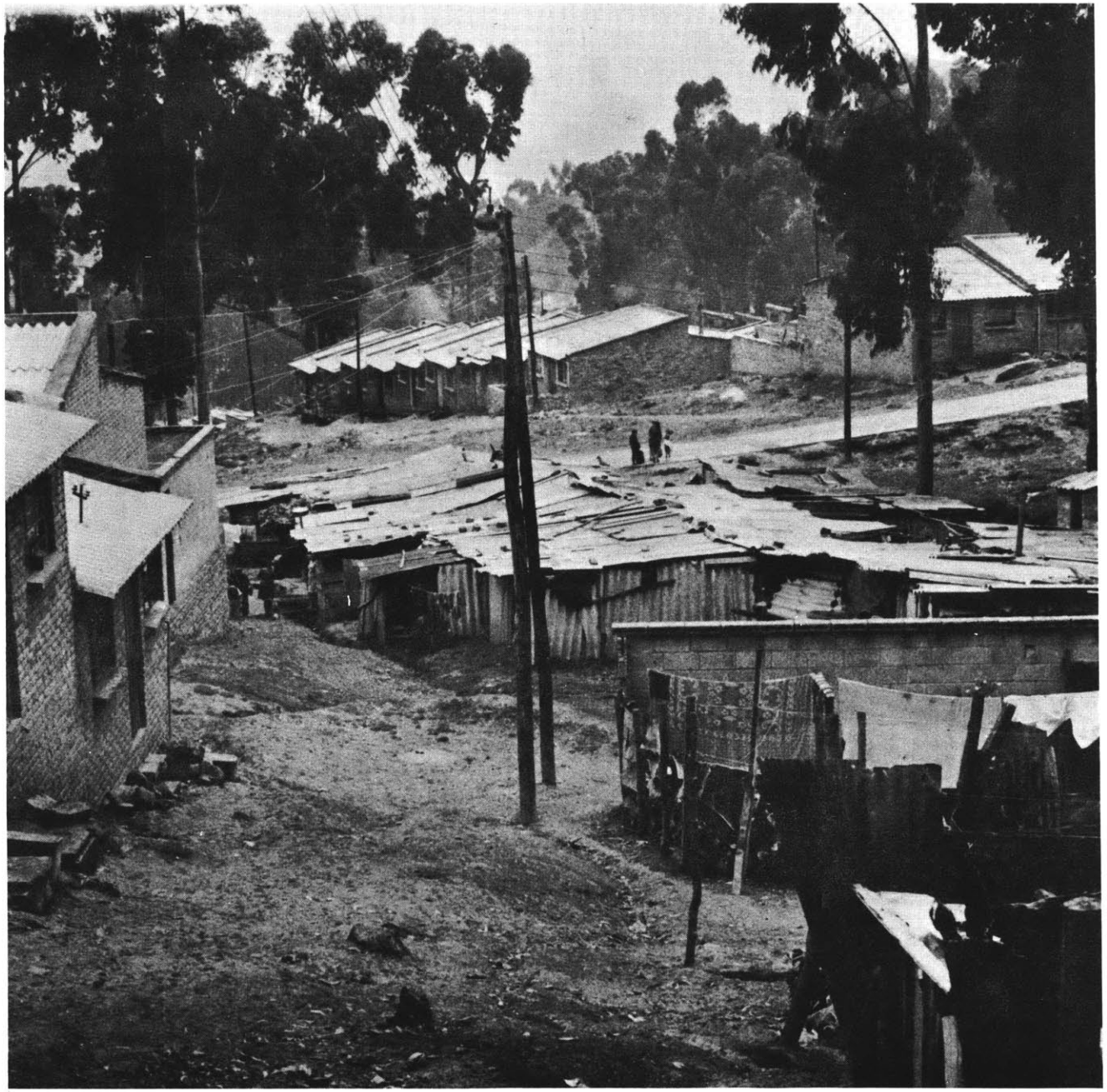
ELEVATION

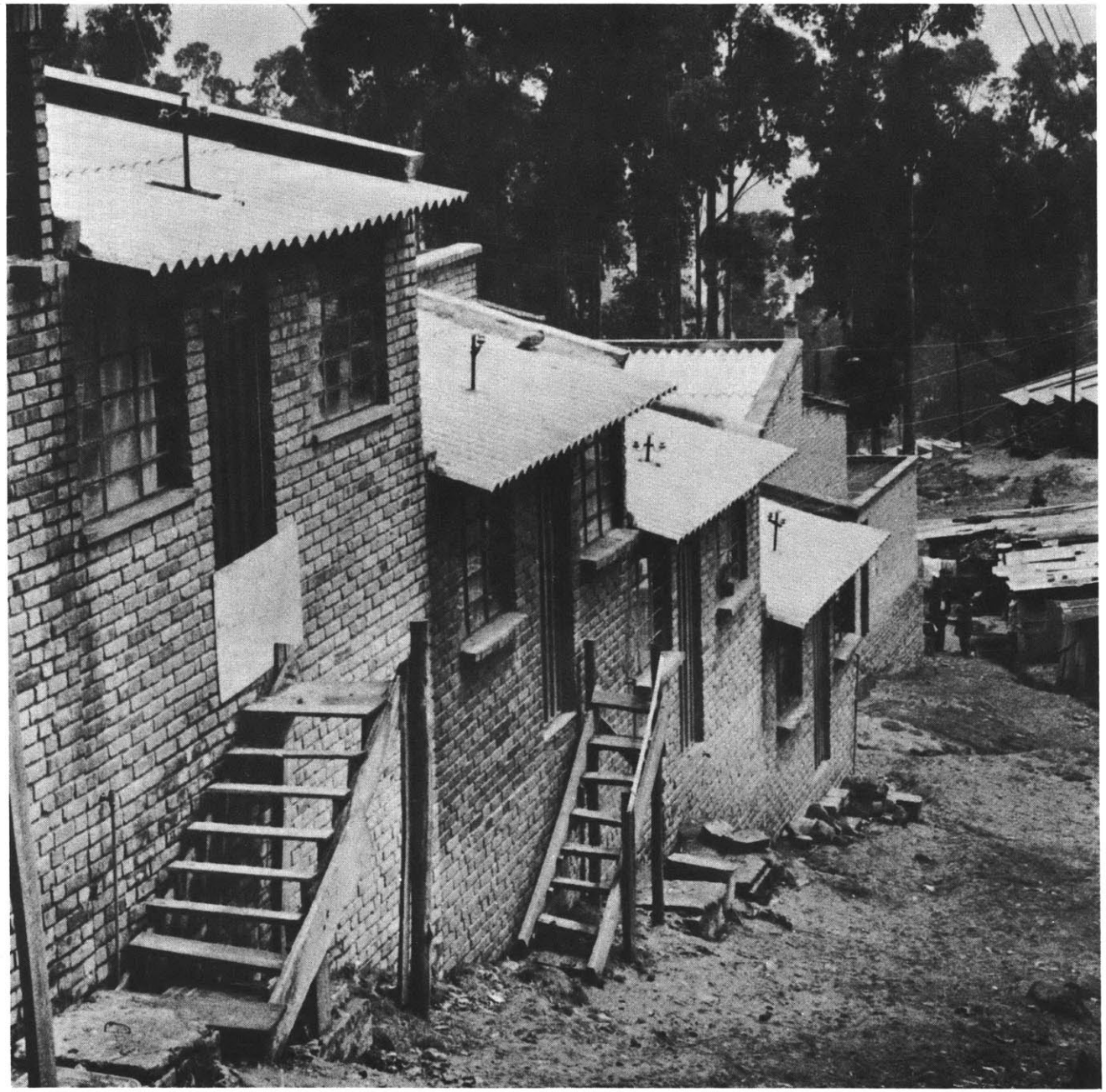


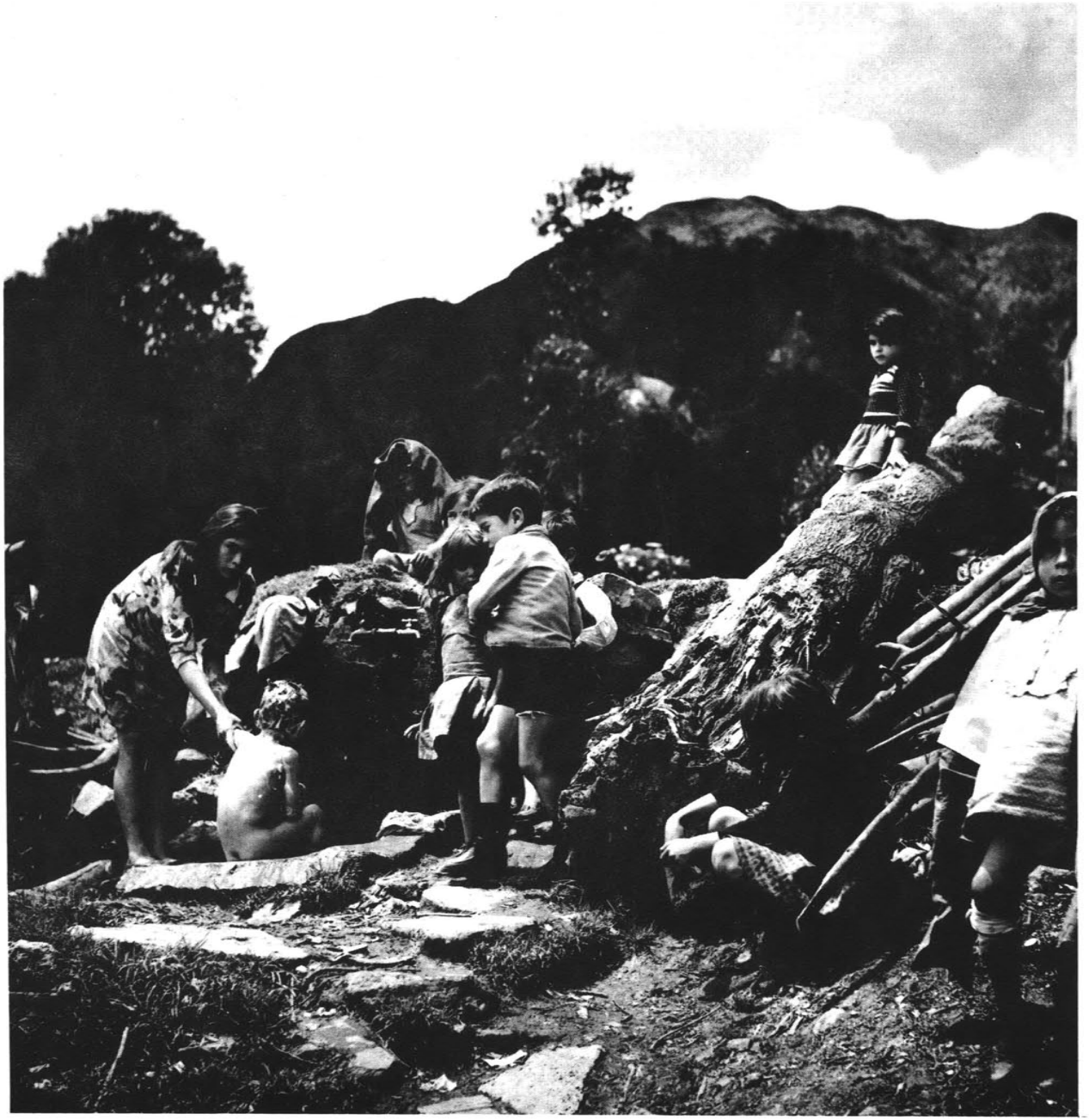
PLAN

BARRIO LOS LACHES
TYPICAL DWELLING









EL ENCANTO

3.500 INTRODUCTION

El Encanto, an extension of the barrio San Isidro, is a small linear development located in the southern sector of the city on a site whose slope at its base is almost flat and then dramatically increases until it is almost vertical. The land was developed by its owners as a "barrio pirata." It is economically integrated with the surrounding worker barrios. The settlement is a well-defined development of rectalinear lots fronting onto the extension of Carrera 6A, the major entry. The site is situated between Carreras 6A and 7A and Calle 35. It is bounded by the barrio San Isidro to the north; to the east and west by private open land; and to the south by the natural barrier of the almost vertical slopes. The barrio, composed of lots whose average size is 8x16 or 128m^2 situated on slopes of 40% average grade, occupies a site of 1.27 hectares of land, approximately 4 kilometers from the center of the city. (38)

3.510 HISTORY

El Encanto began its development in 1955 with the first lot being sold on the more level slope nearest to the Barrio San Isidro. Its population was housed for the past 8 years in units built of provisional, natural and scrap materials. The occupants have been actively constructing dwellings of permanent materials and of substantial size. The original plan was a straight line extension of the Carrera 6A. The lots were back to back and stepped up the slope, parallel to it. The plan has, however, been modified. The extension of 6A has been re-routed at the base of the development to pass between the lots, in order that both lots front on the street. (39)

3.520 THE LOCALITY

a. Map locating barrio in the city
b. Site in surrounding area
c. Site plan

(38) From planning office plans.
(39) From municipal plot plan.

3.530 THE INHABITANTS

The population of El Encanto in 1970 was an estimated 494 persons and has an Age-Sex distribution typical of under-employed and low-income permanently employed urban populations. The barrio is composed of (an estimated) 76 families each with his own lot. There are 94 lots (our count); 86 from map; leaving 17 lots vacant of which one has been converted to a tejo court. The densities that result from the estimated data are 74 dwelling units/ha. including the vacant lots, and 389 persons/ha., a figure derived from the present actual number of inhabitants.

3.540 SITE ANALYSIS

El Encanto is situated at an altitude that ranges from 2660 at the base of the barrio to 2745 (a difference of 85 meters). The site, devoid of trees, is covered by a thick mat of grass which helps control the rain run-off, in the areas adjacent to the street and criss-crossed pedestrian path of the upper slope. The areas of circulation are dirt-surfaced; erosion is a problem. The slope ranges from 8% grade at the base of the development to almost perpendicular at the upper slopes with an average of 40%. The climate of El Encanto is typical of Bogota. With an average temperature of 14 degrees centigrade. The strip developed barrio is bounded on the east and west by private vacant land; to the north by the Barrio San Isidro, and to the south by the natural boundary of the steep, almost perpendicular slope. The principal access to the barrio is through the Barrio San Isidro, on the extension of the Carrera 6A. Bus service to the nearby San Isidro is good, being served by the 20 de Julio and Usaquen buses. The possibilities of expansion are excellent.

3.541 LAND USE

The land use pattern of El Encanto established by the developer is presented in the following graph:

	m^2	%
residential	9,728.00	75
circulation	3,040.00	25
community space	--	--
commercial	--	--
Total	12,768.00 1.276 hectares	100%

The efforts of the community to influence the land use pattern within the guidelines established have been to open a few small stores in their homes. Community space allocations, totally lacking in the developer's plan, now appear in the form of a tejo court. The open areas adjacent to the developed help alleviate the lack of large spaces for recreation. Other community facilities are found in San Isidro.

Maintenance of the streets and paths is good. The lack of available funds for site protection schemes has limited the infrastructure to earth surfaces that require repairing and attention, which they receive. There does exist an awareness of the need for the community's investment to maintain the circulation as well as the need for home construction. (40)

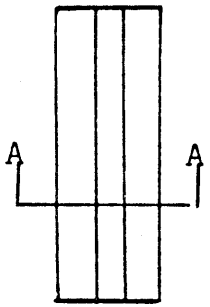
3.542 CIRCULATION

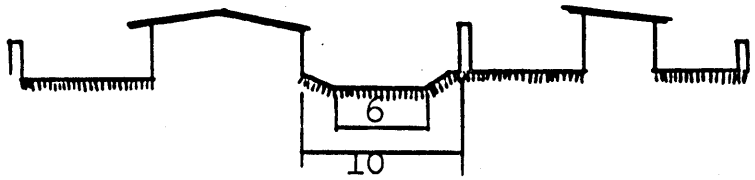
The following graphic description of the component parts of the circulation system illustrate topographical and dimensional characteristics of the barrio:

1. Streets

   a. The dirt surfaced road runs up 3/4 of the development. At the base of the barrio, the slope is 18% and gradually increases to 40% at the road's end.

(40) Interview with barrio residents.





SECTION A-A

2. Pedestrian ways

   a. The remaining 1/4 of the barrio is served by a criss-crossed ramp and stair system carved in the earth.

COMMENT

Of the 10 meter wide right of way, a 6 meter strip is utilized for vehicular traffic. The adjacent grass covered areas are being channelized for sewage and rain run-off canals.

3.543 INFRASTRUCTURE

El Encanto, developed as a "barrio pirata," and tnerefore without any provision for basic services, has solved its infrastructure problem. The entire barrio is provided with light pirated from the power lines of Barrio San Isidro. An estimated 80-90% of the barrio has water installed on their lot. The aqueduct was built through an Accion Communal project. A sewage system, built with 200 8" tubes donated by "Tubos Moore" serves an area that reached 1/3 the distance up

the hill. Where the tubes stop an open ditch continues up the barrio collecting waste and rain run-off from the upper slopes. Tne barrio dumps the collected waste and run-off into the open ditch that is to be eventually connected to the city sewage system. There is one telephone in a small shop occupying the living room of a house.

The provision of community space and facilities was totally lacking in the original plan. An unsold lot that lies on the right of way of the city aqueduct has been converted into a "tejo" court. For the other facilities of schools, clinics, and recreation space the barrio depends completely on Barrio San Isidro.

3.550 SOCIO-ECONOMIC DESCRIPTION

3.551 INCOME

The average income of the inhabitants of El Encanto is an estimated 600 pesos per montn. An estimated 30% of the population is economically active, permanently or temporarily employed. Those self-employed or employed by someone work as night watchmen, construction workers, salesmen, small shop keepers, etc.

3.553 COMMUNITY ORGANIZATION

El Encanto is an extension of the Barrio San Isidro and dependent upon it in many ways. The residents of the barrio send their children to schools in San Isidro, patronize the shops in San Isidro, utilize the recreation facilities of San Isidro, and have representation of the Junta de Accion Communal of San Isidro as a committee. A work committee has been in charge of the projects undertaken by the barrio, as the sewage system. The overdependence on the San Isidro junta inhibits other project organization and initiation. The committee is constituted of the more interested community members but until they form their own junta and accept responsibility for program development and initiation they will remain much the same as they are now.

3.554 TENURE

Tenure in El Encanto is accomplished by the sale of land by the developer to the community

members. The majority of the barrio members have title to their land. Those who do not have their written title have not received it due to legal action taken by one of the developers against the other. The written title, however, is considered a formality and in the apparent atmosphere of security the community is investing time and money in building tneir homes of permanent materials and the community services.

3.560 THE DWELLING UNIT

The characteristics of the social and physical components of El Encanto are described in terms of family groups and in terms of dwellings. (See previous case studies)

3.561 THE FAMILY

The typical social unit is a nuclear family of approximately 5-6 persons.

3.562 THE DWELLING

The characteristics of the 76 dwellings are:

Component	Dimension
lot size	average size 8x16 meters: 128m^2 in area
constructed area	65m^2 (one case study only)
open area	63m^2
area/person	9m^2

CONSTRUCTION MATERIALS

Component	Material
roof	asbestos cement sheets, wood beams, tin sheets, metal scrap, clay tile
floor	cement, wood, earth
walls	brick, concrete block, mud-filled bamboo slats (Bareque)
wall surface finishes	cement plaster, exposed brick, stabilized earth plaster, mud plaster mixed with dung
windows	metal frames with glass panes, wood frames and shutters
doors	metal, wood, interior use of curtains or other as a divider

3.563 DESIGN AND DEVELOPMENT

The plan establisned in 1955 by tne developer was a strip-development of a road climbing the slope perpendicular to the contours. The lots, parallel to the contours, front the road on both sides. Originally, the road was to have been on the east side of the development as a straight line extension of the Carrera 6A and the lots back to back, one set fronting onto the road and the other onto the adjacent vacant land. Lots were sold to the residents without services by the developer. The family then built its first house of natural and scrap materials.

MODIFICATIONS

The improvements and modifications effected in the barrio are most evident in the housing. The

progressively developing barrio displays a variety of stages of construction. The stages range from open and vacant lots to beginning preparation, by extensive cut, to level tne site. The majority are in the state of changing from perishable materials of construction to partially constructed units of permanent materials, and then to completed one and multilevel single family units built of permanent materials.

COSTS

The major costs have been incurred in buying the lot and building materials. Ten years ago according to frontage and location, lot costs were from $500 to $2500 pesos per lot. Now lots are from 6,000 -7,000 pesos per lot of 5 meter width; and 10,000 - 15,000 per lot of 8 meter width. The installation of infrastructure has been investigated by the barrio's work committee. The estimates are considered prohibitive. The utility company's program has been rejected. Installation costs quoted were:

a. 500 pesos/family for electrical installation with a monthly metered charge.

b. 2,360 pesos/family for installation of the aqueduct and sewer lines. (41)

Construction materials follow the costs outlined in the list appearing in the Juan XXIII case study.

(41) Figures quoted to the barrio by a representative of the utility company.

3.600 SUMMARY

It has been established that 40% of the population of Bogota has been denied access to the housing market because of high costs and various legal restrictions. Marginal and low-income settlements have a nomogeneous character different from barrios of other socio-economic status. The short, sharp pointed, widebased population pyramid of an economically marginal barrio indicates a large school-aged population (0-15) as more than 50% of the total population. The economic effects of this type of population distribution are most obvious in the percentage of the economically active members of the population. It is generally accepted that approximately 30% of the population must earn enough to support themselves and the 70% of the population dependent upon them. The competition is intense for funds available for other than the necessities of food, clothing and shelter.

We have presented the legal and illegal efforts made by governmental agencies and individuals to supply shelter to the population group described above. Our analysis of the four settlements establishes specific factors that contribute or retard a barrio's social and physical development, as well as the essential differences in environmental quality that result from increased levels of institutionalization. The four principal factors that promote barrio development are security of tenure, technical assistance, community responsibility and contribution to barrio development, and the effect of time on development.

Squatting is defined as an illegal process. The process is perpetuated by tne myth that possession of land for five years guarantees ownership. It was necessary to examine the legal requirements for building and the establisned building tradition because the legal system is partly responsible for the promotion of squatting.

Various forms of squatter settlements were discussed. El Encanto is an example of the barrio pirata, the popular housing process that deviates least from the legal standards and codes. Development occurs on a purchased lot that lacks the basic services of water, light, sewage, etc. The formal planning authorities completely ignore the speculator's role in planning by

declaring this scheme illegal. Barrios piratas are a valid metnod for settling low-income families in an ordered pattern that allows for the future development of infrastructure. By maintaining the requirements for services many legal property owners are forced to develop their houses with the knowledge of the official planning agencies and outside the financial and technical schemes that facilitate low-income housing.

Another form of illegal settlement is one established by the invasion of public or semi-private land. Las Colinas and Juan XXIII are examples of this type of development. The lack of a positive national policy for dealing with invasion barrios and barrios piratas has further complicated the situation. The municipalities are constantly threatened with land seizures, witn unanticipated demands for public services, and in many cases with the blockage of scheduled and necessary projects. By not recognizing the quantity and specific demands of this housing sector, the legal system has threatened the overall health, safety and welfare of the city.

From a financial point of view it is interesting to note that by not acknowledging squatter settlements, the city is not incorporating these generally marginal sites into the tax structure. In Bogota vacant land is minimally taxed. Even thougn occupied by homes, and in many cases partially served by municipal services, without legal tenure no taxes can be realized.

The legal system refined still further this alienation of popular settlements. Considering the problem of building materials, the standards in many cases permit financing permanent material structures only, sucn as cement, brick, metal roofing, etc. Natural and local materials are prohibited even though they are part of tne local building tradition and are within the economic reacn of most families. For the hot tropical regions such as the north coast of Colombia, the "legal" materials are beyond the economic means of most families and a unit built of wood or bamboo may also be more habitable.

The rate of development of a dwelling unit and the basic services of electricity, water and sewage depends on tenure. The lack of tenure plagues barrio development because of the inhabitants' insecure claim to the land. Juan XXIII is an example of this situation. The quality of

community life and development is very low. As a popular solution to the housing problem, it has only solved the locational problem to any satisfactory degree. The shelter and the open spaces, as well as the infrastructure have been minimally solved. Even though they have received considerable attention from "do good" groups promoting partially fulfilled projects and a lack of a strong central barrio authority the level of development and the quality of the environment is low.

In contrast, the program now being carried out in Las Colinas under a guaranteed title and materials loan program is producing a successful site protection and dwelling unit construction scheme. Here community efforts are directed by a barrio based agency representative and tne community. A family is able to secure loans for house improvements and at the same time pay into a collective fund which maintains the public spaces, stairs and infrastructure. The infrastructure has in effect become the personal property of each family. Higher densities accelerate public investments because most people are served by the addition of the simplest facilities. The rate of development depends on family initiative in availing themselves of the agency's services. This avoids the problem of maintaining monthly quotas that can prove to be a burden for a low-income family with an unsteady income.

Failure to pay can jeopardize legal acquisition of land. However, once tenure is secure, development can be promoted or retarded by community organization and flexibile construction programs supported by financial institutions. A barrio can be organized spatially by block, or socially by family or cultural group--the choice depending on whether organization is before or after a community's establishment. Established barrios tend to be socially organized due to charismatic figures or family ties for leadership. This leadership must be respected if a barrio program is to be successful. Groups created by random selection tend to be more successful when associated with a new program.

The establishment of tenure produces a secure atmosphere that encourages a family to invest in construction of their dwelling and site protection schemes. The case studies illustrated the need for technical assistance from an agency or other outside source, in planning, project

implementation, materials distribution and financing, and maintenance of the barrio. A configuration of lots that allows tne progressive construction of community facilities is not of prime importance in establishing a barrio by invasion. Invasion barrios generally fail to anticipate the residential support services, easements for utilities, open space, space requirements for motorized circulation, parking, etc. A central housing agency is better prepared through its technical, organizational and financial capabilities to establish new development locations, to administer and organize materials distribution and construction, to solve problems of retaining walls, water and sewer system design and construction, and pedestrian and vehicular circulation. The elements can be constructed by contractual arrangements and/or barrio participation.

The governmental agencies play another important role. Their city scale view of a barrio or potential site places it with otner barrios competing for attention. Their larger scale view facilitates logical extension of services according to the pressures the barrio will encounter to expand. Perhaps the official agency's major asset lies in its ability to mobilize large sums of money. In economies that suffer from inflation and agencies that suffer from decapitalization, large and rapid movements of money can realize a considerable savings on materials by issuing small short-term loans.

The case studies indicate that barrio level programs should make available various loan schemes for home improvement in the form of materials. The availability of materials coupled with technical assistance insures barrio support of an improvement program as in Las Colinas. Where the level of institutionalization is detrimental is when potential residents of a new development are socially and economically segregated through pre-screening, or when a family is committed to long-term payments for a house they could have built larger for a similar amount, or when the community is left without control of communal spaces.

The financial liabilities and socio-political risks of projects that depend on the recovery of capital from people with low or uncertain incomes automatically imposes a demand upon those responsible for the careful screening of the prospective "beneficiaries."

> The resultant social groups are stratified either way: if screened on the basis of economic capacity, they are narrowly lower-middle class; if on the basis of need, they are narrowly lower class. (42)

In either case they are dependent upon technical assistance administered by an agency to solve large scale site and construction problems. Efforts are wasted in the duplication of tasks that the barrio resident is capable of doing.

Within a barrio there are latent and active planning, administrative, and technical capabilities besides the resource of labor that is traditionally attributed to be the barrio's contribution to development. Squatter settlements make marginal sites more productive by increased densities. Los Laches (the agency scheme) utilized only 20% of the land to build on. The remaining 80% will be maintained only by conscious effort and constant expense. Las Colinas, established on similar slope conditions by squatting, has six times the density of Los Laches. Along with the increase in density there is an increase in site maintenance. In Los Laches erosion in many areas is threatening the stability of the houses as well as the streets and sidewalks.

The different types of barrio organizations have been mentioned. From the point of view of an agency, the juntas could greatly alleviate the administrative burden by assuming the responsibility for local activities, logistical problems, and organizational problems. Such activities could be the coordination and collection of community funds, infrastructure projects, barrio census, law enforcement, materials distribution for house construction, etc. For any project to succeed the agency must recognize that a barrio organization comprises a decision and policy making structure that can express community priorities for development, represent the barrio in legal problems, qualify for public funds, and enter into contractual relationships as a single entity. A barrio organization offers a continuity beyond that of its individual members and contributes to the stability of barrio action and administration.

(42) Turner, John, Barrios and Channels for Housing Development in Modernizing Countries.

The junta meetings offer the community member the opportunity to voice his opinion and be assured that at least his remark will be heard and judged among peers rather than having the need to contend with class distinctions (which inevitably result when dealing with municipal authorities). People are aware of and have access to the channels of decision and responsibility. The way of doing something is de-mystified.

An untapped resource provided by barrio organizations is the collection of basic data concerning the members of the barrio. This data can serve the barrio by establishing an empirical basis for making decisions. It can also serve the interests of the city by creating a data base where none existed before on a group that represents at least one-third of the urbanizing force in the city.

One of the more significant effects that barrio level administrative groups have had is the creation of home based political training grounds. For many potential leaders, this experience is a substitute for a formal education. It affords for many barrios their first voice in the affairs of the city.

The effect of the limited money allocated to barrio development has resulted in effective procedures for creating a tolerable living situation. Selective maintenance of the existing facilities and the option of substitution and/or initiation of other facilities or plans, work as corrective factors on the orientation provided by governmental planning groups. The lack of commercial, educational, recreational, and other facilities is compensated for by individual and community initiative. Simplifications of redundancies as too wide and too many walkways, too many similar small shops and enterprises, are accomplished by selective maintenance and patronage.

Perhaps the most important contribution the community can make to its own development and where it has demonstrated its greatest capabilities is in the construction of houses. It is interesting to note that when dwellings from each barrio are compared, the standards of construction and the habitable space per person is considerably higher in Las Colinas than in Los Laches. The comparison indicates that under favorable conditions of outside support the family

produces a higher quality dwelling over time than a housing agency does with its instant development schemes. The instant project emphasizes material standards more than space standards. Building a home is less of an economic burden if the family is in control of its rate of growth. The motives and priorities of a planning group proposing action are related to time closely. Short versus long term schemes produce different sets of goals and methods of achieving those goals. The following chart lists the orientations of housing projects relative to the time committed to them for implementation.

CONSEQUENCES OF TIME LIMITATIONS

SHORT TERM	LONG TERM
Product oriented	Service oriented
Access to product through "palanca" or personal favor	Requires sustained contact over long periods to insure continuity
Project initiation highly susceptible to over political-ization "Pork Barreling"	Developmental costs are the result of a barrio's capabilities to create and maintain
Work scheduling important to promote and maintain continuity	Alternative investment to purchase of consumer durables
Can effectively use stockpiled materials	Less economic burden but more costly due to inflation
Feedback from user difficult	Problem of bookkeeping and project continuity
Contractual relations between individuals and agency	Problem of small vested interest groups within barrio promoting their interest
	Voluntary commitment among peers

In many cases housing is nothing more than a token gesture to create imagibility for one political order or another. As in Los Laches, the emphasis was on the building of the

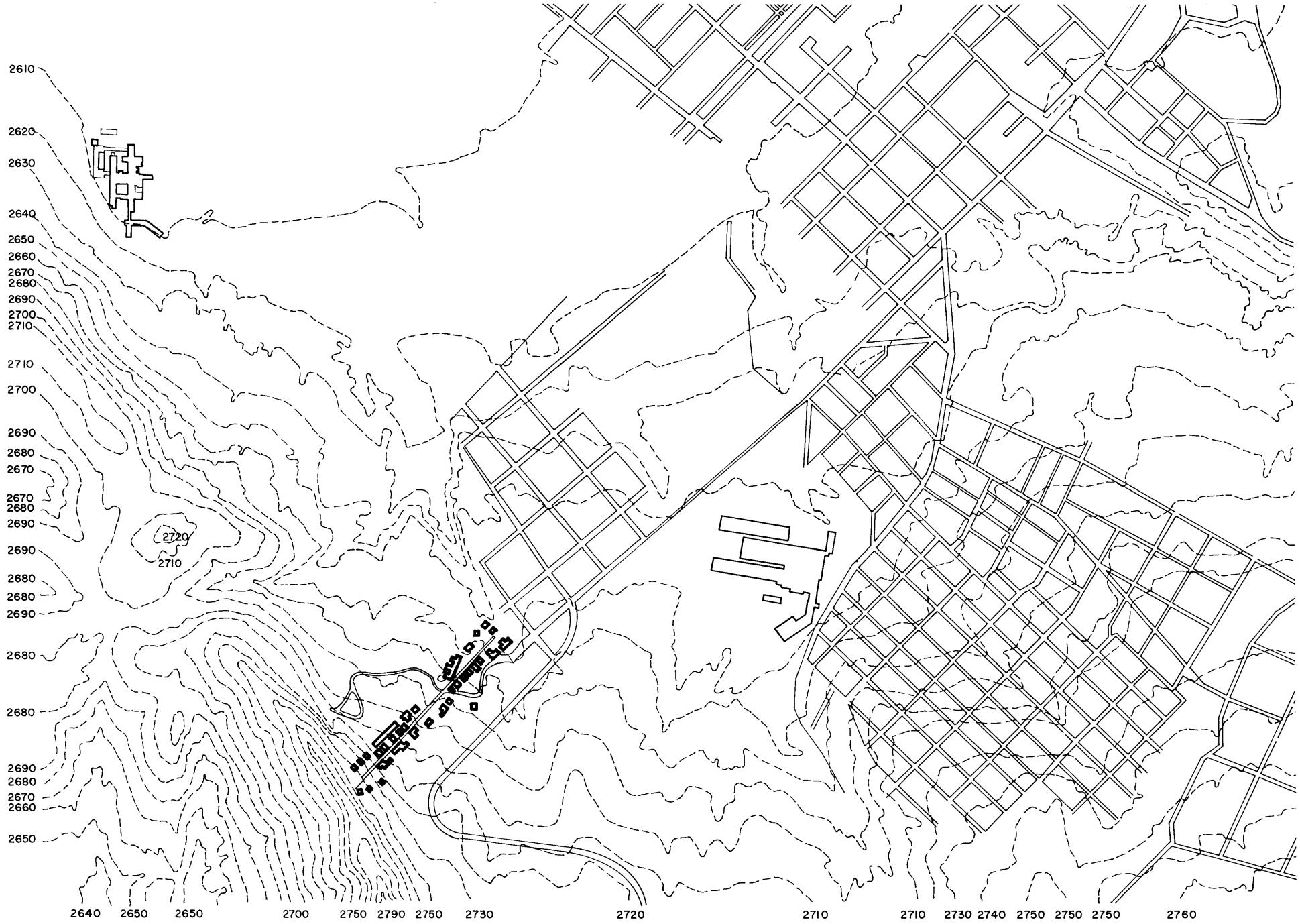
dwelling, leaving site development and circulation to chance. The "imaginable" unit was completed.

In a society that does not possess or mobilize the necessary material resources to build complete modern minimal standard units for all who need them, each family must wait its turn. Generally this is a very long wait. The squatter's method of occupying his plot as soon as he obtains possession, living initially in any sort of shelter he can manage, allows his family to improve its living conditions and become far more independent at a much earlier and a more active stage of life. (43)

The case studies have served to identify what factors are crucial to barrio development. We believe that the form and sequence of development of the barrios suggest a model for effective urbanization of large sloped areas.

(43) Ibid.

EL ENCANTO PHOTO ESSAY

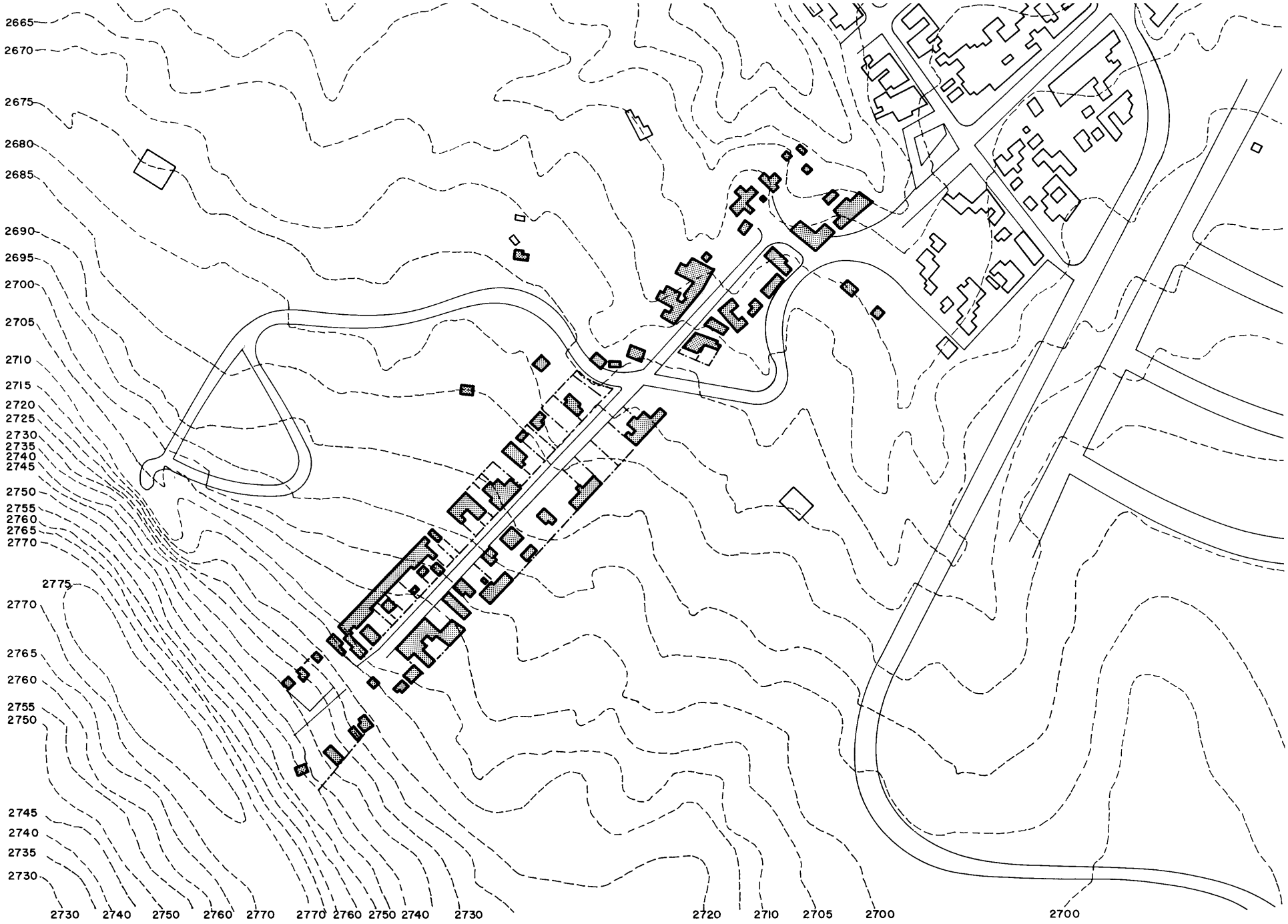


BARRIO EL ENCANTO

CITY SECTOR

0 50 100 200 400 800

SCALE IN METERS

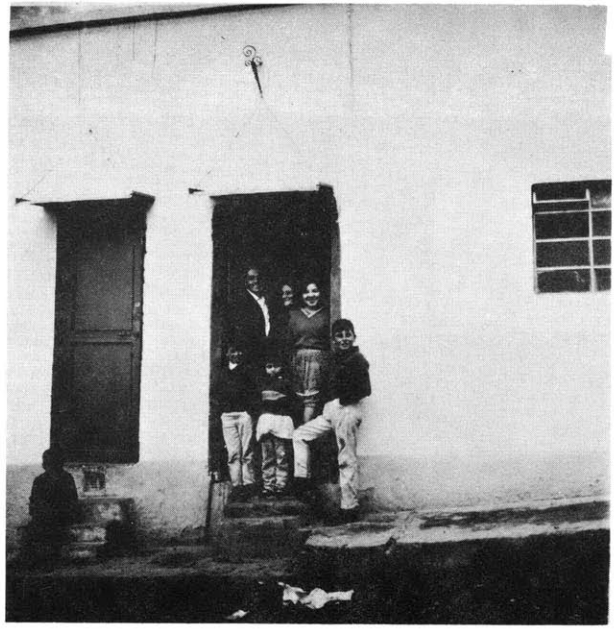


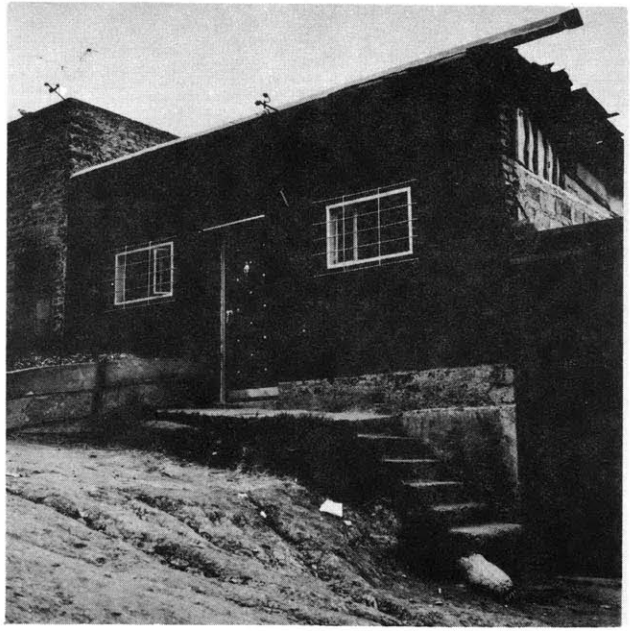
BARRIO EL ENCANTO

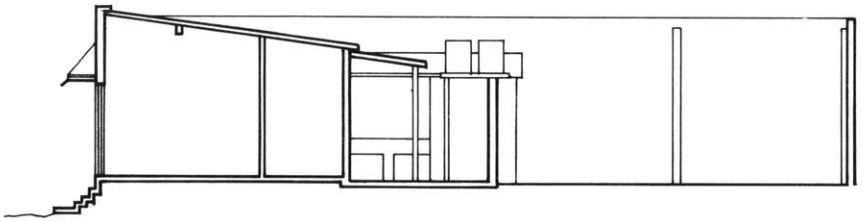
BARRIO PLAN

0 10 20 30 40 50 100 200

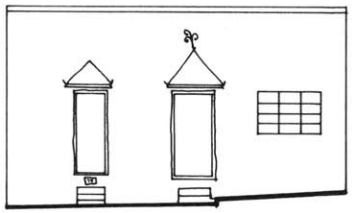
SCALE IN METERS



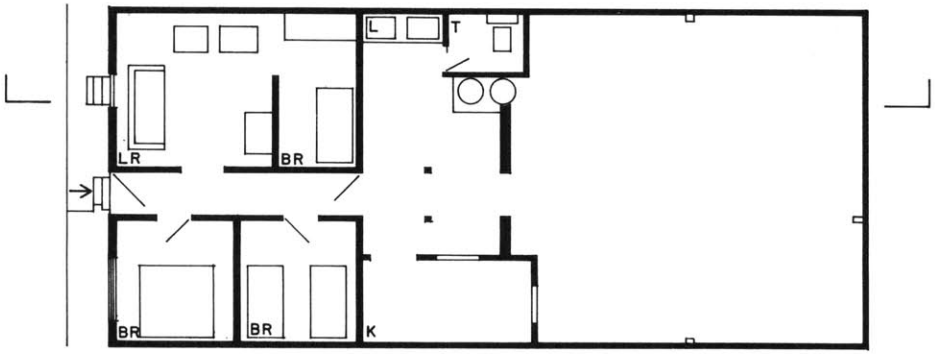




SECTION



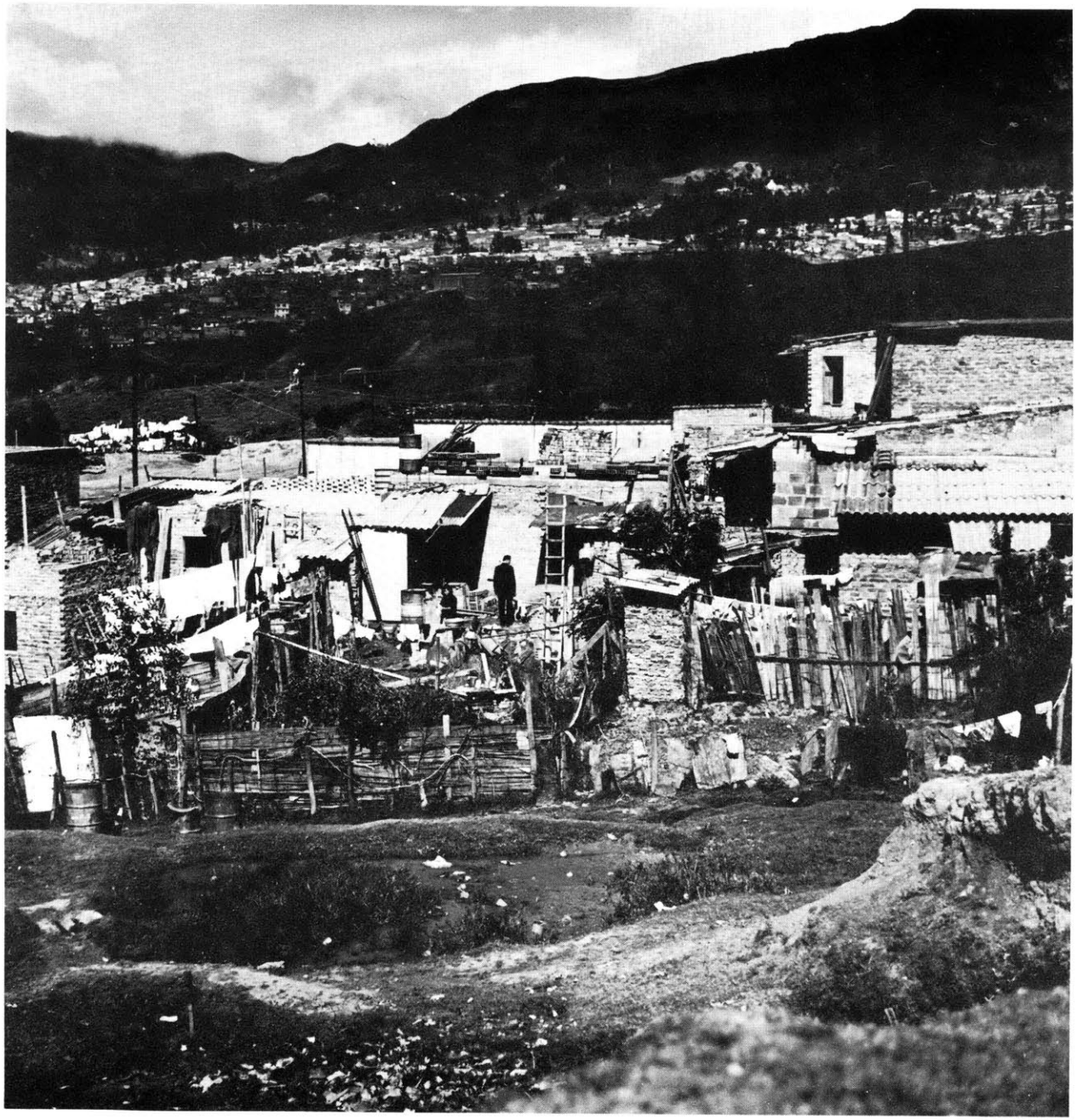
ELEVATION



PLAN

BARRIO EL ENCANTO
TYPICAL DWELLING

SCALE IN METERS



CHAPTER IV

THE GROWTH POLE SYSTEM FOR URBANIZATION

4.100 THE GROWTH POLE SYSTEM FOR URBANIZATION

In this chapter we will present an alternative solution to the legal housing process to bring the immense energies of the self help process into an orderly and secure program for obtaining housing. Our concern is not with improving the efficiency of the existing legal housing institutions, but with incorporating positive attributes of the squatting and self help processes into a legally planned framework.

The Growth Pole System is an administrative and financial planning technique intended for a housing agency. It intends to develop large tracts of land for housing by providing an overall subdivision plan with a minimum set of services. The self help process then constructs the physical housing. The Growth Pole System does not provide physical housing. It does provide vacant lots in a pre-established subdivision plan. The Growth Pole System insures the legal tenure of home builders by selling lots with title. By providing an overall subdivision plan that considers infrastructure, open space and public facilities, the home builder is assured that his efforts to build a house will not be frustrated by a lack of overall barrio planning or legal security.

In its simplest form the Growth Pole System is a system for controlling the sequence and pattern by which land is settled for housing. There are two physical elements to the system. The first is the overall subdivision plan for a minimum 1000 families. This includes lots, street layouts, reserved areas for schools, parks and other land uses. The second element

is selected areas within this plan that receive full and complete development, excluding of course the building of houses. These fully developed areas are called poles. They contain full water, sewer and electrical services and street paving. A pole may be a single block fully serviced, several blocks in a line or a grouping of blocks creating an area. The function of the poles is to attract home builders to specific sites--these sites are the poles. This clusters and concentrates the efforts of self helpers in beginning their homes. The poles are also the points at which services from the adjacent barrios are extended into the newly developing area.

From the standpoint of developing a large tract of land, the use of spaced out poles can promote home building without the huge initial expenditures of capital and time that total sites and services schemes generally require. Full services can take place through a joint home builder and agency effort.

For the potential home builder, the Growth Pole System offers the advantage of acquiring legal title to a lot that is a part of a larger overall development program. He is assured that provisions will be made for necessary utilities, if his lot isn't already served. He is further able to get the same benefits as the barrios piratas, but in a legal framework insuring tenure, long term technical assistance and material loans to begin home construction.

The Growth Pole System is made economically possible by the sale of lots, the elimination of institutional house construction programs, and the introduction of a labor market created by the residents themselves into community development. The Growth Pole administering agency (after the land has been fully subdivided and settled) is responsible for insuring the stability and continuity of services to building families.

For municipal public works agencies, the Growth Pole System offers a framework for increasing health and safety standards, as well as a rational means of bringing vacant land into residential land use. This has a direct cost benefit to the city in terms of the land tax structures and in anticipating future public services expenses.

The Growth Pole System considers several things about low income housing: that there are limited public resources available for providing housing to the increasing number of low income families, and that there already exists a popular housing process, namely invasions to acquire land and self help construction to acquire shelter. By incorporating the building tradition of self help to the framework, lower initial development costs are realized for both home builders and municipal agencies. The Growth Pole System offers wide variations in subdivision layout and the possibilities of selling parcels to provide developers within an overall plan for development. The Growth Pole System recognizes that if development takes place within a framework that does not compete with skills and services that the client is capable of providing himself, then he is far more willing to invest his non-monetary resources in overall community development.

4.110 REQUIREMENTS AND DEFINING CRITERIA OF THE GROWTH POLE SYSTEM

In this chapter we are concerned with translating the housing problems presented in the previous chapters into architectural and planning terms. The case studies have established four minimum requirements that any program for low income housing must satisfy. They are:

1. The necessity to foster housing processes that develop over long periods of time (10 to 30 years) rather than short term total design and build solutions. The

case studies clearly show that attempts to shorten the development time of housing cannot be done within the economic limits of the clients or the governmental agency.

2. Any process for providing housing, self help or total design build must allow for guaranteed legal tenure as part of the normal administration of the development. The differences in development rates with and without guaranteed tenure have already been compared in Barrios Juan XXIII and Las Colinas.

3. Housing agencies must be in a position to provide technical assistance to self-help barrio groups in matters of
   - overall subdivision and infrastructure design
   - contractual management of land titles, loan services

4. That any attempt to provide low cost housing must recognize the inherent cost savings to tne client of self help housé construction. This tradition is already well established; attempts to compete with it by institutionalized housing construction will do so only at a high cost to the client.

4.120 OTHER LIMITS AND ASSUMPTIONS

4.121 SOCIO-ECONOMIC

Family income is the most significant consideration in providing solutions for housing. We are seeking solutions for families with subsistence incomes to three times this value (600 to 1800 pesos/mth. 1970) as characteristic incomes. Subsistence level income is that amount of money required to provide minimum food, shelter and clothing with no remainder for savings. This value, of course, adjusts with inflation.

A second socio-economic consideration requires that housing solutions urbanize a minimum planned area to support a population sufficient to require a primary school. This is a minimum of 1000 families. The building of a primary school along with the installation of sewers are the two largest barrio expenses. Both of them require sudden and rapid investments of cash and manpower.

4.122 PHYSICAL RESOURCES

Our Growth Pole System considers only sloped sites. There are several reasons for this limit. In Bogota, sloped sites are the most favorable ones for squatter settlements because they are located near employment centers. They are also the least expensive sites in terms of the normal land market; however, they require special design attention in site layout and sequencing.

In order to minimize the costs in providing for low income housing, we will consider only sites that are immediately adjacent to existing urbanization and infrastructure. Growth Pole sites are to be served by extending existing adjacent services. This restriction eliminates the high developmental pressures that peripheral sloped sites have for invasions and accreative growth, and lowers the initial costs of developing a subdivision by eliminating costly well digging, septic drain fields, and electrical generation. This savings can be passed on to the low income family by lower lot prices.

There is another practical reason for concentrating planning efforts to the peripheral sites. These sites represent the most likely places for increasing the city size. Bogota has decreased in overall density for the past 20 years. This means the additional growth

is occurring on the edges at lower densities than the core city. A housing program to help control this expansion allows the city to logically extend its service commitments and to control the overall form of the city.

As a part of the physical resources we wish to further require that all residential support facilities be considered as part of the housing process. This means that not only are the 1000 houses to be considered, but also all their required land uses, streets, parking, open space, public facilities and infrastructure. Often these support facilities occupy more land than the area alloted to housing.

4.123 LEGAL STIPULATIONS

Under existing law, no housing units may be built on land without certain public services. It is necessary to point out that in long term developmental programs there may arise cases where land has been urbanized without the full measure of infrastructure, especially sewers. We are assuming in our Growth Pole System that this law can be repealed.

4.130 SUMMARY

The following characteristics define our Growtn Pole System:

- The Growth Pole System is an administrative and financial planning technique for housing agencies to improve the quality and quantity of housing to the lowest income sectors
- The Growth Pole System does not provide physical housing, it does provide vacant lots within an overall plan for self help home builders

- There are two physical planning elements to the Growth Pole System. The overall subdivision plan and selected areas that receive full utilities. The latter is called a pole.
- Pole areas are points for attacning the new site to adjacent utilities, the effect is to cluster initial growth and to minimize the cost in time and capital to develop an area.

For the housing agency, the Growth Pole System offers:

- an effective and low cost method of bringing vacant land into residential use
- a systematic process for encouraging long term development of low income housing
- an administrative framework for providing to self help home builders
  - subdivision layout
  - materials loans
  - house plan services
- a means of bringing the clandestine squatter process into a legal and orderly process for housing
- an orderly means of extending municipal services to newly urbanizing areas
- a means of improving the quality of nousing by efficient subdivision design and standards for open space, public facilities, etc.

For the home builder the Growth Pole System offers:

- low priced lots within an overall subdivision

- guaranteed tenure
- technical services
- materials loans
- house plan services
- provisions for infrastructure
- adjacent locations to existing development and job sources

Growth Pole System limits and assumptions:

- Families with incomes from subsistence to three times subsistence level
- A minimum subdivision size of 1000 families
- Subdivision plans that recognize the full range of residential support facilities in addition to the dwelling lots themselves
- Sloped sites adjacent to existing settlements with infrastructure
- That the existing laws prohibiting construction upon land without full services be repealed

4.200 GROWTH POLE SERVICES AND FUNCTIONS

Growth Pole services and functions are of two types: short term development initiation and long term technical and financial assistance. The first short term function is the identification of potential housing sites. This includes identifying and purchasing sites

adjacent to existing infrastructure adequate in size to provide for both housing and support facilities. The expense of extending basic infrastructure and public transportation are primary considerations. Our survey of possible sites indicates that there are a large number available that satisfy our stated criteria. See Figure 1.

The second short term activity is to define an overall subdivision scheme for a given site. This plan should account for all reserved public lands, define the lot parcels, and consider circulation.

The most important considerations at the time of site selection deal with possible future development of the city into the site region. Highway locations, public open areas, and future commitments of infrastructure are of primary concern. Once a site has been selected, the initial Growth Pole locations are determined. Possible extensions of existing infrastructure determine to a great extent the pole locations. At this time an overall circulation plan can be determined for both pedestrians and automobiles.

In most cases the adjacent developed areas will dictate the number and directions of main roads. Within these limitations, different for each site, the lotting system is determined. For sloped sites in particular the lot area, proportions and orientations with respect to the contours are of considerable consequence to the home builder and must be studied in detail. The lot size determines its initial cost and the number of floors the perspective builder must make to satisfy his space requirements. The proportions control the types of house plans he is able to make as well as how many lots can be served for any given run of infrastructure. The lot orientation with respect to the slope determines the amount of site work necessary to make a plot level for the house. To a great extent this controls the

amount of time it will take to begin the actual house construction.

In addition to these short term programs, tne Growth Pole agency must be in a position to provide long term services, most important of which include technical services and control over the development sequence. Long term technical services include installation and maintenance of infrastructure. Although all lots are initially served by water and electricity, the installation of sewers, site protection devices and the paving of streets must be managed by the barrio itself. By having already established a total infrastructure plan, the agency can make construction materials and equipment available as tne barrio organizes its labor force and needs tnese things.

Almost synonomous with the tecnnical services provided is that of controlling the sequence of development. This is accomplished by regulating the sale of lots to individual home builders and the sale of larger parcels to private developers. On sloped sites there is a direct relationship between the degree of slope and the developmental costs for house construction and infrastructure. As slopes increase, it becomes more important to protect tne soil from erosion as it is being cut and filled. The more slope, the more money needed for retaining walls, stairs and pavement. Costs are reflected in another way. Because of the geometry of sloped sites, infrastructure running parallel to the contours is often serving only a single row of houses making it only half as efficient as one serving two rows of nouses on either side. Staging is therefore important to control builder and community expenses.

There are distinct advantages to controlling the sequence of development in terms of the sales prices of the lots. Lots that were initially at mid-pole locations without full

services gain in value as services are extended to them. In many cases the development agency can use the price mechanism of spot development to create funds for high cash outlay projects such as infrastructure of school building.

4.210 SUMMARY

- Growth Pole services and functions are of two types: short term site selection and purchasing and long term technical and financial assistance
- Short term services include the complete site planning, the reservation of public spaces, roads, and public facilities. The poles are small areas witnin this plan that receive full and complete services.
- Long term services include administering legal titles, controlling the sequence of development, supplying self help groups with infrastructure materials and plans, and home building materials loans.

4.300 EL ENCANTO--AN EXAMPLE OF THE GROWTH POLE SYSTEM

4.310 THE OVERALL PATTERN FOR DEVELOPMENT

The Growth Pole System works through two physical planning elements:

1. A defined overall subdivision plan with a defined lotting pattern and reserved areas for infrastructure and community facilities
2. Full services to specific areas called the poles with a controlled sequence of selling lots at the poles and into the inter-pole areas.

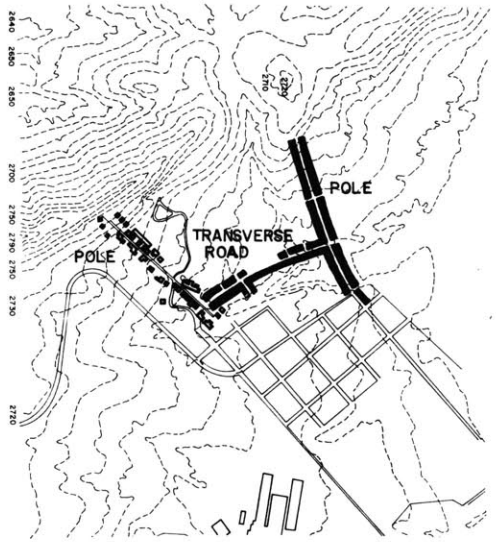
Refering to the El Encanto case study, we can demonstrate the necessary steps for development through the Growth Pole System. As tne case study indicated, El Encanto is a strip development extending from Barrio San Isidro. Utilities have already been extended into El Encanto: all lots have water and electricity; however only the lower portion north of the surface mine service road has sewering.

Considering the barrio itself as one pole (a row of blocks witn full services), a second pole consisting of a road is extended from Carrerra 9 to a point about 350 meters up the slope. This second pole is to receive full services of water, electricity, paving and sufficient sewering to serve the pole areas as well as serve the future inter-pole area. This could be an oversizing of the pipes only. Figures 2a and 2b indicate the barrio's initial layout and the introduction of the second pole road. The same infrastructure provisions are made for a transverse, lower slope road connecting the two poles. The area between the pole roads is about 15 hectares. This area is sufficient to create a minimum of 1000 lots dimensioned 8 x 16 meters with 4 hectares additional area for community buildings, open space and circulation. Figure 2b also indicates the location of the eventual school and recreation field. Figures 2c and 2d show advanced stages of the plan. Although a total subdivision plan is prepared from the offset, Figures 2a, 2b, 2c, 2d represent the most likely sequence for implementing tne plan. Figures 3a, 3b, 3c and 3d provide a more detailed view of the lotting with respect to the El Encanto pole..

4.320 POLE AND TRANSVERSE ROAD LOCATION

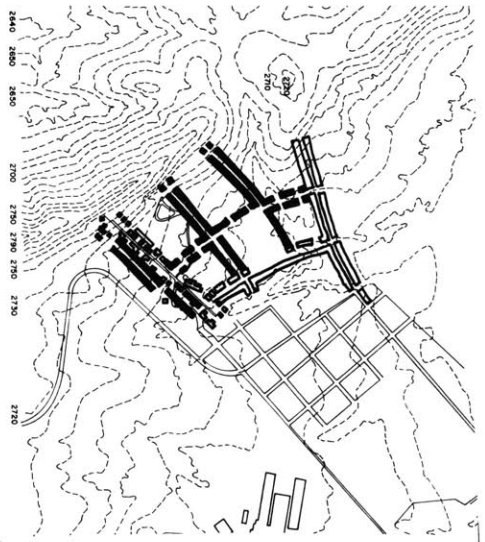
There are three things which control the location of the poles and transverse roads:

1. The overall dimensions and proportions of the site



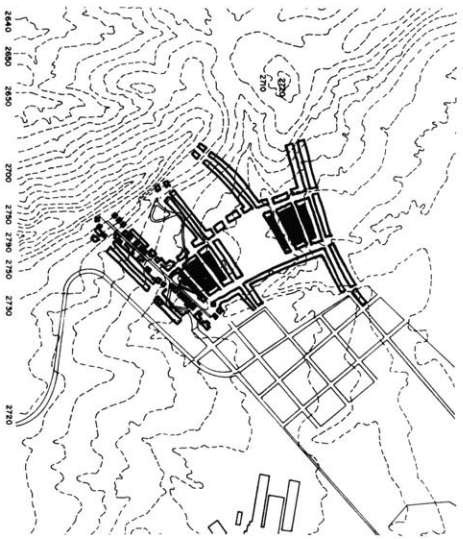
STAGE 1 LOWER SLOPE TRANSVERSE ROAD, PRIMARY POLES

Figure 2a



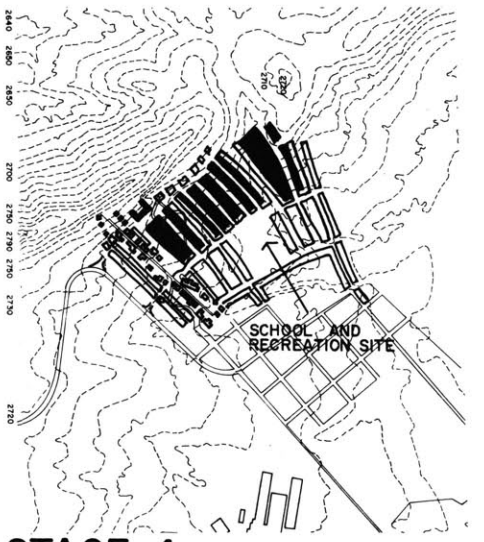
STAGE 2 MID-SLOPE TRANSVERSE ROAD, SECONDARY POLES

Figure 2b



STAGE 3 INFILL OF LOWER SLOPE

Figure 2c



STAGE 4 INFILL OF UPPER SLOPE

Figure 2d

Figure 3a

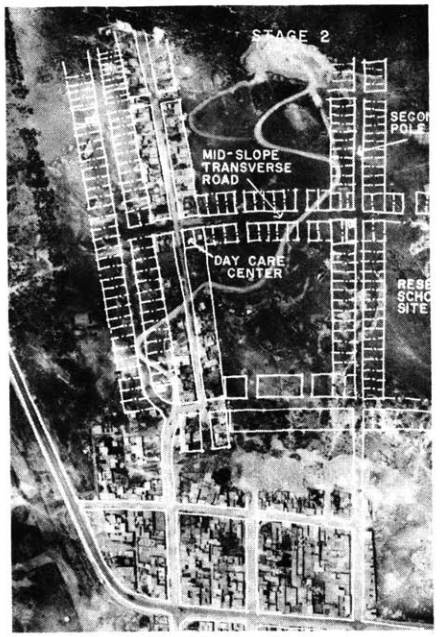


Figure 3b

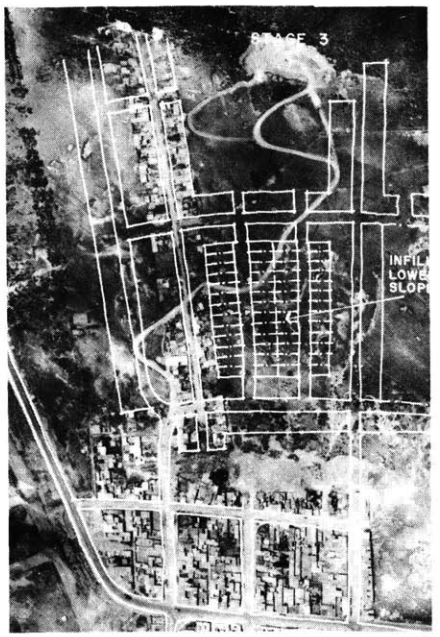


Figure 3c

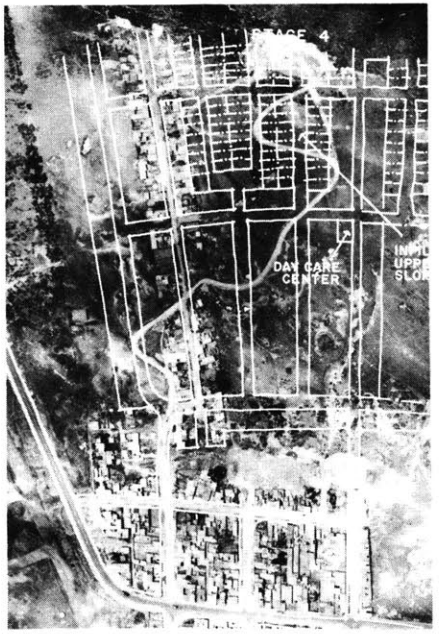


Figure 3d

BARRIO EL ENCANTO

STAGES OF GROWTH POLE DEVELOPMENT

Figure 5

ZONE FOR GROWTH POLE APPLICATION

2750 m. IS MAXIMUM ALTITUDE;(DETERMINED BY AQUEDUCT CAPACITY)

2. The possible service extension points from the adjacent barrios

3. Walking accessibility to the school and market areas.

Case studies have indicated that the maximum distance is about 400 meters. This means that the absolute maximum inter-pole spacing cannot exceed 800 meters for access to a mid-pole school or market. Even at 800 meters, residents at the extreme ends of the pole roads are beyond tne 400 meter limit. The El Encanto area however, does not offer any overall pole location problems.

Location of the transverse pole road is controlled by three similar factors. First, the extension of any existing road networks tnat will provide continuity of circulation from the adjacent areas.

A second locational criteria reflects the higher rates at which the lower sloped areas are developed. The lower slopes will be the first lotted and sold and the first to receive full services after tne pole and transverse road areas. A third criteria is the degree of slope and the financial advantage in lower locations, because grading, bérming and paving costs are less there. Infrastructure costs associated with the road, storm and sanitary drains are also correspondingly cheaper in tnese areas.

4.330 COMMITTED LOT PARCELS

At the same time that the pole and transverse roads are established all lots immediately adjacent to them are parceled. Since 8 x 16 meter lotting has already been established on the lower and intermediate slopes of El Encanto, we have elected to continue this custom.

The block lengtns are also established. Subdivision regulations prohibit any lot from being further than 100 meters from the nearest intersection. This places a 200 meter limit on all blocks.

4.340 SCHOOL AND OPEN SPACE LOCATIONS

From case studies and a survey of primary school area requirements, we have established that an adequate classroom building, adjacent service areas, and parking can be provided in a one hectare parcel. A corresponding recreation area serving 5000 students requires the same area. From the standpoint of reducing tne school building expense and equalizing accessibility to everyone, tne most advantageous sites are those midway between the poles and on the flattest sites available. Since substantial cost reductions can be realized in school designs that minimize the need for multi-story construction, stairs or elevators, and also cut and fill work, rectangular designs with the longest axis parallel to the contours produce the best results. The recreation field on the other hand needs only a sufficiently flat area for a soccer or football field. Figure 3 suggests a location for both the playfield and school building site.

4.350 GROWTH POLE INITIATION SUMMARY

- Poles are established by extending streets and utilities from adjacent barrios
- Pole location reflects the practicality of extending adjacent services, overall site proportions, inter-pole area sufficient for 1000 lots with primary school and playfield and walking distances to scnool and markets

- Transverse roads reflect the extensions of any existing routes parallel to the contours, with best potential for developing the lower slopes first due to lesser cost of berming, grading, and paving on a lower sloped area.
- School area and recreation field location are adjusted to the site's topography. Mid-pole locations for the school are most favorable. Site proportions that orientate the long building axis parallel to the contours reduce the need for stairs and elevators. Recreation fields utilizing the least sloping areas for soccer or football fields are of primary interest.
- Lotting is established along the pole strips and transverse road. Parallels are retained for future pedestrian and auto circulation. Area for play fields, day care centers, etc., are also reserved at this time.

4.400 CRITERIA FOR ESTABLISHING GROWTH POLE FORMS

Thus far we have presented what functions the Growth Pole System is to serve. We have also demonstrated its use in a specific case, Barrio El Encanto. However, we have not yet dealt with specific criteria for creating an overall subdivision plan.

4.410 GROWTH POLE LOCATIONS AND INTER-POLE DISTANCES

The greatest advantage to the use of growth poles is that large areas of land can be developed to high design standards without highly detailed design plans. The degree of success of the Growth Pole System depends on how far apart the full serviced poles can be and still maintain some barrio development relation between them. To give specific estimates of their potential influence is impossible; however, there are some empirical development restrictions that suggest their maximum spacing.

For each of the barrios surveyed in our case studies, the single most important community investment made was for the construction of a primary school and a community facility or recreation area. These developments consolidate the barrio by establishing formal institutions that associate a particular neighborhood with those of the developed city. One of our initial goals in the growth pole process is to establish a means of creating balanced and self contained communities. Many planning schemes in practice today leave their residents in tenuous positions if the plan cannot be completed due to some unforeseen circumstance. We have attempted to minimize the effects of such uncertain planning practices by reserving enough space before the site is occupied and distributing lots in such a way that enough space will be available for the anticipated population. We consider the maximum inter-pole population to range from 5,000 to 7,000 persons or about 1,000 families.

Our case studies have indicated that their average density has been from 500 to 600 persons per hectare. The area required to house 1000 families is from 10 to 12 hectares or 100,000 to 120,000 sq. meters of land. Adequate primary school facilities and an associated play area occupy an additional 20,000 sq. meters. The minimal availability of automobiles (where the rate is about 10 families per car) necessitates only about an additional 3,000 sq. meters parking area. Business, commercial areas such as an open market place and circulation will increase the total land requirements by about 15%. Our approximate breakdown of land uses of an inter-pole population of 6,000 persons or about 1,000 families is below:

LAND USES WITHIN THE GROWTH POLE SYSTEM

Land Use	Area Requirements (sq. mts.)
Residential Land Area	100,000
1 Primary School	10,000
Open area or play field	10,000
Commercial establishments including an open market area	15,000
Parking for 1 car per 10 families	3,000
Religious, social and communal facilities	5,000
Circulation and reserved area	18,000
	161,000 sq. mts.

These estimates demonstrate that the residential support areas are a significant percentage of the total amount. We feel that a school and its associated play field are a reasonable unit to accept as one inter-pole population. By including them in our total space estimates we can be at least 90% accurate. Now that we have made an overall estimate of the required inter-pole area, we must turn to the first locational problem, which sites in the city of Bogota are available for growth pole development and what their dimensional limitations are. Figure 5 illustrates some of the most likely sites for introducing growth poles. These areas have not undergone appreciable development and do not have extensive service commitments from the city. They are also the most likely sites to be taken by invaders if no policies are introduced concerning their urbanization.

Our survey of these sites indicated that the average distance up a slope perpendicular to the contours was about 250 meters, as in the case of El Encanto. By accepting this dimensional restriction in sites, we see that in order to create sufficient area for 6,000 residents (the school support population) about 600 to 800 meters distance is needed in a direction parallel to the contours. If the school and the larger reservations of land are placed mid-way between the poles, this puts all inter-pole areas within the acceptable walking distance to school of from 300 to 400 meters. (1)

The aerial photographs of El Encanto presented earlier are approximately 250 meters by meters base to upper ridge and from pole to pole and provide an actual case example. If we wish to estimate to what degree the growth pole has reduced the need for detailed plans and initial capital, we pose the following generalizations: If the full inter-pole area is developed, it will have required that the original plan have had reserved some 300 meters of primary roadways or about 1800 sq. meters in area, and another 50,000 sq. meters for the school, community facilities, market area and the play field. This is approximately 60,000 sq. meters of land reserved and planned for future use. The total site including both residential and support facilities is about 200,000 sq. meters. This means that the growth pole results in a 60% to 75% reduction in initial infrastructure commitments. The two pole roads and the transverse connector road are the ones requiring initial infrasturcture installation, i.e., sewer, water and electricity service. This doesn't mean that the other areas will not eventually need services too. It does allow service installation to take place at a time when there are enough persons to warrant their installation and in a structure that has reserved space for them.

(1) Supramanzana standard, M.I.T. Department of Architecture, 1969.

The overall benefit to the Growth Pole agency in providing full services only in spaced intervals and not over the entire subdivision before lots are sold is to significantly reduce the initial capital required to attract home builders.

4.420 RESIDENTIAL SUPPORT FACILITIES

As an integral part, the Growth Pole System includes all necessary municipal and community facilities within the subdivision. We undertook the problem of community design standards to see what historical preoccupations there have been in establishing them and what facilities and space recommendations were made. We soon discovered that there was no agreement among planning and public health agencies as to what was required; even worse, there appeared to be no systematic way of obtaining standards either from case studies or empirical experiments.

Our review of contemporary standards produced several overall conclusions; first that with each change of urban scale increasing numbers of people demonstrate the need and the ability to support various adjunct land uses. For example, at the block level involving from 100 to 500 persons, a minimum of commercial services is required. At this scale, specialized community services such as fire and police protection or post offices are not warranted. However, at a particular community scale, each of these residential support facilities will be required.

We also concluded that the private sector land uses such as residential and commercial areas are the financial supporters of the public sector land uses like schools and health clinics. This economic relationship is often overlooked by planners.

Perhaps the most impressive consequence of residential support facilities are their space requirements. For example a subdivision plan for 1000 families will have from one third to one half the total subdivision area committed to non-housing uses. Not only do these support facilities consume area, but they often have locational constraints that dictate where they must be placed. In the El Encanto example of the Growth Pole we saw that walking distances to the school played an important factor in the plan.

4.421 AREA AND FACILITY TYPES

Figures 6 and 7 list the most common facilities required in community development. Figure 6 provides an overall comparison of residential support facilities for 6000 and 50,000 persons. Since the Growth Pole System is directed towards 6000 persons we have broken the overall facility requirements of Figure 6 into specific area and facility types, see Figure 7.

Figure 6

	BARRIO 6000 Persons	SECTOR 50000 Persons
School Equipment		
primary school	x	
secondary school		x
Cultural Activities and Learning Equipment		
special functions, conference and parties room		x

Figure 6 (continued)

	BARRIO 6000 Persons	SECTOR 50000 Persons
manual training work shops		x
library and reading room		x
multifunctional space	x	
parrish church	x	
Commercial Equipment		
corner store	x	
commercial center		x
markets and supermarkets		x
general commerce, weaving trade		
Health and Social Assistance Equipment		
social action and child care equipment		
milk programs	x	
child care center	x	
kindergarten	x	
health equipment		
maternity center		x
hospital		
Green Zones and Sports Fields		
private garden	x	
children's playground	x	
community park	x	
urban park		x

Figure 6 (continued)

	BARRIO 6000 Persons	SECTOR 50000 Persons
Sports Equipment		
sportsfield and gymnasium	x	
sports center		x
stadium		x
General Equipment		
Municipal Administration		
administration of barrio	x	
police station		x
municipal administration		x
branch office banks		
firemen	x	
police headquarters	x	
administration and technical service	x	
maintenance and refuse collection	x	
Communications		
branch post office	x	
mailbox and telephone	x	
postoffice and telegraph		x

Figure 7

COMMUNITY FACILITIES FOR A BARRIO OF 6000 PERSONS OR 1000 HOUSES

Facility Type	Area Constructed M^2/Person	Area Constructed Total M^2	Open Area M^2/Person	Open Area Total M^2	Total M^2
Primary School	.49	2,920	.90	5,400	8,320
Multi-Use Room	.20	1,200	.20	1,200	2,400
Parrish Church	.08	480	.12	720	1,200
Commercial	.27	1,620	.23	1,380	3,000
Day Care Centers	.17	1,020	.14	720	1,440
Kindergarten	.16	960	.16	960	1,920
Community Parks			1.00		6,000
Sports Field			1.65	10,000	*10,000
Barrio Administration Office	.03	180	.03	180	360
Post Office and Telephone Exchange	.06	360	.06	360	720
Totals	1.46	8,740	4.49	20,920	35,360

Source: Plazas, Jorge, Alternativas Para El Desarrollo Urbano de Bogota D.E., p. 95.
*Note: The sports field area has been increased from 6,000 sq. mts.

4.500 DWELLING LOT ALTERNATIVES

Next to the residential support facilities, the sizing and proportioning of dwelling lots determines the efficiency of the overall subdivision. Lot sizes and proportions determine to a large extent the possible floor plans a person can build. Excessively narrow lots result in house plans with long, space-consuming corridors. The area of the lot determines if a second floor will be required and what the initial cost of the lot will be. Assuming the area of the lot is adequate, the proportions greatly affect the efficiency of municipal services to each lot. The narrower a lot gets, the more efficient are the utilities serving that lot assuming the utilities front the lot on its narrow end. A small savings per lot represents great savings in overall barrio services.

The above relationships are further complicated when developing lots on steep slopes. There is a direct relationship of lot proportions and orientation with respect to the slope contours which greatly affect the development costs to the home owner.

4.510 EFFICIENCY OF SUBDIVISION LAYOUT

In an attempt to create an empirical measure of subdivision layout efficiency a technique called R factor was developed under the direction of Prof. Horacio Caminos (MIT, Department of Architecture, 1970). The R factor creates a mathematical relation between subdivision services and their associated service areas. Although the technique is more universally applicable than we present here, the R factor relates lineal utilities such as streets, electrical and telephone lines, and water and sewer lines to the areas that these lines serve, such as lots.

In its general form the R value, or index of efficiency between the lineal utilities and the lots, is expressed as a ratio:

$$R = \frac{\text{Total Lineal Service Distance (meters)}}{\text{Total Service Area (sq. meters)}}$$

From inspection we see that if the total lineal service distance is held constant and the total service area associated with the lineal services is steadily increased, the result is a lowering of the value of R. Therefore, lowering R values reflect an increasing of the efficiency of lineal services to service areas. In short, more area, more lots, more people, etc., can be served by a fixed lineal distance of utilities.

LOWER R VALUES INDICATE HIGHER PLAN EFFICIENCIES.

In order to simplify the use of the R technique, special tables have been prepared.

4.520 NUMERIC R TABLES

To apply the R technique to subdivision layouts, tables were generated relating lot areas, lot proportions, the number of lot sides serviced and the block length. Although these tables were specifically designed to evaluate street grids and sewer networks, both their principles and actual numbers can be applied to any similar lot and utility line relationships. The tables serve in a clerical capacity only. They perform the necessary arithmetic and allow for a scanning of alternate possibilities.

The numeric tables include lots whose area ranges from 25 sq. meters to 800 sq. meters in increments of 25 sq. meters. These tables represent the range of lot areas encountered in the 16 case studies of Urban Dwelling Environments (2). These areas are considered representative of most urban subdivision.

In order to simplify the problem of varying street widths, sidewalks, curbing, and possible planting strips, the lot extends to the center of the street. When evaluating the following lot:

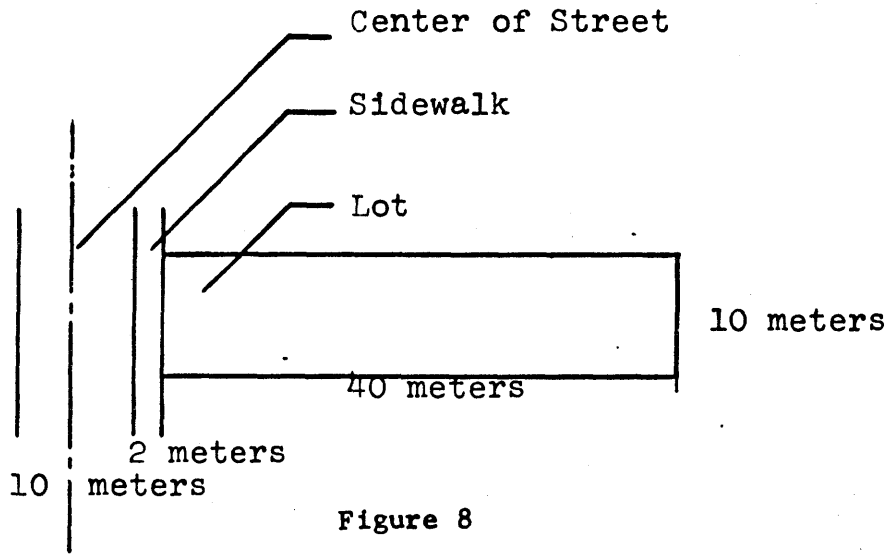


Figure 8

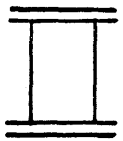
the lot becomes 10 meters by 47 meters.

(2) Caminos, Turner, and Steffian, Urban Dwelling Environments, MIT Press, 1969.

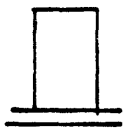
To express the subdivision efficiency only in terms of lot area, proportion and the number of sides served by a utility is to ignore the fact that there are transverse streets or street grids perpendicular to the one in front of the lot. Intuitively an infinitely long block is more efficient than many short blocks. Short blocks introduce transverse streets that increase the total lineal service lines for a given area. To acknowledge the streets running transverse to the lots fronting the street, several of the more common transverse spacings have been included. The numeric R charts include the most common spacings, 75, 100, 125, 150, 175 and 200 meters.

The 16 case studies from Urban Dwelling Environments indicate, however, that there are two broad categories of lot and utility relationships. They furthermore account for 90% of all cases. These are "1 Way Short" and "2 Way Short" schemes. The "1 Way Short" refers to a lot that is served on only one of its short sides by a service line.

For the case of square lots this is an irrelevant differentiation; however, these cases, are not typical. The "2 Way Short" refers to a lot that is served on two of its short sides, usually a rectangular lot served by both an alley and fronting street. Figure 9 illustrates typical site conditions for both "1 Way Short" and "2 Way Short" cases.



2 Way Short



1 Way Short

Figure 9

To use the numeric R tables, merely locate the appropriate lot area chart, (see Appendix D). The lot area includes the adjusted width to include the transverse streets as well as the adjusted lot depth to include the street area to the center line(s). Next identify the lot proportions. This can be done by using any one of the known dimensions of the adjusted lot or an approximation of the proportions. Read across to the transverse street spacing column corresponding to the block length measured from center to center of the transverse streets. These columns appear under the "1 Way Short" and "2 Way Short" headings; use whichever applies. In Appendix D we have located the efficiency R value for a 400 sq. meter lot, proportions 1:5, "1 Way Short," and transverse spacing of 150 meters. The R value is 178.

4.530 GRAPHIC R CHARTS

In order to measure the relative improvements in efficiency brought about by changes in lot proportions transverse street spacing a set of graphic R charts has been prepared to accompany Figure 9. Figures 10, 11, 12, 13, 14 and 15 graphically illustrate lot areas of 25, 50, 100, 200, 400 and 800 sq. meters respectively. These charts locate all R values of the same value. Their contour is superimposed over a reference grid which relate row wise varying lot proportions and column wise varying transverse spacings. At each grid intersection two numbers appear. The upper right hand number is the R value for "1 Way Short" cases; the lower left hand, the "2 Way Short" cases. Solid contour lines denote "1 Way Short" and dashed lines the "2 Way Short." For ease of reading, in every case possible contour intervals are 50 R units. In the 25 sq. meter and 50 sq. meter lots, contour intervals in the lots of 1:1 proportions use a 1000 R unit increment. The rate of improvement for these smaller lots is so pronounced that 50 R unit intervals would obscure the graph.

1 WAY SHORT + 2 WAY SHORT R CHART FOR 25 SQUARE METER LOTS

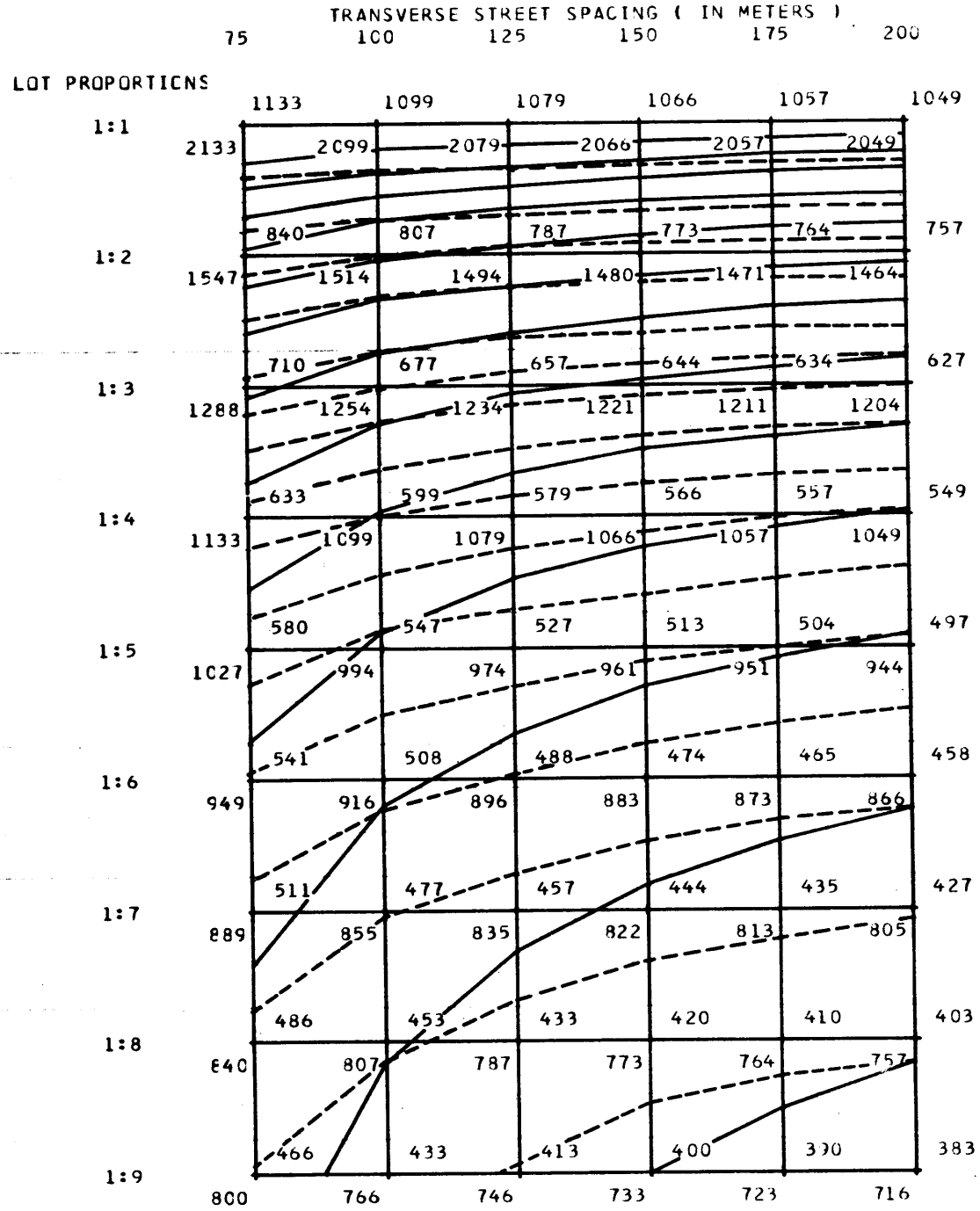


Figure 10

1 WAY SHORT + 2 WAY SHORT R CHART FOR 50 SQUARE METER LOTS

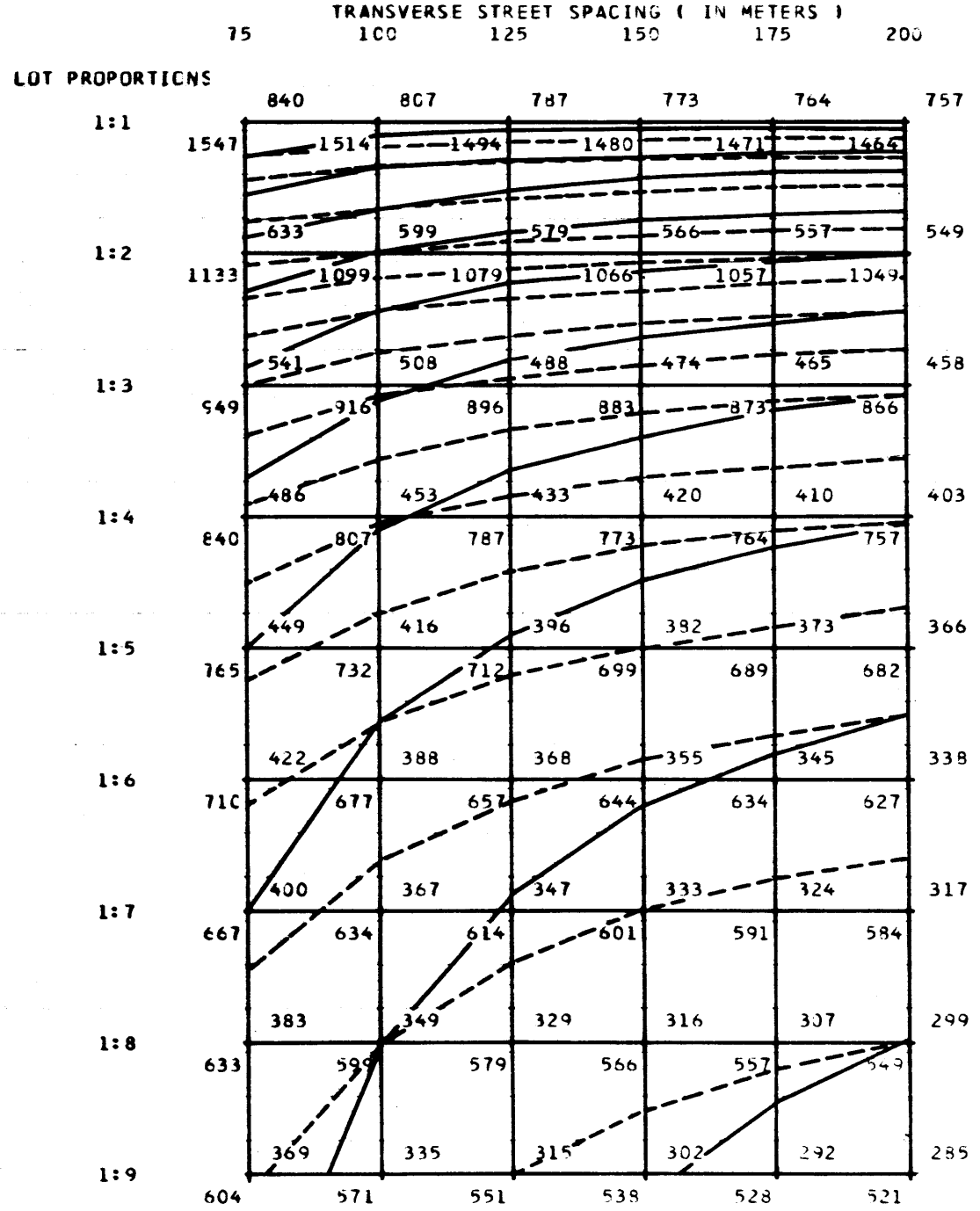


Figure 11

1 WAY SHORT + 2 WAY SHORT R CHART FOR 100 SQUARE METER LOTS

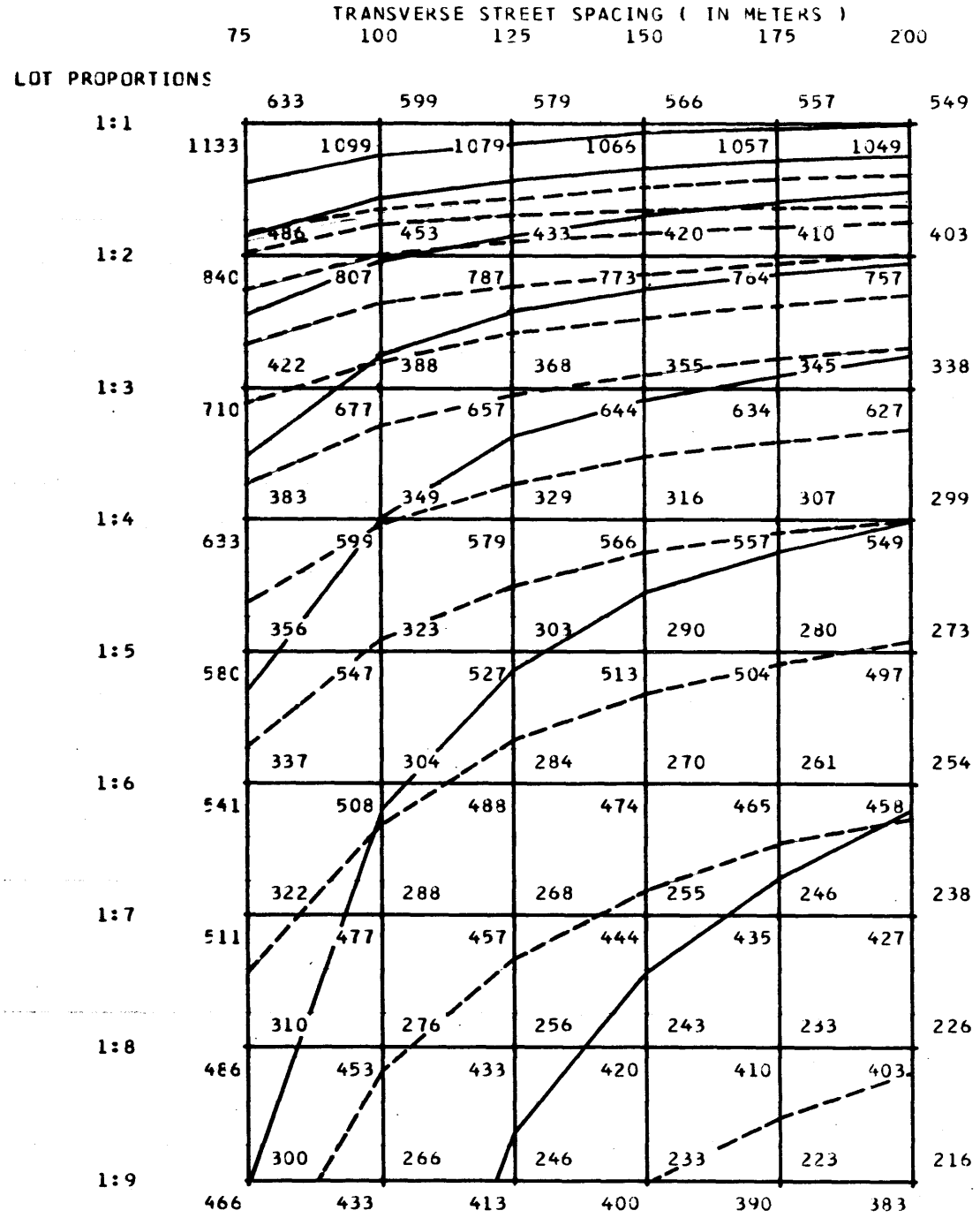


Figure 12

1 WAY SHORT + 2 WAY SHORT R CHART FOR 200 SQUARE METER LOTS

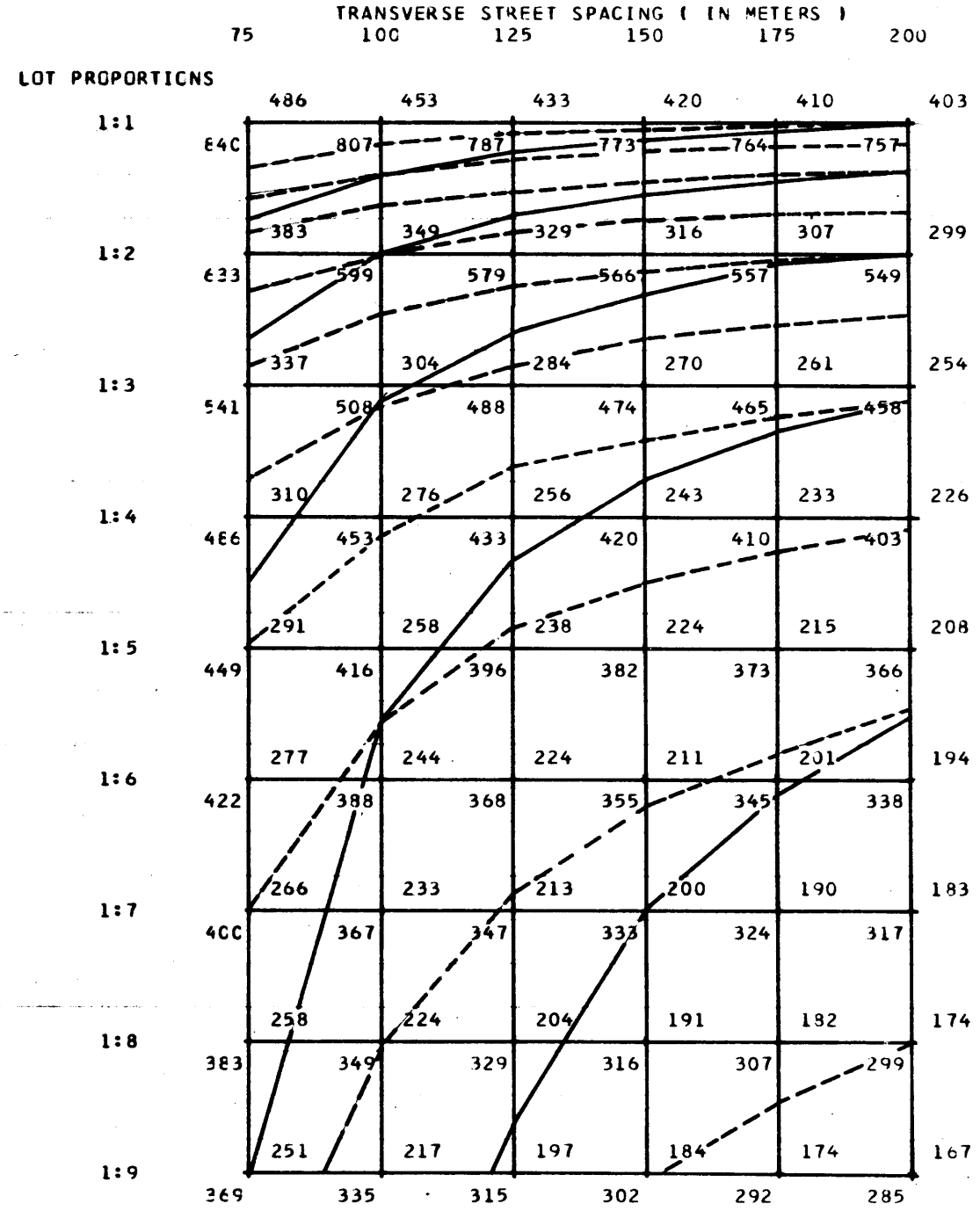


Figure 13

1 WAY SHORT + 2 WAY SHORT R CHART FOR 400 SQUARE METER LOTS

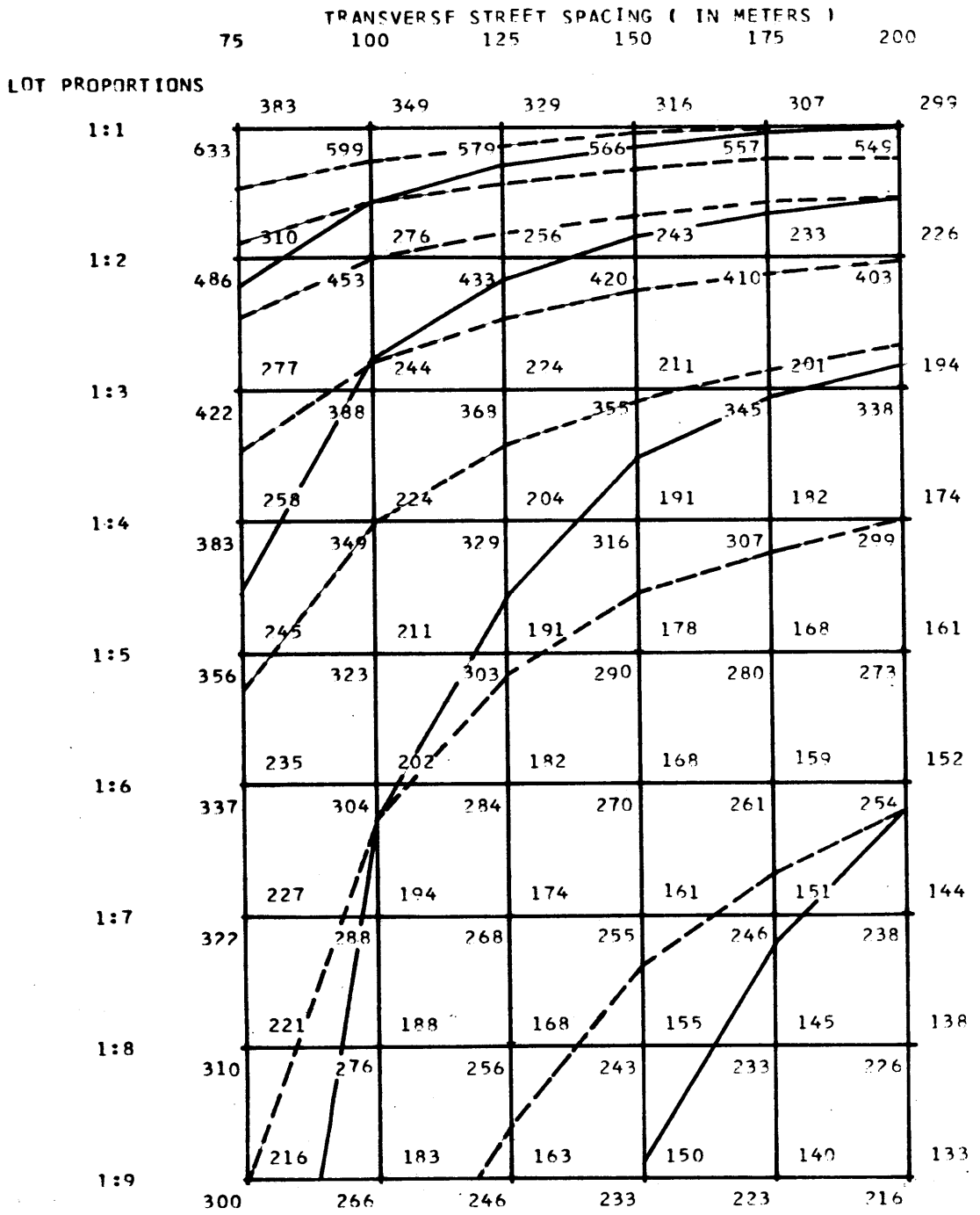


Figure 14

1 WAY SHORT + 2 WAY SHORT B CHART FOR 800 SQUARE METER LOTS

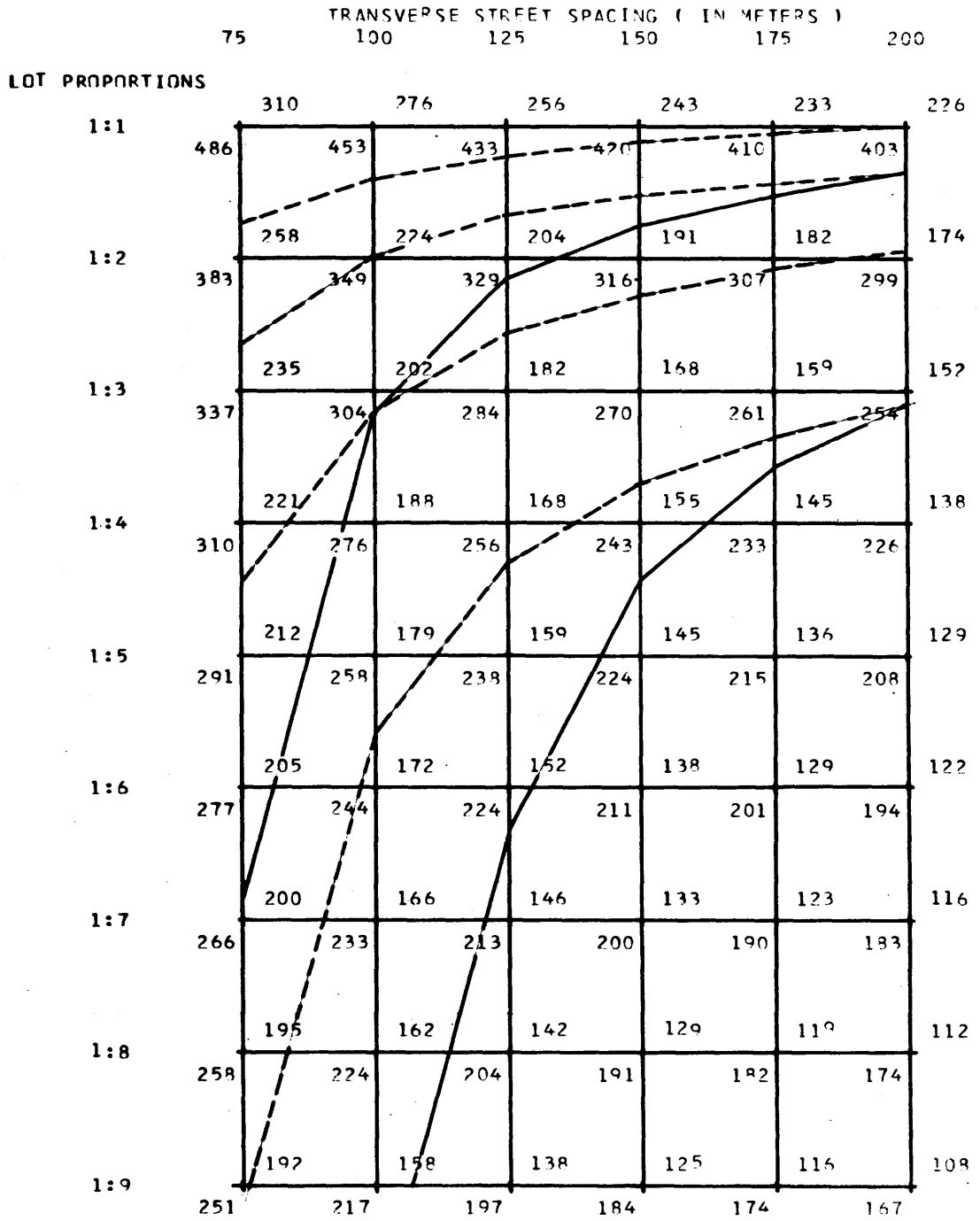


Figure 15

The graphic R charts illustrate the rate of change of the efficiency values. Where contour lines appear closest together the R value changes fastest. In all cases the lowest R value appears in the lower right hand corner. Narrow lots on the long blocks produce the lowest R value.

The R graphic charts serve the subdivision designer in a unique way. It has already been pointed out that the R values decrease (increase in efficiency) with longer blocks and narrow lots; however, what other choices are there that net nearly the same R values with other lot areas, proportions and transverse lot spacing? The graphic charts help to answer this question. Take for example the 50 sq. meter lot, see Figure 11. Note that the "1 Way Short" contour lines are becoming asymptotic to the 75 meter transverse spacing axis. Conversely there is a region of convergence in the upper right corner. This indicates that many more contours can be crossed for any change in lot proportions if the transverse spacing can be 150 meters or more. Crossing contours in effect is increasing the layout efficiency. One can see that for 75 meter transverse street spacing as much efficiency is gained as a percentage changing the lot proportions from 1:1 to 1:2 than from 1:3 to 1:9. Small lots from 25 to 200 sq. meters are particularly responsive to changes in proportions and transverse street spacing. This is particularly noticeable when the 50 sq. meter lot is compared to the 800 sq. meter lot chart, Figure 15 . Here the larger basic area of the lot makes it inherently more efficient, so much so that with all the possible lot proportions and transverse street spacing combinations, only 202 units for "1 Way Short" can be realized. (3)

It is interesting to note that when all R charts, either numeric or graphic, are compared, the percentage of overall improvement is almost generally a constant 300% from the least to

(3) The R for 1:1 proportions at 75 meter transverse spacing is 310, at 1:9 and 200 meter spacing it is 108, giving an absolute change of 202 R units.

the most efficient choice for any area lot. This comparison is within the "1 Way Short" class. "2 Way Short" cases are by definition less efficient; however, they exhibit the same 300% value range described above.

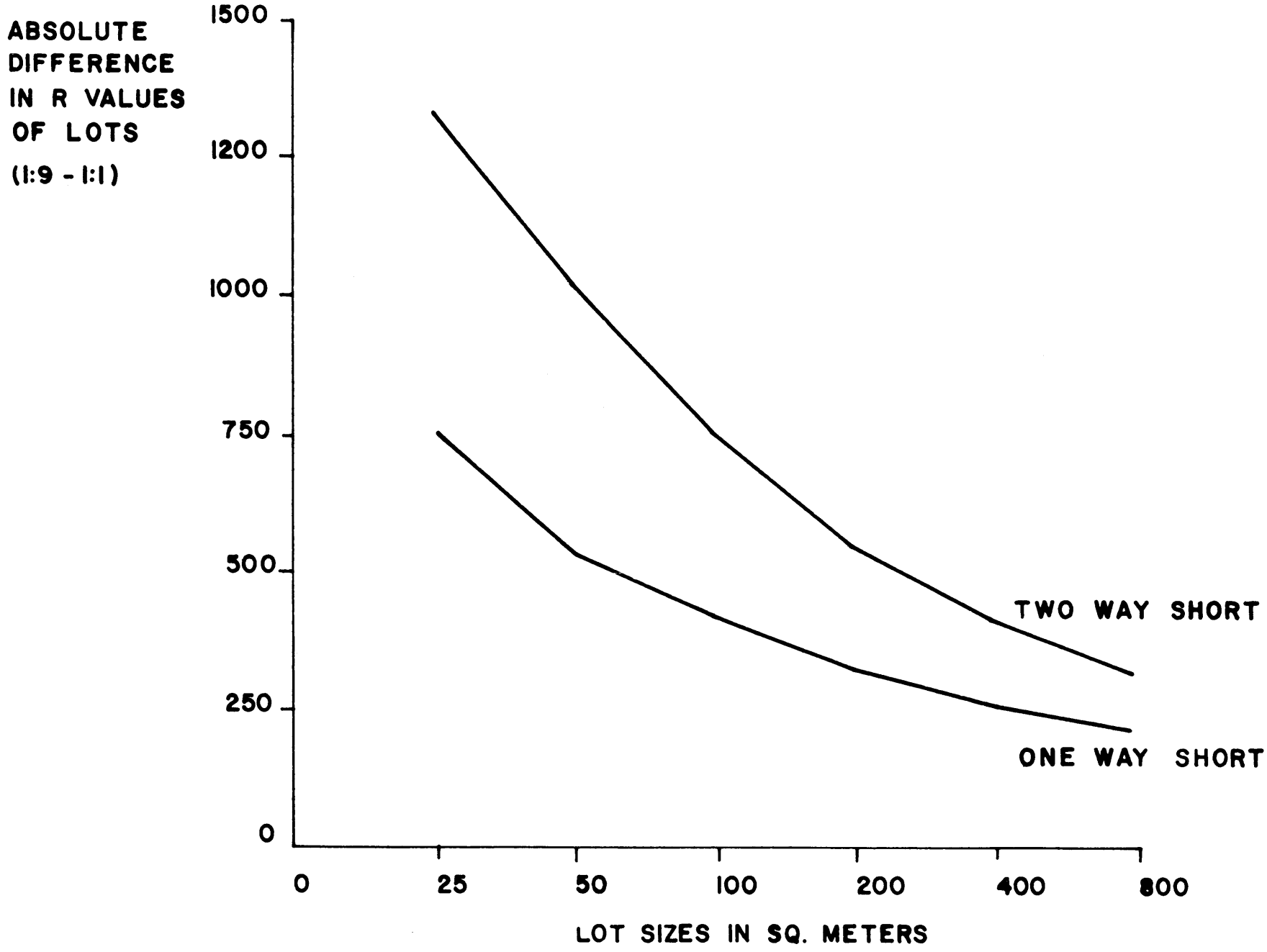
RELATIVE IMPROVEMENTS FOR CHANGES IN LOT AREAS

It has already been demonstrated that small lots are the most responsive to changes of layout. Figure 16 has been prepared to quantify at what point the lot area, proportions, and transverse street spacing are powerful regulators of efficiency. Figure 16 shows the absolute change in R values possible by changing proportions, etc. The abscissa axis denotes lot areas of 25, 50, 100, 200, 400, and 800 sq. meters. The ordinate axis contains the range of absolute improvements in R values.

Referring to the "1 Way Short" graph of page 181, small lots, 200 meters and under, slight variations in transverse spacing and/or lot proportions made substantial differences in efficiency. For the 25 sq. meter lot 750 R units can be achieved. A 400 sq. meter lot yields improvements of only 250 R units and the 800 sq. meter lot 202 R units. The graph, p. 181, illustrates that with a steadily decreasing R value range changes in lot proportions and transverse street spacing are only applicable to lots of less than 400 sq. meters. The graph for "2 Way Short" cases indicates similar conclusions.

4.540 SUMMARY

In most subdivision designs, the area of the lot is fixed by economic restrictions of sale value. The case studies indicate that lots were in the 100 to 300 meter range. Therefore, the next most important consideration is the proportions and what restrictions they impose



RELATIVE IMPROVEMENT IN LOT EFFICIENCY

Figure 16

upon the dwelling unit and the efficiency of the infrastructure. When we look at the R figure 11 for the 50 sq. meter lot and compare it to that of the 800 sq. meter lot figure 15 these factors become important. Note that for a 50 sq. meter lot, the maximum range of R values for "1 Way Short" is from 1133 at 1:1 proportions and 75 meter transverse connector spacing to 383 at 1:9 and 200 meter spacing. The difference in R values is 750. For "2 Way Short" it is even more--some 1417 R units. When we compare this to the same proportion and transverse connector spacings for the 800 sq. meter lot, figure 15, we find ranges of 202 and 319 respectively. We have plotted the difference in R value for each of the tables presented here, see figure 16. Note that for the 25, 50 and 100 sq. meter lots there is considerable difference in R values from 1:1 proportions and 75 meter transverse connector spacing to 1:9 and 200 meter spacings. These differences are plotted for "1 Way" and "2 Way Short" cases. From all of these analyses of lot sizes, proportions and connector spacings, we conclude the following:

Lower R values indicate higher subdivision efficiency and that for any given lot area, 1:9 proportions and 200 meter transverse connector spacings are more efficient by 300% than 1:1 and 75 meter combinations.

Larger sized lots, 500 sq. meters or more, are more efficient (have lower R values) than smaller sized lots.

That smaller sized lots, less than 200 sq. meters, undergo the greatest improvements in efficiency by changes in lot proprotions and/or transverse connector spacing. Figure 16 indicates the relative R improvements. This is particularly important for the majority of low-income settlements occupying lots in this area range.

By inspection of the R value lines drawn on the tables 10 , 11, 12, 13 , 14, and 15 , it is clear that small lots undergo the greatest improvements in efficiency by changing their lot proportions. Changes in transverse connector spacing help but are not nearly as influential.

2 way schemes are by nature twice as inefficient as "1 Way Short" schemes; however, this difference is minimized by using large lots of at least 500 sq. meters or more.

4.550 LOT ORIENTATIONS ON SLOPED SITES

Thus far we have dealt with the problem of lot sizing and the geometrical constraints placed upon them. In this section we will see that the variety of subdivisions is further limited by slopes in terms of the amount of earth work involved in preparing a flat site. Not all subdivisions are affected by these constraints because in the invasion houses at Las Colinas, the whole problem was avoided by building houses on stilts.

4.551 PARALLEL VS. PERPENDICULAR

In considering what orientation relative to the contours that a lot should have to minimize the cut and fill requirements, one rule universally applies: the least cut and fill required to produce a level building site results from orientating the long axis of the lot parallel to the contours. (Obviously in the case of square lots there is no difference) For example, given a slope of 45% or about 25 degrees angle, a lot 8 meters by 15 meters would have to re-locate 105 cubic meters of earth when the long axis of the lot is perpendicular to the slope and only 56 cubic meters of fill when parallel. These differences become more pronounced as the lots become longer with respect to their widths. The same slope requires for a lot 8 meters by 30 meters 419 and 112 cubic meters for the same respective orientations as the first example.

We can further generalize on the effects of lot orientation relative to the contours by stating that as a lot is rotated from having its long axis perpendicular to that of parallel to the contours there is a continuous and almost lineal reduction on cut and fill requirements. Since this rule applies to lots which have been rotated about their centroids, see Figure 17, they produce at all times balanced out and fill situations. All earth work takes place on the site itself by merely relocating to another portion of the lot.

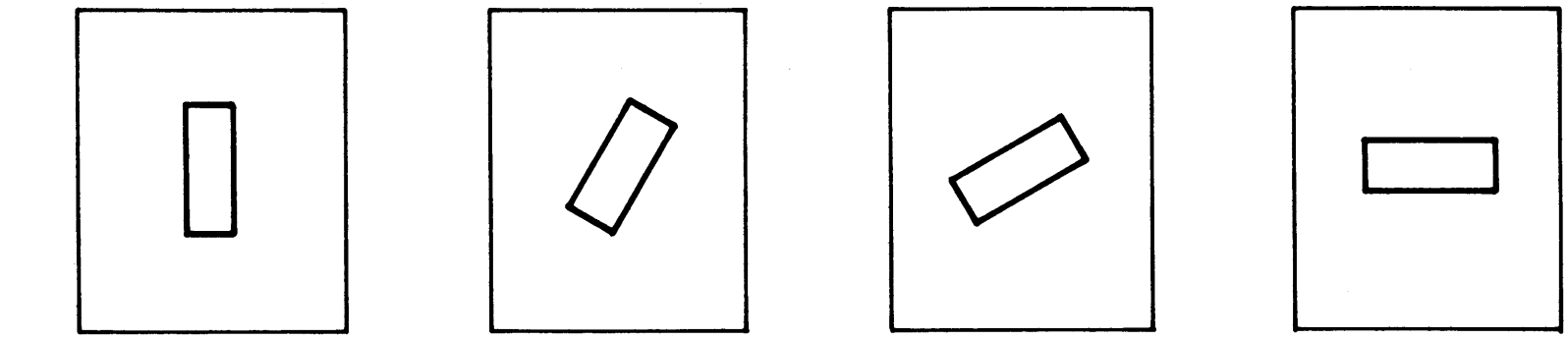
4.560 BALANCED CUT AND FILL VS. ALL CUT SCHEMES

There are two basic ways of locating a lot with respect to the slope. The first is by rotating the lot about its centroid until a more or less optimal solution is arrived at. Figure 17 illustrates this process. The second system is one in which the lot is always in pure cut (see Figure 18 for examples). Although this technique is not the most economical in terms of earth movement, it is by far the most common. This is due to two important reasons. First, if a lot is in pure cut it presents a solid and uniform base to build upon. This is not easy to do where balanced cut and fill are used. The filled areas have to be compacted and sufficiently retained in order to create a uniform surface. At the expense of more site work, pure cut solutions are better. The second reason for their popularity is that in most squatter developments, the streets are located first, and usually run parallel to the contours. When the lots fronting the street and above it on the slope are prepared for building permanent material houses their only choice (if they want their first floor to be level with the street) is to prepare the lot in complete cut.

The rule of locating the long axis of the lot parallel to the contours is still valid; however, there is not such a uniform reduction in cut as lots are rotated as Figure 18 suggests by one corner through 90 degrees. What happens is that at the perpendicular lot

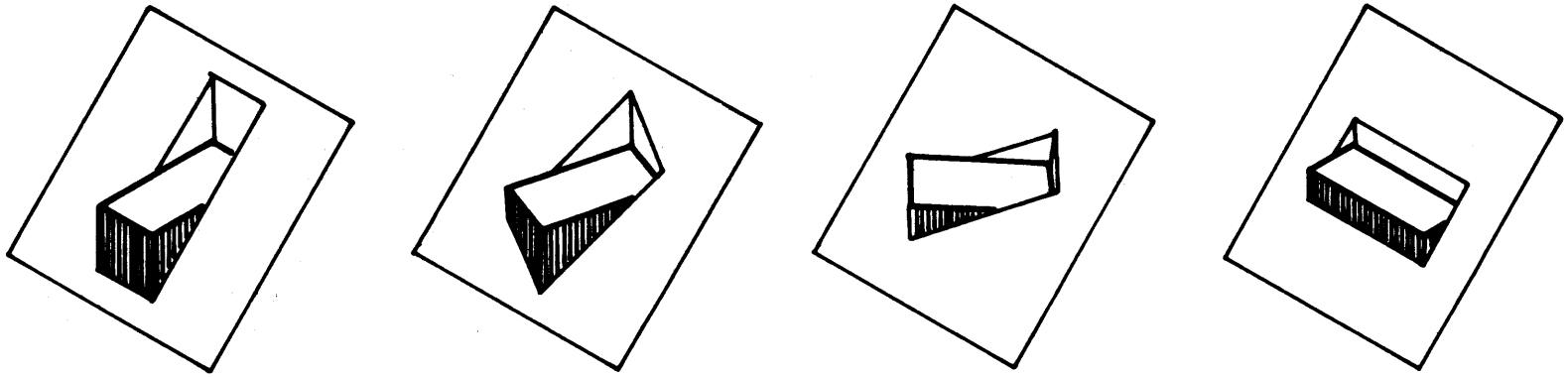
maximum cut
and fill

minimum cut
and fill



PLAN

0° 30° 60° 90°



ISOMETRIC

CUT & FILL / LOT ROTATION ABOUT CENTROID

Figure 17

slope orientation, or 0 degrees rotation, the next to greatest cut volume is incurred, Figure 18 step 1. As the lot is rotated and corner 2 of the lot cuts further into the slope, the greatest cut is incurred. At each successive rotation towards 90 degrees the cut reduces to a minimum until at 90 degrees, or as our rule states, the least cut is found.

Because of the rather laborious process of calculating the volumes for the two types of lot rotation systems, balanced cut and fill and pure cut, we have prepared a series of tables with volumes of earth movement already calculated. See Appendix E.

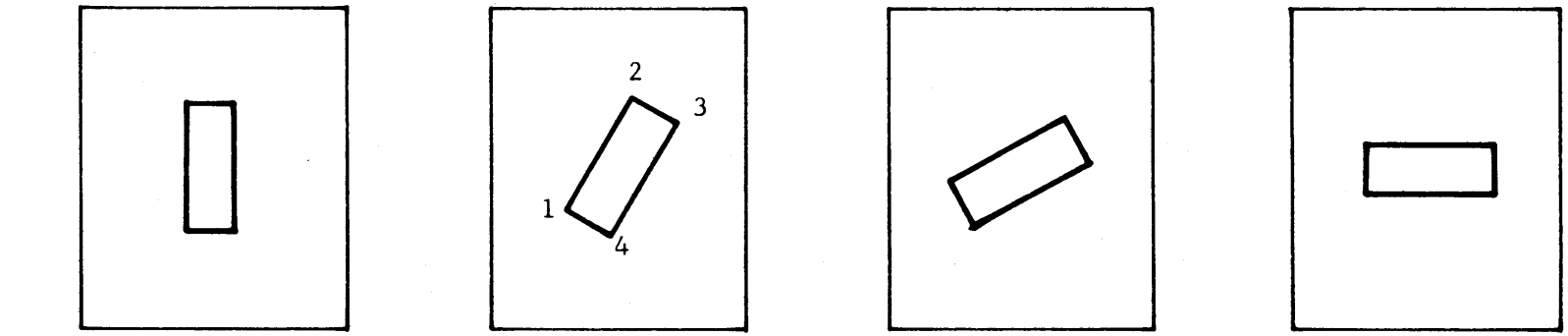
4.570 COMBINED EFFECTS OF DWELLING LOT CHOICES AND ORIENTATIONS

The previous two sections have presented the most important constraints placed upon subdivision designs. There are additional constraints that further limit the number of possible designs for barrios.

The first of these combined problems deals with the order of barrio development. It has been a common practice to locate pedestrian circulation routes on steep slopes in a direction parallel to the contours. This is done firstly because they are logical places for commercial establishments to begin as the slopes do not affect the ease of walking along the contour, and, second that their nearly horizontal runs make logical starting points for sewer and water lines. This, however, makes for complications when the cut and fill requirements are considered for the lots themselves. Reduced earthwork results when the long axis of the lot is orientated parallel to the contours. This places fewer lots on any given run of utility as the "1 Way" and "2 Way Long" cases indicated earlier.

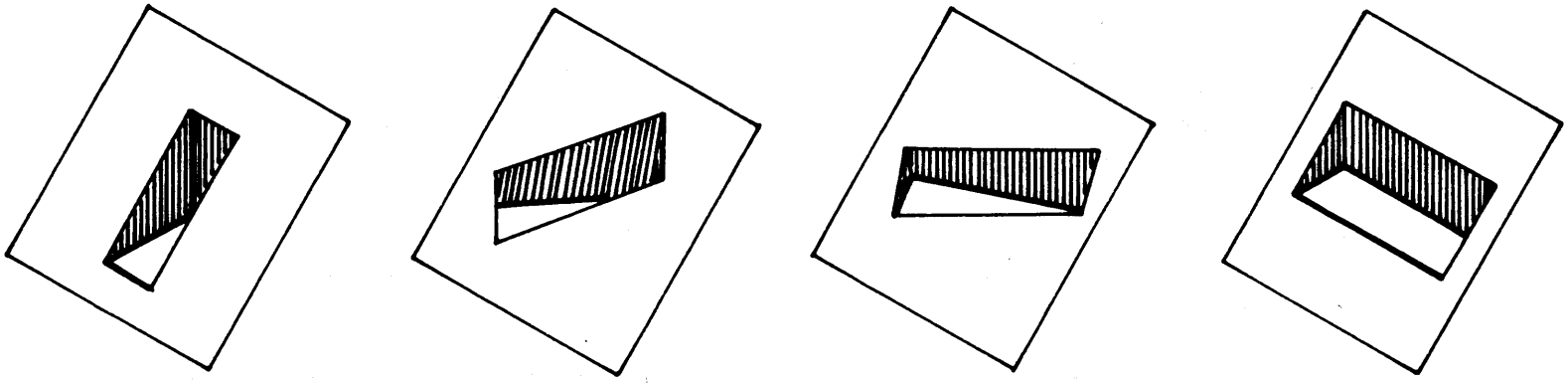
Maximum cut occurs when corner 2 is furthest into slope

minimum cut



PLAN

0° 30° 60° 90°



ISOMETRIC

CUT / LOT ROTATION ABOUT LOT CORNER

Figure 18

There is no steadfast method of resolving this conflict, only that there need be a joint consideration given to the costs incurred in both infrastructure and the lot development itself. Generally housing agencies have ignored the cost of developing the lot by saying that these are non-monetary investments made by the owner himself and that their responsibility ends with providing an inexpensive infrastructure. What has happened in some barrios is that residents will not contribute to the installation of infrastructure until they at least have a shelter. Orientations of lots that maximize the efficiency of utilities force longer shelter development times because increased cut and fill make investments of non-monetary resources come much later in barrio developmental sequence.

We have also noted that in cases where extreme slope conditions are undergoing development, infrastructure is only serving one row of houses. Because of the steep slopes, development directly downhill from the infrastructure takes several years. Las Colinas had this staging problem throughout. The community must absorb the costs of infrastructure at a time when it is only half capable of doing so.

There are additional restraints placed upon the location of lots with respect to services. Steep slopes decrease the allowable depth of lots by limiting the angles at which drainage pipes can be placed in the ground.

From the above discussion, it is clear that what appeared to be hard and steadfast rules for efficient subdivision design merely resulted in rules for some aspects of subdivision design and leaves the ultimate form to the particular site at hand.

The following conclusions result from the previous presentations of lot descriptions:

Small lots undergo the greatest improvements in efficiency by changes in lot proportions and/or transverse connector spacing. Table indicates that changes result in a range of improvement two to three times greater than those over 200 sq. meters.

Small lots improve efficiency fastest by changes in their proportions, and from going from "2 Way" to "1 Way" schemes. Transverse connector spacing improves overall subdivision efficiency but at a rate much slower than changes in proportions.

Lots undergo the least cut and fill when their long axis is located paralled to the contours. This is true regardless of whether or not the lot is leveled by balancing cut and fill or by pure cuts in the slope.

Although they do not offer balanced distributions of fill and have considerably higher earthwork requirements, lots that are developed in pure cut are the most common.

Reductions in lot development time and cost necessitate that their long axis be located parallel to the contours; this however, is in direct conflict with attempts to serve more lots with any given amount of infrastructure. It turns out that these two states must be resolved in the context of the barrio, where real costs can be applied to each case and a balance arrived at.

5.000 CONCLUSION

The Growth Pole System is in itself a tentative conclusion to a specific set of physical and social requirements. By advocating its use we have relied heavily upon the natural energies that people express for creating and influencing the form of their own living environment. This approach recognizes that housing is just one of many media for improving the quality of life. We have not relied on simplified solutions that substitute technological and modernizing solutions for natural and longer term development processes. Furthermore our approach has been to determine the requirements of the future by measuring the inadequacies and potentials of the present.

The authors feel the surface of low income housing development in Colombia has only been touched here. We feel the most important issue yet unattempted by the environmentalist is the social costing of physical development. We do feel, however, that the increasing concern for housing issues on an international basis is providing the first experience to initiate this work. This international conscience furthermore indicates a more universal and basic response of men to collaborate in solving problems of growth and progress.

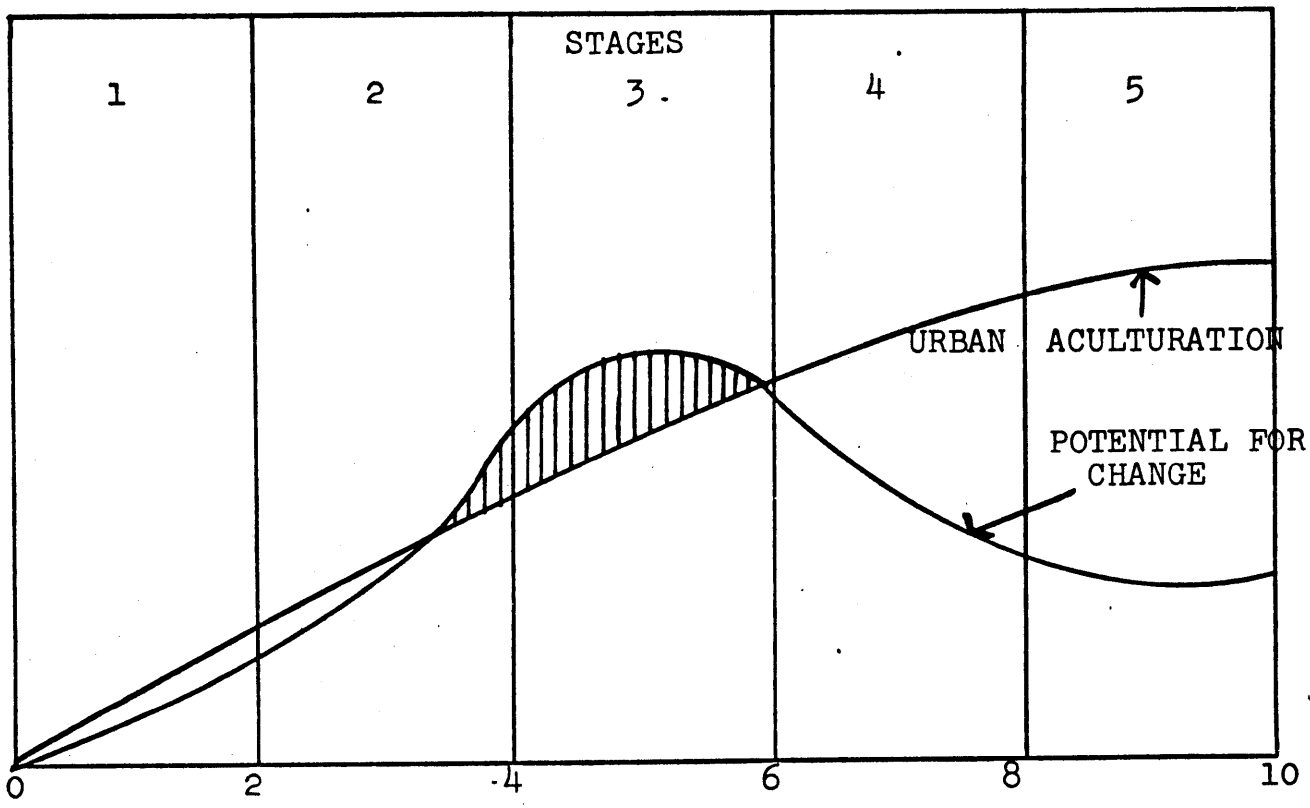
APPENDIX A

Migration, Urbanization, and Marginality

by Ramiro Cardona Gutieres

Translation of Spanish text describing a possible correlation between the potential for social change that migrants posses with increasing levels of urban acculturation.

Director of Social Demographic Studies
Division of Population Studies
Colombia Association of Medical Faculty



The Stages

First

The possibility that the new immigrants have in converting themselves into real change agents capable of taking a real attitude against the existing urban system is very remote, if one takes into account that these individuals:

a) are in a complete unstructured situation
b) are satisfying "urgent needs"
c) their greatest commitment continues to be with the country of "campo"
d) still they do not perceive the social pyramid because they are not located at any strata nor do they aspire to pertain to any specific one
e) they have individual disorientations, they do not perceive their conflict as shared.

Second
The immigrants begin to become potential change agents in an advanced time of this stage:

a) they have perceived in some manner the social pyramid and they have located themselves in one of the strata
b) they begin the change of individual disorientation to collective disorientation. They acquire some consciousness of class. It is possible that it is at this stage that individuals invade, opening to a charismatic leader.
c) more commitment to urban values than to rural values

Third
It is in this stage when the immigrants offer their greatest potential as agents of social change:

a) their disorientation is definitely collective. They are perfectly identified with urban values. They are conscious of the few channels of access it is worth pointing out, with the possibility of satisfying their aspirations with existing means.
b) they have an awareness of the power that their numbers present
c) they have taken a collective action against the existing system and have had success
d) they perceive the possibility of a greater collective action as a possible and near fact. They detect how much they have to gain and how little they have to lose.

Four

The individuals, now old immigrants, begin to lose the potential to which social change refers:

a) they have invaded with success and have achieved some social mobility. They have made a considerable investment and have identified more and more with the social levels immediately above them.
b) if they perceive that there is much to gain, now they perceive that there is something to lose. Thus the beginning of conservatism.
c) their system of standards and values now has purely urban characteristics. Their commitment with the rural system is almost nothing, which means to say that they will not accept returning to the country (a greater aculturation and a greater perspective in time).

Five

The same tendency as the fourth stage but more intense. Two hypotheses exist in relation with the possibility that individuals that have invaded and have had success in the action institutionalize its illegality as part of their process of aculturation:

a) The first signal that this institutionalization of illegality exists and that it is very certain that these individuals repeat new illegal acts to gain the longed for mobility, stimulated by their past experiences. The second signal that when these individuals have invaded with success and have gained some social mobility, they begin to commit themselves to the existing social system, because they do not try to go against it. Our observations in the field indicate to us to accept the second hypothesis.

APPENDIX B

An open letter to Senor Ramiro Cardona, Director of Socio-Demographic Studies at the Colombian Association of Medical Faculty, Bogota from Pro-Vivienda, explaining their position in the design of Barrio Policarpa. The letter is translated in context:

Centro Nacional Pro-Vivienda
Republic de Colombia
Personeria Juridica No. 001458 of 1961
Carrera 14 (Avenida Caracas) NO. 15-42 Telephone 432093
Post Office Box 4008 - Telegraph "Cenaprov"

Some Organizational Aspects of the Barrio Policarpa Salavarrieta

The Centro Nacional Pro-Vivienda and its Center No. 1 of the Barrio Policarpa, realizing that the solution to the housing problem does not consist in the building of shacks, but in a continued struggle to improve it continuously, until it is converted into a decent home for the family, and that in order to be able to achieve that the active participation of all the inhabitants of the barrio is indispensible, and the ability to look for solutions to other problems inherent in the dwelling.

In agreement with the development of the program of Center No. 1 of Policarpa and to perform its function, the barrio has been divided into 14 sectors, arranging with each one of these sectors a commission that elects its own responsible treasurer, and secretary. These commissions are responsible to the board of directors of the barrio and are those who are given the task of taking the orientations of the board of directors to the barrio inhabitants, as well as promote and watch that the decisions and tasks are done that were agreed upon in the barrio assembly, also in the meetings of each commission the problems that appear are discussed and decided upon, also that initiatives and propositions are studied to then present them to the junta or the general assembly of the barrio. There is a person in each

commission that is given the task of directing meetings, orienting and controlling the people he is in charge of, to be able to carry out the projects or tasks given by the board of directors or the general assembly of the commission.

Cultural Commission: it is in charge of organizing and educating the children and adults in: music, dance, singing, oratory, and theater. This committee is in charge of planning with the board of directors the presentations of lectures, artists, movies, plays, etc. In this work the committee has received scholarships to the district schools for the artists of the barrio and has contracted the intellectuals, artists, theater groups of national prestige, to elevate the cultural level in the barrio to the level of all the city's inhabitants.

Committee of Hygiene: this committee is in charge of watching out for the health of all the residents and in order to do that, to get the collaboration of the Colombia Red Cross, with the idea of their giving a course in first aid, besides forming a campaign for building and operating a medical clinic, connected to various doctors that cooperate with the barrio attending the patients in the barrio clinic.

Committee of Solidarity: is in charge of gathering and delivering the solidarity to the members that fall ill, to those that have a member of their family die, to those that are unfortunately jailed for causes related to the organization and the service of the barrio, to help morally and economically the Pro-Vivienda movement, or workers that ask for help when they suffer a tragedy or have an important problem.

Committee of Education: is in charge of organizing courses in the literary and the functioning of the primary school, that gets the desks for the students and are used also in the cultural house for other functions.

Committee of Sports: it is their goal to be in charge of promoting all the programs of physical education and sports that are present and of interest. It has organized two male teams of soccer and two female teams, three teams of "tejo," a cycling club and chess teams.

Committee of Security: previously, each family worked two hours every two weeks within each of the 14 sectors, now there exists a permanent body for security and they are paid monthly by the entire barrio. They are responsible for security: they watch for the security of the barrio and all its inhabitants in the houses of the night against attack, robbery, fire, and any unforeseen incidents of any of the residents. Also it is in charge of carrying out in that time the rulings of the general assembly or the board of directors about the functioning of bars and the vagrancy of minors. In the hours of the night, the committee has the authority to solve any problem that appears and can demand the cooperation that might be needed from any of the barrio members.

Committee of Maintenance: it is present at each assembly and presents how to improve the streets and the houses, giving an orientation in the form of notes or a demonstration to each one, to call to the attention to whom it may concern the condition of their dwelling in order that they build or rebuild, paint or fix up the front of their houses.

Committee of Energy: is the only authority that can make connections, installations or repairs of the power and in this way all the inhabitants will enjoy this service.

Committee of the Aqueduct: is another of the committees that has the sole power to extend the network, make the necessary installations and repairs, and control the use of the water. Thanks to this group now all the families have this vital service.

Committee of Sewage Systems: by the aid of various persons, their knowledge of this service was presented the plans for the construction and the specialization of the personnel of the commission to develop the sewage installations, perhaps the project of greatest importance and development for our economic means. This committee is in charge of directing works; making the ditches, as the technical part is pertinent to collecting as part of the tubes and installations. Today a third of the barrio has this service and it is still being promoted. The control and the direction is handled by the board of directors, the general assembly, and the Centro Nacional Pro-Vivienda. The families of the barrio participate in the implementation of some of the tasks lated out by this committee. How the projects are

financed: the financing of these work fronts are achieved by the quotas that the inhabitants of the barrio give, and all organized by the board of directors. All of these projects and services are developed in a free and voluntary way.

How the Leaders are Trained: with the participation of the inhabitants in the different committee or work fronts, a collective direction is achieved and the permanent overcoming of the future greater tasks as direction of the Center and the school at the Centro Nacional Pro-Vivienda. With these forms of evolution we have arrived at a greater stage of organization, by all means and the mentality of the inhabitants is constituted in a front of progress and social change.

Our concepts: Owing to the incapacity and the negligence of the system and also the desire for progress and improvements of our organization in which we have achieved some of these methods of organization to present and have now what is the Barrio Policarpa Salvarrieta. Against our proposals and because of the achievement of this fact we have been picked by the Great Press and the reaction to build an "Independent Republic" and other indignities and commonly affirm those who ignore that the causes of the so-called "marginal" barrios is the product of the organization of necessity. Those who make us marginal are not ourselves but the system that separates itself and puts itself at the margin of the social problem.

In agreement with our experience we realize perfectly that the law is not enough, the promises, the lectures, the proposals in order that the problems solve themselves. This is to say that what is needed is facts, examples, actions and pressure from the citizens in order that all this be a reality. The solution of the housing problem does not consist in gaining land title, there are those who have it but lack the house. There are others that don't have it but have a house. There are those that have land but don't do anything to gain a house, and there are those who don't have title and continue to work for a house. There are laws to "solve" the housing problem, but they are not applied, for that reason we see no solution and there are solutions for housing that have been achieved without laws.

If we take things as they are, fixing the worst of the problems with the existing means, with housing we push for social justice.

Report of the Executive National Committee
National Center for Housing

APPENDIX C

Case Study Data Structure

1. Physical determinants
   a. Introduction
      1) Physical location
      2) Historical retrospect
   b. Locality segment characteristics
      1) Location in city
      2) Site plan
   c. Site analysis
      1) Topography
         a) Slope
         b) Vegetation
         c) Climate
         d) Natural drainage
      2) Barrio access
      3) Directions of growth and expansion
      4) Land uses
         a) Residential
         b) Circulation
         c) Commercial
         d) Community space
      5) Circulation
         a) Streets (automotive and pedestrian)
         b) Paths

6) Infrastructure
   a) Light
   b) Water
   c) Sewage
   d) Community space
   e) Communication

d. Dwelling unit
   1) Lot size
   2) Constructed area
   3) Open area
   4) Area/person
   5) Room types and sizes
   6) Construction Materials
      a) Roof
      b) Floor
      c) Walls and finishes
         1. interior
         2. exterior
   7) Design and developer
   8) Design modifications
   9) Costs
      a) Lot
      b) Infrastructure
      c) Construction Materials
         1. Materials
         2. Labor

d) Payment systems
1. Initial quotas
2. Monthly quotas
3. Interest program

10) Sponsoring agencies

2. Social-political-economic determinants

a. Basic demography

1) Population

a) Age-sex

b) Total families

c) Densities

b. Community organizations

1) Inter-barrio

2) Intra-barrio

3) Barrio to municipality

4) Municipality to barrio

c. Economic processes

APPENDIX D

Numeric R Charts for Lot Areas 25-800 Sq. Meters

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
25	1/ 1	5.00	5.00	1133	1099	1079	1066	1057	1049	2133	2099	2079	2066	2057	2049
25	1/ 2	3.54	7.07	840	807	787	773	764	757	1547	1514	1494	1480	1471	1464
25	1/ 3	2.89	8.66	710	677	657	644	634	627	1288	1254	1234	1221	1211	1204
25	1/ 4	2.50	10.00	633	599	579	566	557	549	1133	1099	1079	1066	1057	1049
25	1/ 5	2.24	11.18	580	547	527	513	504	497	1027	994	974	961	951	944
25	1/ 6	2.04	12.25	541	508	488	474	465	458	949	916	896	883	873	866
25	1/ 7	1.89	13.23	511	477	457	444	435	427	889	855	835	822	813	805
25	1/ 8	1.77	14.14	486	453	433	420	410	403	840	807	787	773	764	757
25	1/ 9	1.67	15.00	466	433	413	400	390	383	800	766	746	733	723	716

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
50	1/ 1	7.07	7.07	840	807	787	773	764	757	1547	1514	1494	1480	1471	1464
50	1/ 2	5.00	10.00	633	599	579	566	557	549	1133	1099	1079	1066	1057	1049
50	1/ 3	4.08	12.25	541	508	488	474	465	458	949	916	896	883	873	866
50	1/ 4	3.54	14.14	486	453	433	420	410	403	840	807	787	773	764	757
50	1/ 5	3.16	15.81	449	416	396	382	373	366	765	732	712	699	689	682
50	1/ 6	2.89	17.32	422	388	368	355	345	338	710	677	657	644	634	627
50	1/ 7	2.67	18.71	400	367	347	333	324	317	667	634	614	601	591	584
50	1/ 8	2.50	20.00	383	349	329	316	307	299	633	599	579	566	557	549
50	1/ 9	2.36	21.21	369	335	315	302	292	285	604	571	551	538	528	521

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
75	1/ 1	8.66	8.66	710	677	657	644	634	627	1288	1254	1234	1221	1211	1204
75	1/ 2	6.12	12.25	541	508	488	474	465	458	949	916	896	883	873	866
75	1/ 3	5.00	15.00	466	433	413	399	390	383	799	766	746	733	723	716
75	1/ 4	4.33	17.32	422	388	368	355	345	338	710	677	657	644	634	627
75	1/ 5	3.87	19.36	391	358	338	324	315	308	649	616	596	583	573	566
75	1/ 6	3.54	21.21	369	335	315	302	292	285	604	571	551	538	528	521
75	1/ 7	3.27	22.91	351	318	298	284	275	268	569	536	516	503	493	486
75	1/ 8	3.06	24.49	337	304	284	270	261	254	541	508	488	474	465	458
75	1/ 9	2.89	25.98	325	292	272	259	249	242	518	484	464	451	442	434

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
100	1/ 1	10.00	10.00	633	599	579	566	557	549	1133	1099	1079	1066	1057	1049
100	1/ 2	7.07	14.14	486	453	433	420	410	403	840	807	787	773	764	757
100	1/ 3	5.77	17.32	422	388	368	355	345	338	710	677	657	644	634	627
100	1/ 4	5.00	20.00	383	349	329	316	307	299	633	599	579	566	557	549
100	1/ 5	4.47	22.36	356	323	303	290	280	273	580	547	527	513	504	497.
100	1/ 6	4.08	24.49	337	304	284	270	261	254	541	508	488	474	465	458
100	1/ 7	3.78	26.46	322	288	268	255	246	238	511	477	457	444	435	427
100	1/ 8	3.54	28.28	310	276	256	243	233	226	486	453	433	420	410	403
100	1/ 9	3.33	30.00	300	266	246	233	223	216	466	433	413	400	390	383

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
125	1/ 1	11.18	11.18	580	547	527	513	504	497	1027	994	974	961	951	944
125	1/ 2	7.91	15.81	449	416	396	382	373	366	765	732	712	699	689	682
125	1/ 3	6.45	19.36	391	358	338	324	315	308	649	616	596	583	573	566
125	1/ 4	5.59	22.36	356	323	303	290	280	273	580	547	527	513	504	497
125	1/ 5	5.00	25.00	333	299	279	266	257	249	533	499	479	466	457	449
125	1/ 6	4.56	27.39	315	282	262	249	239	232	498	465	445	431	422	415
125	1/ 7	4.23	29.58	302	269	249	235	226	219	471	438	418	404	395	388
125	1/ 8	3.95	31.62	291	258	238	224	215	208	449	416	396	382	373	366
125	1/ 9	3.73	33.54	282	249	229	215	206	199	431	398	378	364	355	348

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
150	1/ 1	12.25	12.25	541	508	488	474	465	458	949	916	896	883	873	866
150	1/ 2	8.66	17.32	422	388	368	355	345	338	710	677	657	644	634	627
150	1/ 3	7.07	21.21	369	335	315	302	292	285	604	571	551	538	528	521
150	1/ 4	6.12	24.49	337	304	284	270	261	254	541	508	488	474	465	458
150	1/ 5	5.48	27.39	315	282	262	249	239	232	498	465	445	431	422	415
150	1/ 6	5.00	30.00	299	266	246	233	223	216	466	433	413	399	390	383
150	1/ 7	4.63	32.40	287	254	234	220	211	204	441	408	388	375	365	358
150	1/ 8	4.33	34.64	277	244	224	211	201	194	422	388	368	355	345	338
150	1/ 9	4.08	36.74	269	236	216	202	193	186	405	372	352	338	329	322

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
175	1/ 1	13.23	13.23	511	477	457	444	435	427	889	855	835	822	813	805
175	1/ 2	9.35	18.71	400	367	347	333	324	317	667	634	614	601	591	584
175	1/ 3	7.64	22.91	351	318	298	284	275	268	569	536	516	503	493	486
175	1/ 4	6.61	26.46	322	288	268	255	246	238	511	477	457	444	435	427
175	1/ 5	5.92	29.58	302	269	249	235	226	219	471	438	418	404	395	388
175	1/ 6	5.40	32.40	287	254	234	220	211	204	441	408	388	375	365	358
175	1/ 7	5.00	35.00	276	242	222	209	199	192	419	385	365	352	342	335
175	1/ 8	4.68	37.42	266	233	213	200	190	183	400	367	347	333	324	317
175	1/ 9	4.41	39.69	259	225	205	192	183	175	385	351	331	318	309	301

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
200	1/ 1	14.14	14.14	486	453	433	420	410	403	840	807	787	773	764	757
200	1/ 2	10.00	20.00	383	349	329	316	307	299	633	599	579	566	557	549
200	1/ 3	8.16	24.49	337	304	284	270	261	254	541	508	488	474	465	458
200	1/ 4	7.07	28.28	310	276	256	243	233	226	486	453	433	420	410	403
200	1/ 5	6.32	31.62	291	258	238	224	215	208	449	416	396	382	373	366
200	1/ 6	5.77	34.64	277	244	224	211	201	194	422	388	368	355	345	338
200	1/ 7	5.35	37.42	266	233	213	200	190	183	400	367	347	333	324	317
200	1/ 8	5.00	40.00	258	224	204	191	182	174	383	349	329	316	307	299
200	1/ 9	4.71	42.43	251	217	197	184	174	167	369	335	315	302	292	285

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
225	1/ 1	15.00	15.00	466	433	413	399	390	383	799	766	746	733	723	716
225	1/ 2	10.61	21.21	369	335	315	302	292	285	604	571	551	538	528	521
225	1/ 3	8.66	25.98	325	292	272	259	249	242	518	484	464	451	442	434
225	1/ 4	7.50	30.00	299	266	246	233	223	216	466	433	413	399	390	383
225	1/ 5	6.71	33.54	282	249	229	215	206	199	431	398	378	364	355	348
225	1/ 6	6.12	36.74	269	236	216	202	193	186	405	372	352	338	329	322
225	1/ 7	5.67	39.69	259	225	205	192	183	175	385	351	331	318	309	301
225	1/ 8	5.30	42.43	251	217	197	184	174	167	369	335	315	302	292	285
225	1/ 9	5.00	45.00	244	211	191	177	168	161	355	322	302	288	279	272

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
250	1/ 1	15.81	15.81	449	416	396	382	373	366	765	732	712	699	689	682
250	1/ 2	11.18	22.36	356	323	303	290	280	273	580	547	527	513	504	497
250	1/ 3	9.13	27.39	315	282	262	249	239	232	498	465	445	431	422	415
250	1/ 4	7.91	31.62	291	258	238	224	215	208	449	416	396	382	373	366
250	1/ 5	7.07	35.36	274	241	221	208	198	191	416	382	362	349	339	332
250	1/ 6	6.45	38.73	262	229	209	195	186	179	391	358	338	324	315	308
250	1/ 7	5.98	41.83	252	219	199	186	176	169	372	339	319	305	296	289
250	1/ 8	5.59	44.72	245	211	191	178	168	161	356	323	303	290	280	273
250	1/ 9	5.27	47.43	238	205	185	172	162	155	344	310	290	277	267	260

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
275	1/ 1	16.58	16.58	434	401	381	368	358	351	736	703	683	669	660	653
275	1/ 2	11.73	23.45	346	313	293	279	270	263	559	526	506	493	483	476
275	1/ 3	9.57	28.72	307	274	254	240	231	224	481	448	428	414	405	398
275	1/ 4	8.29	33.17	284	250	230	217	207	200	434	401	381	368	358	351
275	1/ 5	7.42	37.08	268	234	214	201	191	184	403	369	349	336	326	319
275	1/ 6	6.77	40.62	256	223	203	189	180	173	379	346	326	312	303	296
275	1/ 7	6.27	43.87	247	213	193	180	171	163	361	327	307	294	285	277
275	1/ 8	5.86	46.90	239	206	186	173	163	156	346	313	293	279	270	263
275	1/ 9	5.53	49.75	233	200	180	167	157	150	334	301	281	267	258	251

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
300	1/ 1	17.32	17.32	422	388	368	355	345	338	710	677	657	644	634	627
300	1/ 2	12.25	24.49	337	304	284	270	261	254	541	508	488	474	465	458
300	1/ 3	10.00	30.00	299	266	246	233	223	216	466	433	413	399	390	383
300	1/ 4	8.66	34.64	277	244	224	211	201	194	422	388	368	355	345	338
300	1/ 5	7.75	38.73	262	229	209	195	186	179	391	358	338	324	315	308
300	1/ 6	7.07	42.43	251	217	197	184	174	167	369	335	315	302	292	285
300	1/ 7	6.55	45.83	242	209	189	175	166	159	351	318	298	284	275	268
300	1/ 8	6.12	48.99	235	202	182	168	159	152	337	304	284	270	261	254
300	1/ 9	5.77	51.96	229	196	176	162	153	146	325	292	272	259	249	242

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
325	1/ 1	18.03	18.03	410	377	357	344	334	327	688	654	634	621	611	604
325	1/ 2	12.75	25.50	329	296	276	262	253	246	525	492	472	458	449	442
325	1/ 3	10.41	31.22	293	260	240	226	217	210	453	420	400	386	377	370
325	1/ 4	9.01	36.06	272	238	218	205	195	188	410	377	357	344	334	327
325	1/ 5	8.06	40.31	257	224	204	190	181	174	381	348	328	314	305	298
325	1/ 6	7.36	44.16	246	213	193	179	170	163	359	326	306	293	283	276
325	1/ 7	6.81	47.70	238	204	184	171	161	154	342	309	289	276	266	259
325	1/ 8	6.37	50.99	231	198	178	164	155	148	329	296	276	262	253	246
325	1/ 9	6.01	54.08	225	192	172	159	149	142	318	284	264	251	242	234

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
350	1/ 1	18.71	18.71	400	367	347	333	324	317	667	634	614	601	591	584
350	1/ 2	13.23	26.46	322	288	268	255	246	238	511	477	457	444	435	427
350	1/ 3	10.80	32.40	287	254	234	220	211	204	441	408	388	375	365	358
350	1/ 4	9.35	37.42	266	233	213	200	190	183	400	367	347	333	324	317
350	1/ 5	8.37	41.83	252	219	199	186	176	169	372	339	319	305	296	289
350	1/ 6	7.64	45.83	242	209	189	175	166	159	351	318	298	284	275	268
350	1/ 7	7.07	49.50	234	201	181	167	158	151	335	302	282	268	259	252
350	1/ 8	6.61	52.92	227	194	174	161	151	144	322	288	268	255	246	238
350	1/ 9	6.24	56.12	222	189	169	155	146	139	311	278	258	244	235	228

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
375	1/ 1	19.36	19.36	391	358	338	324	315	308	649	616	596	583	573	566
375	1/ 2	13.69	27.39	315	282	262	249	239	232	498	465	445	431	422	415
375	1/ 3	11.18	33.54	282	249	229	215	206	199	431	398	378	364	355	348
375	1/ 4	9.68	38.73	262	229	209	195	186	179	391	358	338	324	315	308
375	1/ 5	8.66	43.30	248	215	195	182	172	165	364	330	310	297	288	280
375	1/ 6	7.91	47.43	238	205	185	172	162	155	344	310	290	277	267	260
375	1/ 7	7.32	51.23	230	197	177	164	154	147	328	295	275	261	252	245
375	1/ 8	6.85	54.77	224	191	171	157	148	141	315	282	262	249	239	232
375	1/ 9	6.45	58.09	219	186	166	152	143	136	305	272	252	238	229	222

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
400	1/ 1	20.00	20.00	383	349	329	316	307	299	633	599	579	566	557	549
400	1/ 2	14.14	28.28	310	276	256	243	233	226	486	453	433	420	410	403
400	1/ 3	11.55	34.64	277	244	224	211	201	194	422	388	368	355	345	338
400	1/ 4	10.00	40.00	258	224	204	191	182	174	383	349	329	316	307	299
400	1/ 5	8.94	44.72	245	211	191	178	168	161	356	323	303	290	280	273.
400	1/ 6	8.16	48.99	235	202	182	168	159	152	337	304	284	270	261	254
400	1/ 7	7.56	52.92	227	194	174	161	151	144	322	288	268	255	246	238
400	1/ 8	7.07	56.57	221	188	168	155	145	138	310	276	256	243	233	226
400	1/ 9	6.67	60.00	216	183	163	150	140	133	300	266	246	233	223	216

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
425	1/ 1	20.62	20.62	375	342	322	309	299	292	618	585	565	551	542	535
425	1/ 2	14.58	29.15	304	271	251	238	228	221	476	442	422	409	400	392
425	1/ 3	11.90	35.71	273	240	220	206	197	190	413	380	360	346	337	330
425	1/ 4	10.31	41.23	254	221	201	187	178	171	375	342	322	309	299	292
425	1/ 5	9.22	46.10	241	208	188	175	165	158	350	316	296	283	274	266
425	1/ 6	8.42	50.50	232	199	179	165	156	149	331	298	278	264	255	248
425	1/ 7	7.79	54.54	225	191	171	158	148	141	316	283	263	250	240	233
425	1/ 8	7.29	58.31	219	185	165	152	142	135	304	271	251	238	228	221
425	1/ 9	6.87	61.85	214	180	160	147	137	130	295	261	241	228	218	211

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
450	1/ 1	21.21	21.21	369	335	315	302	292	285	604	571	551	538	528	521
450	1/ 2	15.00	30.00	299	266	246	233	223	216	466	433	413	399	390	383
450	1/ 3	12.25	36.74	269	236	216	202	193	186	405	372	352	338	329	322
450	1/ 4	10.61	42.43	251	217	197	184	174	167	369	335	315	302	292	285
450	1/ 5	9.49	47.43	238	205	185	172	162	155	344	310	290	277	267	260
450	1/ 6	8.66	51.96	229	196	176	162	153	146	325	292	272	259	249	242
450	1/ 7	8.02	56.12	222	189	169	155	146	139	311	278	258	244	235	228
450	1/ 8	7.50	60.00	216	183	163	149	140	133	299	266	246	233	223	216
450	1/ 9	7.07	63.64	211	178	158	145	135	128	290	257	237	223	214	207

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
475	1/ 1	21.79	21.79	362	329	309	296	286	279	592	558	538	525	515	508
475	1/ 2	15.41	30.82	295	262	242	228	219	212	457	424	404	391	381	374
475	1/ 3	12.58	37.75	265	232	212	199	189	182	398	364	344	331	322	314
475	1/ 4	10.90	43.59	248	214	194	181	171	164	362	329	309	296	286	279
475	1/ 5	9.75	48.73	235	202	182	169	159	152	338	305	285	271	262	255
475	1/ 6	8.90	53.39	226	193	173	160	150	143	320	287	267	253	244	237
475	1/ 7	8.24	57.66	220	186	166	153	143	136	306	273	253	240	230	223
475	1/ 8	7.71	61.64	214	181	161	147	138	131	295	262	242	228	219	212
475	1/ 9	7.26	65.38	209	176	156	143	133	126	286	252	232	219	210	202

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
500	1/ 1	22.36	22.36	356	323	303	290	280	273	580	547	527	513	504	497
500	1/ 2	15.81	31.62	291	258	238	224	215	208	449	416	396	382	373	366
500	1/ 3	12.91	38.73	262	229	209	195	186	179	391	358	338	324	315	308
500	1/ 4	11.18	44.72	245	211	191	178	168	161	356	323	303	290	280	273
500	1/ 5	10.00	50.00	233	199	179	166	157	149	333	299	279	266	257	249
500	1/ 6	9.13	54.77	224	191	171	157	148	141	315	282	262	249	239	232
500	1/ 7	8.45	59.16	217	184	164	151	141	134	302	269	249	235	226	219
500	1/ 8	7.91	63.25	212	179	159	145	136	129	291	258	238	224	215	208
500	1/ 9	7.45	67.08	207	174	154	141	131	124	282	249	229	215	206	199

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
525	1/ 1	22.91	22.91	351	318	298	284	275	268	569	536	516	503	493	486
525	1/ 2	16.20	32.40	287	254	234	220	211	204	441	408	388	375	365	358
525	1/ 3	13.23	39.69	259	225	205	192	183	175	385	351	331	318	309	301
525	1/ 4	11.46	45.83	242	209	189	175	166	159	351	318	298	284	275	268
525	1/ 5	10.25	51.23	230	197	177	164	154	147	328	295	275	261	252	245
525	1/ 6	9.35	56.12	222	189	169	155	146	139	311	278	258	244	235	228
525	1/ 7	8.66	60.62	215	182	162	149	139	132	298	264	244	231	222	214
525	1/ 8	8.10	64.81	210	177	157	143	134	127	287	254	234	220	211	204
525	1/ 9	7.64	68.74	206	172	152	139	129	122	278	245	225	212	202	195

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
550	1/ 1	23.45	23.45	346	313	293	279	270	263	559	526	506	493	483	476
550	1/ 2	16.58	33.17	284	250	230	217	207	200	434	401	381	368	358	351
550	1/ 3	13.54	40.62	256	223	203	189	180	173	379	346	326	312	303	296
550	1/ 4	11.73	46.90	239	206	186	173	163	156	346	313	293	279	270	263
550	1/ 5	10.49	52.44	228	195	175	162	152	145	324	290	270	257	247	240.
550	1/ 6	9.57	57.45	220	187	167	153	144	137	307	274	254	240	231	224
550	1/ 7	8.86	62.05	213	180	160	147	137	130	294	261	241	227	218	211
550	1/ 8	8.29	66.33	208	175	155	142	132	125	284	250	230	217	207	200
550	1/ 9	7.82	70.36	204	171	151	137	128	121	275	242	222	208	199	192

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
575	1/ 1	23.98	23.98	341	308	288	275	265	258	550	517	497	483	474	467
575	1/ 2	16.96	33.91	280	247	227	214	204	197	428	394	374	361	352	344
575	1/ 3	13.84	41.53	253	220	200	187	177	170	374	340	320	307	297	290
575	1/ 4	11.99	47.96	237	204	184	170	161	154	341	308	288	275	265	259
575	1/ 5	10.72	53.62	226	193	173	159	150	143	319	286	266	253	243	236
575	1/ 6	9.79	58.74	218	185	165	151	142	135	303	270	250	236	227	220
575	1/ 7	9.06	63.44	212	178	158	145	135	128	290	257	237	224	214	207
575	1/ 8	8.48	67.82	207	173	153	140	130	123	280	247	227	214	204	197
575	1/ 9	7.99	71.94	202	169	149	136	126	119	272	239	219	205	196	189

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
600	1/ 1	24.49	24.49	337	304	284	270	261	254	541	508	488	474	465	458
600	1/ 2	17.32	34.64	277	244	224	211	201	194	422	388	368	355	345	338
600	1/ 3	14.14	42.43	251	217	197	184	174	167	369	335	315	302	292	285
600	1/ 4	12.25	48.99	235	202	182	168	159	152	337	304	284	270	261	254
600	1/ 5	10.95	54.77	224	191	171	157	148	141	315	282	262	249	239	232
600	1/ 6	10.00	60.00	216	183	163	149	140	133	299	266	246	233	223	216
600	1/ 7	9.26	64.81	210	177	157	143	134	127	287	254	234	220	211	204
600	1/ 8	8.66	69.28	205	172	152	138	129	122	277	244	224	211	201	194
600	1/ 9	8.16	73.48	201	168	148	134	125	118	269	236	216	202	193	186

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
625	1/ 1	25.00	25.00	333	299	279	266	257	249	533	499	479	466	457	449
625	1/ 2	17.68	35.36	274	241	221	208	198	191	416	382	362	349	339	332
625	1/ 3	14.43	43.30	248	215	195	182	172	165	364	330	310	297	288	280
625	1/ 4	12.50	50.00	233	199	179	166	157	149	333	299	279	266	257	249
625	1/ 5	11.18	55.90	222	189	169	156	146	139	312	278	258	245	236	228
625	1/ 6	10.21	61.24	214	181	161	148	138	131	296	263	243	229	220	213
625	1/ 7	9.45	66.14	208	175	155	142	132	125	284	251	231	217	208	201
625	1/ 8	8.84	70.71	204	170	150	137	127	120	274	241	221	208	198	191
625	1/ 9	8.33	75.00	199	166	146	133	123	116	266	233	213	199	190	183

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
650	1/ 1	25.50	25.50	329	296	276	262	253	246	525	492	472	458	449	442
650	1/ 2	18.03	36.06	272	238	218	205	195	188	410	377	357	344	334	327
650	1/ 3	14.72	44.16	246	213	193	179	170	163	359	326	306	293	283	276
650	1/ 4	12.75	50.99	231	198	178	164	155	148	329	296	276	262	253	246
650	1/ 5	11.40	57.01	221	187	167	154	144	137	308	275	255	242	232	225
650	1/ 6	10.41	62.45	213	180	160	146	137	130	293	260	240	226	217	210
650	1/ 7	9.64	67.45	207	174	154	140	131	124	281	248	228	214	205	198
650	1/ 8	9.01	72.11	202	169	149	136	126	119	272	238	218	205	195	188
650	1/ 9	8.50	76.49	198	165	145	132	122	115	264	230	210	197	187	180

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
675	1/ 1	25.98	25.98	325	292	272	259	249	242	518	484	464	451	442	434
675	1/ 2	18.37	36.74	269	236	216	202	193	186	405	372	352	338	329	322
675	1/ 3	15.00	45.00	244	211	191	177	168	161	355	322	302	288	279	272
675	1/ 4	12.99	51.96	229	196	176	162	153	146	325	292	272	259	249	242
675	1/ 5	11.62	58.09	219	186	166	152	143	136	305	272	252	238	229	222
675	1/ 6	10.61	63.64	211	178	158	145	135	128	290	257	237	223	214	207
675	1/ 7	9.82	68.74	206	172	152	139	129	122	278	245	225	212	202	195
675	1/ 8	9.19	73.48	201	168	148	134	125	118	269	236	216	202	193	186
675	1/ 9	8.66	77.94	197	164	144	130	121	114	261	228	208	194	185	178

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
700	1/ 1	26.46	26.46	322	288	268	255	246	238	511	477	457	444	435	427
700	1/ 2	18.71	37.42	266	233	213	200	190	183	400	367	347	333	324	317
700	1/ 3	15.28	45.83	242	209	189	175	166	159	351	318	298	284	275	268
700	1/ 4	13.23	52.92	227	194	174	161	151	144	322	288	268	255	246	238
700	1/ 5	11.83	59.16	217	184	164	151	141	134	302	269	249	235	226	219
700	1/ 6	10.80	64.81	210	177	157	143	134	127	287	254	234	220	211	204
700	1/ 7	10.00	70.00	204	171	151	138	128	121	276	242	222	209	199	192
700	1/ 8	9.35	74.83	200	166	146	133	123	116	266	233	213	200	190	183
700	1/ 9	8.82	79.37	196	162	142	129	120	112	259	225	205	192	183	175

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
725	1/ 1	26.93	26.93	319	285	265	252	242	235	504	471	451	438	428	421
725	1/ 2	19.04	38.08	264	231	211	197	188	181	395	362	342	329	319	312
725	1/ 3	15.55	46.64	240	207	187	173	164	157	347	314	294	281	271	264
725	1/ 4	13.46	53.85	226	192	172	159	149	142	319	285	265	252	242	235
725	1/ 5	12.04	60.21	216	183	163	149	140	133	299	266	246	232	223	216
725	1/ 6	10.99	65.95	209	175	155	142	132	125	284	251	231	218	208	201
725	1/ 7	10.18	71.24	203	170	150	136	127	120	273	240	220	207	197	190
725	1/ 8	9.52	76.16	198	165	145	132	122	115	264	231	211	197	188	181
725	1/ 9	8.98	80.78	195	161	141	128	119	111	257	223	203	190	180	173

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
750	1/ 1	27.39	27.39	315	282	262	249	239	232	498	465	445	431	422	415
750	1/ 2	19.36	38.73	262	229	209	195	186	179	391	358	338	324	315	308
750	1/ 3	15.81	47.43	238	205	185	172	162	155	344	310	290	277	267	260
750	1/ 4	13.69	54.77	224	191	171	157	148	141	315	282	262	249	239	232
750	1/ 5	12.25	61.24	214	181	161	148	138	131	296	263	243	229	220	213
750	1/ 6	11.18	67.08	207	174	154	141	131	124	282	249	229	215	206	199
750	1/ 7	10.35	72.46	202	169	149	135	126	119	271	238	218	204	195	188
750	1/ 8	9.68	77.46	197	164	144	131	121	114	262	229	209	195	186	179
750	1/ 9	9.13	82.16	194	160	140	127	118	110	255	221	201	188	178	171

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
775	1/ 1	27.84	27.84	312	279	259	246	236	229	492	459	439	425	416	409
775	1/ 2	19.69	39.37	260	227	207	193	184	177	387	354	334	320	311	304
775	1/ 3	16.07	48.22	237	203	183	170	160	153	340	307	287	274	264	257
775	1/ 4	13.92	55.68	223	189	169	156	146	139	312	279	259	246	236	229
775	1/ 5	12.45	62.25	213	180	160	146	137	130	293	260	240	227	217	210.
775	1/ 6	11.37	68.19	206	173	153	139	130	123	279	246	226	213	203	196
775	1/ 7	10.52	73.65	201	167	147	134	125	117	269	235	215	202	192	185
775	1/ 8	9.84	78.74	196	163	143	130	120	113	260	227	207	193	184	177
775	1/ 9	9.28	83.52	193	159	139	126	117	109	253	219	199	186	176	169

AREA	RATIO	WIDTH	DEPTH	1 WAY SHORT 75	100	125	150	175	200	2 WAY SHORT 75	100	125	150	175	200
800	1/ 1	28.28	28.28	310	276	256	243	233	226	486	453	433	420	410	403
800	1/ 2	20.00	40.00	258	224	204	191	182	174	383	349	329	316	307	299
800	1/ 3	16.33	48.99	235	202	182	168	159	152	337	304	284	270	261	254
800	1/ 4	14.14	56.57	221	188	168	155	145	138	310	276	256	243	233	226
800	1/ 5	12.65	63.25	212	179	159	145	136	129	291	258	238	224	215	208
800	1/ 6	11.55	69.28	205	172	152	138	129	122	277	244	224	211	201	194
800	1/ 7	10.69	74.83	200	166	146	133	123	116	266	233	213	200	190	183
800	1/ 8	10.00	80.00	195	162	142	129	119	112	258	224	204	191	182	174
800	1/ 9	9.43	84.85	192	158	138	125	116	108	251	217	197	184	174	167

APPENDIX E

CUT AND FILL CHARTS FOR LOTS ROTATED ABOUT THEIR CENTROID AND CORNER

SLOPE ANGLE FOR LOT CUT OR FILL VOLUMES = 5.00

VOLUMES OF CUT AND FILL REQUIRED AT 0 30 60 AND 90 DEGREES (LOTS ROTATED ABOUT CENTROID)

LOT DEPTH	LOT WIDTH 3	4	5	6	7	8	9	10	11	12
5	1 1| 1 0	1 1| 1 1	1 1| 1 1	2 2| 2 2	2 2| 2 3	2 2| 3 3	2 3| 4 4	3 3| 5 5	3 4| 6 7	3 5| 7 8
6	1 1| 1 1	2 1| 1 1	2 2| 2 2	2 2| 2 2	3 3| 3 3	3 3| 4 4	4 4| 5 5	4 5| 6 7	4 5| 7 8	5 6| 8 9
7	2 1| 1 1	2 2| 1 1	3 2| 2 2	3 3| 3 3	4 4| 4 4	4 4| 5 5	5 5| 6 6	5 6| 7 8	6 7| 8 9	6 7| 10 11
8	2 2| 1 1	3 3| 2 1	3 3| 2 2	4 4| 3 3	5 5| 4 4	6 5| 5 6	6 6| 7 7	7 7| 8 9	8 8| 10 11	8 9| 11 13
9	3 2| 1 1	4 3| 2 2	4 4| 3 2	5 5| 4 4	6 6| 5 5	7 7| 6 6	8 8| 8 8	9 9| 9 10	10 10| 11 12	11 11| 13 14
10	3 3| 2 1	4 4| 3 2	5 5| 3 3	7 6| 4 4	8 7| 6 5	9 8| 7 7	10 9| 9 9	11 11| 10 11	12 12| 12 13	13 13| 15 16
11	4 3| 2 1	5 5| 3 2	7 6| 4 3	8 7| 5 4	9 8| 6 6	11 10| 8 8	12 11| 10 10	13 13| 12 12	15 14| 14 15	16 16| 16 17
12	5 4| 3 1	6 6| 4 2	8 7| 5 3	9 8| 6 5	11 10| 7 6	13 12| 9 8	14 13| 11 11	16 15| 13 13	17 17| 15 16	19 18| 18 19
13	6 5| 3 1	7 6| 4 2	9 8| 5 4	11 10| 7 5	13 12| 8 7	15 13| 10 9	17 15| 12 12	18 17| 14 14	20 19| 17 17	22 21| 20 20
14	6 6| 3 1	9 8| 5 2	11 9| 6 4	13 11| 8 6	15 13| 9 7	17 15| 12 10	19 18| 13 12	21 20| 16 15	24 22| 19 19	26 24| 22 22
15	7 6| 4 1	10 9| 5 3	12 11| 7 4	15 13| 9 6	17 15| 11 8	20 18| 13 10	22 20| 15 13	25 23| 18 16	27 25| 20 20	30 28| 24 24
16	8 7| 4 2	11 10| 6 3	14 12| 8 4	17 15| 10 6	20 17| 12 9	22 20| 14 11	25 23| 17 14	28 25| 19 17	31 28| 22 21	34 31| 26 25
17	9 8| 5 2	13 11| 7 3	16 14| 9 5	19 17| 11 7	22 20| 13 9	25 23| 16 12	28 26| 18 15	32 29| 21 19	35 32| 24 22	38 35| 28 27
18	11 9| 5 2	14 12| 7 3	18 16| 10 5	21 19| 12 7	25 22| 14 10	28 25| 17 13	32 29| 20 16	35 32| 23 20	39 35| 26 24	42 39| 30 28
19	12 10| 6 2	16 14| 8 3	20 17| 11 5	24 21| 13 7	28 24| 16 10	32 28| 19 13	36 32| 22 17	39 35| 26 21	43 39| 29 25	47 43| 33 30
20	13 11| 7 2	17 15| 9 3	22 19| 12 5	26 23| 14 8	31 27| 17 11	35 31| 21 14	39 35| 24 18	44 39| 28 22	48 43| 32 26	52 48| 35 31
21	14 13| 7 2	19 17| 10 4	24 21| 13 6	29 25| 16 8	34 30| 19 11	39 34| 22 15	43 39| 26 19	49 43| 30 23	53 48| 34 28	58 52| 39 33
22	16 14| 8 2	21 18| 11 4	26 23| 14 6	32 28| 17 9	37 33| 21 12	42 37| 24 15	48 42| 28 19	53 47| 32 24	58 52| 37 29	63 57| 42 35

SLOPE ANGLE FOR LOT CUT OR FILL VOLUMES = 20.00

VOLUMES OF CUT AND FILL REQUIRED AT 0 30 60 AND 90 DEGREES (LOTS ROTATED ABOUT CENTROID)

LOT DEPTH	LOT WIDTH 3		4		5		6		7		8		9		10		11		12	
5	3	3	5	4	6	6	7	7	8	9	9	10	10	12	11	14	13	16	14	19
	2	2	4	4	5	6	8	8	10	11	13	15	16	18	20	23	24	28	29	33
6	5	4	7	6	8	8	10	10	11	12	13	14	15	16	16	19	18	21	20	24
	3	2	5	4	7	7	9	10	12	13	16	17	20	22	24	27	29	33	35	39
7	7	6	9	8	11	10	13	13	16	15	18	18	20	21	22	24	25	27	27	31
	4	3	6	5	8	8	11	11	15	16	19	20	24	26	29	32	35	39	41	46
8	9	8	12	10	15	13	17	16	20	19	23	23	26	26	29	30	32	34	35	38
	5	3	7	6	10	9	13	13	17	18	22	23	28	29	33	36	40	44	47	52
9	11	10	15	13	18	17	22	20	26	24	29	28	33	32	37	37	41	41	44	46
	6	4	9	7	12	10	16	15	20	20	26	26	32	33	38	41	46	50	54	59
10	14	12	18	16	23	20	27	25	32	29	36	34	41	39	45	44	50	50	55	55
	7	4	11	7	14	11	18	16	23	22	29	29	36	37	43	45	52	55	61	65
11	17	14	22	19	28	24	33	30	39	35	44	41	50	46	55	53	61	59	66	65
	9	5	13	8	17	13	22	18	27	25	33	32	40	41	49	50	58	61	68	72
12	20	17	26	23	33	29	39	35	46	41	52	48	59	55	65	62	72	69	79	76
	11	5	15	9	19	14	25	20	30	27	37	35	45	44	54	55	64	66	75	79
13	23	20	31	27	38	34	46	41	54	48	61	56	69	64	77	72	85	80	92	88
	12	5	17	9	22	15	28	21	35	29	42	38	50	48	60	59	71	72	82	85
14	27	23	36	31	45	39	53	47	62	56	71	64	80	73	89	82	98	91	107	101
	14	6	19	10	25	16	32	23	39	31	48	41	56	52	66	64	78	77	90	92
15	31	27	41	36	51	45	61	54	72	64	82	74	92	83	102	94	113	104	123	115
	16	6	22	11	29	17	36	25	44	33	53	44	62	55	73	68	85	83	99	98
16	35	30	47	41	58	51	70	62	81	72	93	83	105	94	116	106	128	118	140	130
	18	7	25	12	32	18	40	26	49	36	59	47	70	59	80	73	93	88	107	105
17	39	34	53	46	66	58	79	69	92	82	105	94	118	106	131	119	145	132	158	145
	20	7	28	12	36	19	45	28	54	38	65	49	77	63	87	77	101	94	116	111
18	44	38	59	51	74	65	88	78	103	91	118	105	133	119	147	133	162	147	177	162
	23	7	31	13	40	20	50	29	60	40	71	52	84	66	98	82	110	99	126	118
19	49	43	66	57	82	72	98	87	115	101	131	117	148	132	164	147	181	163	197	179
	25	8	34	14	44	22	55	31	66	42	78	55	92	70	106	86	119	105	136	124
20	55	47	73	63	91	80	109	96	127	112	146	129	164	146	182	163	200	180	218	198
	28	8	38	15	49	23	60	33	72	45	85	58	100	74	115	91	132	110	146	131
21	60	52	80	70	100	88	120	105	140	124	160	142	180	160	201	179	221	198	241	217
	31	9	42	15	53	24	66	34	79	47	93	61	108	77	125	95	142	116	162	138
22	66	57	88	77	110	96	132	116	154	135	176	155	198	176	220	196	242	217	264	238
	34	9	46	16	58	25	72	36	86	49	101	64	117	81	134	100	153	121	174	144

SLOPE ANGLE FOR LOT CUT OR FILL VOLUMES = 40.00

VOLUMES OF CUT AND FILL REQUIRED AT 0 30 60 AND 90 DEGREES (LOTS ROTATED ABOUT CENTROID)

LOT DEPTH	LOT WIDTH 3		4		5		6		7		8		9		10		11		12	
5	8	7	10	10	13	13	16	16	18	20	21	24	24	27	26	32	29	38	31	44
	5	5	8	8	12	13	17	19	23	26	30	34	38	42	46	52	56	63	66	75
6	11	10	15	14	19	18	23	22	26	27	30	32	34	37	38	43	42	49	45	56
	7	6	11	10	16	16	22	23	29	31	37	40	46	51	56	63	68	76	80	91
7	15	14	21	19	26	24	31	29	36	35	41	41	46	48	51	55	56	63	62	72
	9	7	14	12	19	18	26	26	34	36	44	47	54	59	67	73	80	89	94	106
8	20	18	27	24	34	31	40	37	47	45	54	52	60	60	67	69	74	78	80	88
	12	8	17	13	23	21	31	30	40	41	51	54	63	68	77	84	92	101	109	121
9	25	22	34	30	42	38	51	47	59	55	68	65	76	74	85	85	93	95	102	107
	14	8	21	15	28	24	36	34	47	46	59	60	73	76	88	94	105	114	124	136
10	31	28	42	37	52	47	63	57	73	68	84	78	94	90	105	102	115	115	126	128
	17	9	25	17	33	26	42	38	54	51	67	67	83	85	100	105	119	127	140	151
11	38	33	51	45	63	56	76	68	89	81	101	94	114	107	127	121	140	136	152	151
	21	10	29	18	39	29	50	42	61	56	76	74	93	93	112	115	133	140	156	166
12	45	40	60	53	75	67	91	81	106	96	121	111	136	126	151	142	166	159	181	176
	24	11	34	20	45	31	57	45	70	62	86	80	104	102	125	126	148	152	173	181
13	53	46	71	62	89	78	106	95	124	111	142	129	159	146	177	165	195	184	213	203
	28	12	39	22	51	34	65	49	81	67	96	87	116	110	138	136	163	165	190	196
14	62	54	82	72	103	91	123	109	144	129	164	148	185	169	205	189	226	211	247	233
	32	13	45	23	58	37	74	53	91	72	111	94	129	119	153	147	179	178	208	211
15	71	62	94	83	118	104	141	125	165	147	189	170	212	192	236	216	259	240	283	265
	37	14	51	25	66	39	83	57	102	77	123	101	142	127	168	157	196	190	227	226
16	80	70	107	94	134	118	161	142	188	167	215	192	241	218	268	244	295	271	322	299
	42	15	57	27	74	42	93	60	113	82	136	107	161	136	184	168	214	203	247	241
17	91	79	121	106	151	133	182	160	212	188	242	216	273	245	303	274	333	304	363	335
	47	16	64	29	83	45	103	64	125	87	150	114	177	144	201	178	233	216	268	257
18	102	89	136	119	170	149	204	179	238	210	272	242	306	274	340	306	374	339	408	373
	53	17	72	30	92	47	114	68	138	92	165	121	194	153	225	189	253	228	290	272
19	114	99	151	132	189	166	227	199	265	234	303	269	341	304	378	340	416	376	454	413
	58	18	80	32	102	50	126	72	152	98	180	127	211	161	245	199	274	241	313	287
20	126	109	168	146	210	183	252	221	293	259	335	297	377	336	419	375	461	415	503	456
	65	19	88	34	112	52	138	75	166	103	197	134	230	170	265	210	304	254	337	302
21	139	121	185	161	231	202	277	243	324	285	370	327	416	369	462	413	508	456	555	501
	71	20	96	35	123	55	151	79	181	108	214	141	249	178	287	220	328	266	373	317
22	152	132	203	177	254	221	304	267	355	312	406	358	457	405	507	452	558	499	609	548
	78	21	105	37	134	58	165	83	197	113	232	148	269	187	310	231	353	279	400	332

SLOPE ANGLE FOR LOT CUT OR FILL VOLUMES = 5.00

VOLUMES OF CUT REQUIRED AT 0 30 60 AND 90 DEGREES (LOTS ROTATED ABOUT ONE CORNER)

LOT DEPTH	LOT WIDTH 3		4		5		6		7		8		9		10		11		12	
5	3	4	4	6	5	7	7	10	8	12	9	15	10	17	11	20	12	24	13	27
	3	2	5	3	7	5	10	8	13	11	16	14	20	18	24	22	29	26	34	31
6	5	5	6	8	8	10	9	13	11	16	13	19	14	23	16	27	17	31	19	35
	4	2	7	4	10	7	13	9	17	13	21	17	25	21	31	26	36	32	42	38
7	6	7	9	10	11	13	13	17	15	20	17	25	19	29	21	34	24	39	26	44
	6	3	9	5	12	8	16	11	20	15	26	20	31	25	37	31	44	37	51	44
8	8	9	11	12	14	16	17	21	20	26	22	31	25	36	28	42	31	48	34	54
	7	3	10	6	15	9	19	13	25	17	31	22	37	28	44	35	52	42	60	50
9	11	11	14	15	18	20	21	25	25	31	28	37	32	44	35	50	39	58	42	65
	8	4	13	6	17	10	23	14	29	19	36	25	44	32	52	39	61	48	70	57
10	13	13	17	19	22	24	26	31	31	37	35	44	39	52	44	60	48	68	52	77
	10	4	15	7	20	11	27	16	34	21	42	28	50	35	60	44	70	53	81	63
11	16	16	21	22	26	29	32	36	37	44	42	52	48	61	53	70	58	79	63	90
	12	4	17	8	24	12	31	17	39	24	48	31	58	39	68	48	79	58	92	69
12	19	19	25	26	31	34	38	42	44	51	50	60	57	70	63	81	69	92	76	103
	14	5	20	8	27	13	35	19	44	26	54	34	65	43	77	52	90	63	103	76
13	22	22	30	30	37	39	44	49	52	59	59	69	67	81	74	92	81	105	89	118
	16	5	23	9	31	14	40	20	50	28	61	36	73	46	86	57	100	69	115	82
14	26	25	34	35	43	45	51	56	60	67	69	79	77	92	86	105	94	119	103	133
	18	6	26	10	35	15	45	22	56	30	68	39	82	50	96	61	111	74	128	88
15	30	29	39	39	49	51	59	63	69	76	79	89	89	103	98	118	108	133	118	149
	20	6	29	10	39	16	50	24	62	32	76	42	90	53	106	66	123	79	141	94
16	34	32	45	44	56	57	67	71	78	85	90	100	101	116	112	132	123	149	134	167
	22	6	32	11	43	17	55	25	69	34	84	45	99	57	117	70	135	85	154	101
17	38	36	51	50	63	64	76	79	88	95	101	111	114	129	126	147	139	165	152	185
	25	7	36	12	48	19	61	27	76	36	92	48	109	60	128	74	147	90	169	107
18	42	40	57	55	71	71	85	88	99	105	113	123	127	142	142	162	156	183	170	204
	27	7	39	13	52	20	67	28	83	39	100	50	119	64	139	79	160	95	183	113
19	47	45	63	61	79	79	95	97	110	116	126	136	142	157	158	178	174	201	189	224
	30	7	43	13	57	21	73	30	90	41	109	53	129	67	151	83	174	101	198	120
20	52	49	70	68	87	87	105	107	122	127	140	149	157	172	175	195	192	220	210	245
	33	8	47	14	63	22	80	31	98	43	118	56	140	71	163	87	188	106	214	126
21	58	54	77	74	96	95	116	117	135	139	154	163	174	187	193	213	212	239	231	266
	36	8	51	15	68	23	86	33	106	45	128	59	151	74	176	92	202	111	230	132
22	63	59	85	81	106	104	127	127	148	152	169	177	190	204	212	231	233	260	254	289
	39	9	56	15	74	24	93	35	115	47	138	62	163	78	189	96	217	116	247	139

SLOPE ANGLE FOR LOT CUT OR FILL VOLUMES = 20.00

VOLUMES OF CUT REQUIRED AT 0 30 60 AND 90 DEGREES (LOTS ROTATED ABOUT ONE CORNER)

LOT DEPTH	LOT WIDTH 3		4		5		6		7		8		9		10		11		12	
5	14	16	18	23	23	31	27	40	32	50	36	61	41	72	45	85	50	98	55	113
	14	8	22	15	31	23	42	33	55	45	69	58	84	74	101	91	120	110	141	131
6	20	22	26	31	33	42	39	54	46	66	52	80	59	95	65	111	72	128	79	147
	18	10	28	17	40	27	54	39	69	53	87	70	106	88	127	109	150	132	175	157
7	27	29	36	41	45	55	53	69	62	85	71	102	80	121	89	141	98	162	107	184
	23	11	35	20	50	32	66	46	85	62	106	81	129	103	155	127	182	154	212	183
8	35	37	47	52	58	69	70	87	81	106	93	127	105	150	116	174	128	199	140	226
	29	13	43	23	61	36	80	52	102	71	127	93	154	118	184	146	217	176	251	210
9	44	46	59	64	74	84	88	106	103	129	118	154	133	181	147	209	162	239	177	271
	35	15	52	26	72	41	95	59	121	80	150	105	181	133	215	164	253	198	293	236
10	55	55	73	78	91	101	109	127	127	155	146	184	164	215	182	248	200	283	218	320
	41	16	62	29	85	45	111	65	141	89	174	116	209	147	248	182	291	220	336	262
11	66	66	88	92	110	120	132	150	154	182	176	216	198	253	220	291	242	331	264	373
	49	18	72	32	98	50	128	72	162	98	199	128	239	162	283	200	331	242	382	288
12	79	78	105	108	131	141	157	175	183	212	210	251	236	293	262	336	288	382	314	429
	56	20	83	35	113	55	147	79	184	107	226	140	271	177	320	218	373	264	429	314
13	92	91	123	125	154	163	184	202	215	244	246	289	277	335	307	384	338	436	369	490
	65	21	94	38	128	59	166	85	208	116	254	151	304	192	358	236	417	286	479	341
14	107	104	143	144	178	186	214	231	250	279	285	328	321	381	356	436	392	494	428	554
	73	23	107	41	144	64	186	92	233	125	284	163	339	206	399	255	463	308	531	367
15	123	119	164	164	205	211	246	262	286	315	327	371	368	429	409	491	450	555	491	622
	83	25	120	44	161	68	208	98	259	134	315	175	376	221	441	273	511	330	586	393
16	140	134	186	185	233	238	279	294	326	354	373	416	419	481	466	549	512	620	559	693
	93	26	133	47	179	73	230	105	286	143	348	186	414	236	485	291	561	352	642	419
17	158	150	210	207	263	266	315	329	368	394	421	463	473	535	526	610	578	688	631	769
	103	28	148	49	198	77	254	111	315	152	382	198	453	250	531	309	613	374	701	445
18	177	168	236	230	295	296	354	365	413	437	471	513	530	592	589	674	648	759	707	848
	114	29	163	52	218	82	279	118	345	160	417	210	495	265	578	327	667	396	762	471
19	197	186	263	255	328	328	394	403	460	483	525	565	591	652	657	741	722	835	788	931
	125	31	179	55	239	86	305	124	376	169	454	221	538	280	628	346	723	418	825	498
20	218	205	291	281	364	361	437	444	509	530	582	620	655	714	728	812	800	913	873	1018
	137	33	196	58	261	91	332	131	409	178	493	233	583	295	679	364	781	440	890	524
21	241	226	321	308	401	395	481	486	561	580	642	678	722	780	802	886	882	995	963	1109
	150	34	213	61	283	96	360	138	443	187	533	244	629	309	732	382	841	462	958	550
22	264	247	352	337	440	431	528	529	616	632	704	738	792	848	880	962	968	1081	1056	1203
	163	36	232	64	307	100	389	144	478	196	574	256	677	324	787	400	904	484	1027	576

SLOPE ANGLE FOR LOT CUT OR FILL VOLUMES = 40.00

VOLUMES OF CUT REQUIRED AT 0 30 60 AND 90 DEGREES (LOTS ROTATED ABOUT ONE CORNER)

LOT DEPTH	LOT WIDTH 3		4		5		6		7		8		9		10		11		12	
5	31	37	42	53	52	72	63	92	73	115	84	140	94	167	105	196	115	227	126	260
	32	19	50	34	72	52	97	75	126	103	158	134	194	170	234	210	277	254	324	302
6	45	51	60	72	75	97	91	124	106	153	121	185	136	220	151	256	166	296	181	338
	42	23	65	40	92	63	124	91	160	123	200	161	244	204	293	252	347	304	404	362
7	62	67	82	95	103	126	123	160	144	196	164	236	185	279	205	325	226	373	247	425
	54	26	82	47	115	73	153	106	196	144	245	188	298	238	357	293	421	355	489	423
8	80	85	107	120	134	158	161	200	188	245	215	293	241	345	268	400	295	459	322	520
	66	30	100	54	140	84	185	121	236	164	293	215	356	272	425	335	499	406	579	483
9	102	105	136	148	170	194	204	244	238	298	272	356	306	417	340	483	374	552	408	625
	80	34	120	60	167	94	220	136	279	185	345	241	418	306	497	377	582	457	674	543
10	126	128	168	179	210	234	252	293	293	357	335	425	377	497	419	573	461	653	503	738
	96	38	142	67	196	105	256	151	325	205	400	268	483	340	573	419	670	507	774	604
11	152	153	203	213	254	277	304	347	355	421	406	499	457	582	507	670	558	762	609	859
	112	42	165	74	227	115	296	166	373	226	459	295	552	374	653	461	762	558	879	664
12	181	179	241	249	302	324	362	404	423	489	483	579	543	674	604	774	664	879	724	990
	130	45	190	81	260	126	338	181	425	247	520	322	625	408	738	503	859	609	990	724
13	213	209	283	289	354	375	425	466	496	563	567	665	638	773	709	886	779	1005	850	1129
	149	49	217	87	295	136	382	196	479	267	586	349	701	441	826	545	961	660	1105	785
14	247	240	329	332	411	429	493	533	575	642	657	757	740	878	822	1005	904	1138	986	1277
	169	53	246	94	333	147	430	211	537	288	654	376	782	475	919	587	1067	710	1225	845
15	283	273	377	377	472	487	566	603	660	726	755	855	849	990	943	1131	1038	1279	1132	1433
	191	57	276	101	372	157	479	226	597	308	726	403	866	509	1016	629	1178	761	1350	906
16	322	309	429	425	537	549	644	678	751	815	859	958	966	1108	1073	1265	1181	1428	1288	1598
	213	60	308	107	414	168	531	242	660	329	801	429	954	543	1118	671	1293	812	1481	966
17	363	347	485	477	606	614	727	758	848	909	969	1068	1090	1233	1212	1406	1333	1585	1454	1772
	237	64	341	114	457	178	586	257	727	349	880	456	1045	577	1223	713	1413	862	1616	1026
18	408	387	543	531	679	683	815	842	951	1008	1087	1183	1223	1364	1358	1554	1494	1751	1630	1955
	263	68	376	121	503	189	643	272	796	370	962	483	1141	611	1333	755	1538	913	1756	1087
19	454	429	605	588	757	755	908	930	1059	1113	1211	1303	1362	1502	1513	1709	1665	1924	1816	2146
	289	72	413	127	551	199	702	287	868	390	1047	510	1240	645	1447	797	1667	964	1902	1147
20	503	473	671	648	838	831	1006	1022	1174	1222	1342	1430	1509	1647	1677	1872	1845	2105	2012	2346
	317	75	452	134	601	210	765	302	943	411	1136	537	1343	679	1565	839	1801	1015	2052	1208
21	555	520	740	711	924	911	1109	1119	1294	1337	1479	1563	1664	1798	1849	2041	2034	2294	2219	2555
	346	79	492	141	653	220	829	317	1021	431	1228	564	1450	713	1687	881	1940	1065	2207	1268
22	609	569	812	777	1015	994	1217	1220	1420	1456	1623	1701	1826	1955	2029	2218	2232	2491	2435	2773
	376	83	534	148	707	231	896	332	1102	452	1323	590	1560	747	1813	922	2083	1116	2369	1328

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