INTEGRAL PLAN FOR SLUM UPGRADING
MANAGUA NICARAGUA

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FOREWORD

The city of Managua.as in other Latin American cities.is characterized by its un-controlled urbanization.The present urban structure reflects the general processes of changes occurring over the last 50 years.These changes were originally conditionated by Nicaragua's vulnerable role in the world market.the forms of agriculture exploitation,the incipient industrialization and the unequal distribution of wealth during the dictatorial period.More recent conditions are the rise in expectations brought about by the revolutionary process and the economic and physical changes brought about by the destructive effects of the war.

78.5% of Managua's live in popular settlements at different levels of development that occupy 55.0% of the total city area.

The technical and service infrastructure in these areas is very deficient.The increase of illness generated by the precarious sanitary conditions in these barrios is alarming.

The scarcity of resources is aggravated by the forms of land use,the low densities and the uncontrolled illegal occupations of land.This causes difficulties in the supply.at reasonable cost.of conventional technical infrastructure where it is most needed.

The Integral Plan for Slum Upgrading (PSIB) looks for alternative solutions for the improvement of these settlements.

Solutions are based on the condition of each settlement as well as the differents stage of the model of development. Therefore the Plan considers.amongst other issues, the role and investment goals of the building sector at the different stages, the amount and characteristics of unemployment and sub-employment, the avaibility of local materials.the level of community development together with the sanitation conditions.

The PSIB looks into the future to give a general framework for the interventions to be carried out in the different settlements in relation to drinking-water supply.road system.collection and disposal of waste water.rainfall drainage and colection and disposal of garbage .Moreover it gives general guidelines for the formulation of Annual Action Plans.

The formulation of these Action Plans implies in itself .a high level of Popular Participation and coordination between the different Institutions involved.

In short the PSIB became an instrument for planning the use of land and improving the quality of life in the popular barrios.

The PSIB contemplates the following phases:

1. **Inventory** and **Diagnosis** (including data processing).
2. **Up-grading alternatives** for the different types of settlements of Managua.
3. **Specific Projects**.different sanitary systems. Directory Plans for the different type of settlements.
4. **Implementation of Pilot Plans**

The plan is excecuted by the Municipality of Managua under the proffesional advice of Delft University of Technology .Faculty of Architecture and the Instituto de Pesquizas Tecnologicas .Sao Paulo (I.P.T.). The Plan also takes account of the conclusions of short consultancies of Latin American experts.

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INTEGRAL SLUMS UP GRADING PLAN PSIB MANAGUA

An International Technical Cooperation Experience

Introduction.

The technical cooperation process that has taken place in the framework of the PSIB-Managua has its origins in the identification of a common theoretical substratum to urban development in Latin American countries,that has been worked out by a number of Latin American and European professionals since the 70's.
Such substrate is based on the approach that urban development is a process subordinated to the broader transformations of productive forces and social relations.The city is seen as a complex productive system that contains the dual characteristics of basic conditions for the production of goods and of labour force reproduction.
Any proposal to intervene in the urban structure must necessarily start from an understanding of the movements and tendencies concerning the social and economic organizations of its agents.
Territorial land occupation is seen as the physical expression of those movements,which combined with natural environmental conditions determine the apparent limits of each type of action.

The works that are carried out do not lend themselves to the elaboration of profund structural analysis because of the very formation and practice of the professionals involved in that process.However the importance of such analysis is clear,such as the application of their results as guidelines for intervention in the urban structure.On the other hand,the necessity to undertake inmediate actions imposes itself.Inmediate actions that will result in effective improvements in the quality of life of the populations living today in Latin American cities,many of which are below the minimum health and safety standards.

It is under this view that the PSIB-Managua is being developed.The International Cooperation is coordinated by the Delft Technical University (The Netherlands) and the work has been financed by the Dutch Ministry of Development Cooperation.
The PSIB represents actually a very important contribution in the discussion of habitat and urban development in Latin American countries.
The IPT,Technical Research Institute of the State of Sao Paulo (Brazil),participates in the process as a technical consulting body.
These consultancies takes place in the framework of cooperations agreements with the Delft University of Technology and the Nicaraguan Ministry of External Cooperation which has sought the assistance of the Brazilean Ministry of Foreign Affairs.

This repport deals with some methodological and final proposals for intervention in the city of Managua. References to the broader scope of economic,social territorial and technological aspects are based on periodical documents both from TUDelft and IPT Brazil,listed at the end of this repport.

1.Basic applied concepts.

Technical Cooperation,in the framework of the PSIB-Managua,takes place based on the mutual understanding of basic concepts that are applied in the project as a whole. The discussions related to these concepts involve all the institutions - namely the ALCALDIA de MANAGUA (ALMA) Managua's Municipality and the MINVAH (Nicaraguan Ministry of Housing) - which are responsible for the realization of the project.

1.1. Urban Development as an Integrated process.

The habitat problem - or in more generic terms - that of the built environment for consumption,requires an integral approach that is able to involve the number of goods and services which are necessary to fulfill the basic requirements of habitability.
The fragmentary treatment of elements of these goods and services (i.e. housing units, infrastructure networks,road system,etc) makes it difficult to visualize the fundamental habitat requirements of the population.
Such treatment makes it also difficult to visualize the attributes associated with the goods and services which have already been installed. It also frquently involves wastage which originates in the duplication and/or deficiencies in the fulfillment of requirements.
It is possible to affirm that where resources are most limited,the more complex and complicated become the functional relations that are established between the different (and scarce) elements of the urban structure.
For the sake of argument we can consider the upper-class dwelling placed at the end of minimum of complexity. This dwelling is built in a relatively well-served area,thus the functional relations are well defined: the house shelters all activities belonging to the family,the public networks and circulation system provide operational conditions which are reasonably acceptable from the points of view of safety,hygiene and confort.
At the other end of maximun complexity we can consider a squatter area of any Latin American city.Here the public and private spaces are mixed,the performance of functions belonging to the habitat generates conflicts between the community members and processes of the physical environment (erosion,floods) are exascerbated because of disordered occupation of urban land.In such situations the dwelling are at risk and the inhabitants are also at risk when the supplied drinking water and the waste waters mix, with obvious sanitary problems.
In such areas,technical interventions take on a very complex character which is aggravated by the scarcity of resources.
This makes it impossible to apply conventional systems of infrastructure and urban services.
In a context where most of the generated resources is being diverted to the war,the technological alternatives to be used must necessarily be those with the least possible cost which are able to meet the largest number of basic requirements.
The approach of urban development as an integrated process is imperative in order to be able to achieve the maximum of urban services required to be installed.The main services are : water supply,sewerage and drainage systems and the circulation network.
The considerations of these services in an integrated way, reflects strongly the existing organization of dwelling units and the settlement lay-out,generating specific urban design

alternatives for each type of service to be installed.
Each element is analized under a macro perspective system (quarter or neighbourhood level).In a general way,in the macro-structure,the limits to be supply of each one of the goods and services are defined according to present availability and to investment perspectives in the medium term.In the micro-structure the main problem and tendencies are defined in relation to the demand of the same goods and services.

1.2. Applicability of unconventional technologies.

The unconventional technologies for urban infrastructure are derived from the range of descentralized solutions applicable to each type of settlement (barrio).They have different degrees of dependency in relation to the general networks and systems. The search for descentralized solutions is justified because of the accelerated growth rates of new settlements,associated with restrictions in the supply of conventional urban infrastructure systems.
In a general way,the investment capacity of public sector in infrastructure works,does not meet real demand.This tends to be worsened by the war. In this way the interventions to be realized in the PSIB must fulfill the basic requirements of each area through the following :

a. The maximum utilization of the existing conventional infrastructure.
b. The installation of unconventional infrastructure alternatives that can fulfill - for a reasonable time - minimum safety and health standards and that are coherent within the sectorial development plans of each system (water supply,sewerage, drainage and road systems).

In the first line of intervention are included the settlements localized within the already consolidated urban fabric. In many of these settlements.it is feasible to increase housing densities,because of the availability of large numbers of empty lots. In many cases,the decision to increase the density of an area will require (besides the beter utilization of the existing infrastructure)the installation of systems that will complement those already available.This is the case,for instance,in the barrios which have primary sewerage collectors (along the main roads) to which the great majority of dwellings are not connected.
In order to obtain an effective improvement in sanitary conditions, alternatives to the installation of the secondary networks must be studied.This is because frecuently the already existing dwellings would not have the possibility of conections within the conventional patterns.
Increasing densities,in these terms,requires an integrated knowledge of the different infrastructure components and of the evolution of the urban fabric.To attempt to solve each problem in an isolated way would increase the risks of getting negative results in the improvement of local sanitation.
The second line of intervention would include mainly the most recently occupied areas that have appeared in the urban expansion zones and which the infrastructure of Managua does not reach.
In such cases,one starts from the conception of low-cost integrated infrastructure systems,which have a high degree of

autonomy in relation to the centralized systems.
The maximum utilization of local resources and conditions is sought, preserving as far as possible the characteristics of the natural physical environment (bearing in mind the dangers of erosion, isatability and contamination).
The employment of non-conventional technologies is thus defined to complement and to be an instrument of the operation of sectorial urban infrastructure development policies, and not as an exclusive alternative with respect to these policies.
The relation between the general guidelines on an urban or regional scale - which have been defined by the different bodies of the revolutionary power - and the local guidelines of the PSIB can be complementary either by combining conventional and non-conventional systems in the same location or it can also be achieved by the application of non-conventional systems in a whole area, postponing in this way an increase in the necessity of conventional system servicing on a larger scale.
The installation of local infrastructure systems must be coordinated with the production of materials and components in mini-factories, bearing in mind the maximum utilization of resources and productivity of labour.

I. Development of the Plan.

The Plan Comprises 4 stages:

I . Inventory and Diagnosis
II. Alternative solutions.
III Specific Projects
IV. Formulation of Action Plans and Pilot Plans.

I. 1.0. The first stage,the characterization of the urban reality is directed to local needs and was done in coordination with the City Development Plan ,at that time in excecution.
The characterization of the urban reality, done in historical terms,include the following studies:geo-demographic,geo-morphologic,urban system,building sector,housing production,building materials.
The characterization concludes:

1.1.The identification of homogenous areas and the classification of all settlements into 5 categories according to certain physical and socio-economic premises concerning the dwelling,the technical infrastructure. the community services and the nature of each barrio.
1.2.The identification of critical areas in respect of the availability of city services,technical infrastructure and employment attraction nodes.
1.3. The drafting of an initial proposal of possible actions which takes into considerations the nature of each barrio and the sort of problems which may arise. (Pilot Plans 1985).

2.0.The Diagnosis identifies restrictions and potentialities at macro level (city level and basic-unit level) and at micro-level (settlement and neighborhood level).

2.1.At macro level a physical and socio-economic evaluation was performed in 7 settlements selected as typical of the 5 categories of settlements of the city.
With this diagnosis the following steps were taken:
2.1.1.The identification of the structure of popular participation in the different location.The aspirations and experience of popular organizations.
2.1.2.The identification of the critical problems of the the different typologies of barrios.
2.1.3.The identification of the posible development actions to carried out.
2.1.4.The identification of the physical problems concernins the urban layout,tenancy,family composition.
2.1.5.The potential cost of technical infrastructure related to adjustments of urban layout and infilling programmes.
2.1.6.Conclusions at macro-level.Identification and classification of barrios into :
- a. Barrios in process of deterioration
  b. Barrios in process of development
  c. Barrios to be consolidated.

2.2.At micro level,a physical and socio-economic evaluation was carried out in 5 selected areas (neighbourhood level) of typical settlements.The following aspects were studied in respect to the up-grading actions:

2.2.1.Family composition,overcrowding patterns.

2.2.2.Tenancy and socio-economic conditions of the users.

2.2.3.Forms of occupation of land.Public and private.

2.2.4.Prevailing illnesses caused by sanitation shortages and incidence of diseases by main transmission sources.

2.2.5.Observations concerning topography and soil issues

2.2.6.Observations concerning levels and seasonal variations of the water table.

2.2.7.Form of occupation of the plot , the prevailing characteristic of the dwelling ,water cycle,habits of the users in respect to multiple use of water and handling and separation of garbage.

2.2.8.Existing sewage disposal systems ,rainwater collection and disposal and road system.

2.2.9.Conditions of the sanitary installations, water collection.Backflowing of surface water in the settlements.

2.2.10.Locational and qualitative aspects of sanitary spaces.

2.2.11.The existing building materials.

2.2.12.Conclusions.General technical premises with respect to the technical interventions to be carried out in the barrios.

II. Alternative solutions.

II.1. Technical Solutions.In order to carry out the analysis of the different technical aspects included in this study, the typical sanitation problems occurring in the city were projected onto the already selected settlement type. In this way, 5 barrios were chosen which together contained both the sanitation problem and the different sorts of popular settlements existing in the whole city.
Each of the 5 barrios was study in depth, and according to the characteristic of each type of settlement,technical solutions were drafted for the different technical aspects that comprise this study in accordance with the technical premises formerly concluded.

2. Progressive development actions were drafted for:

2.a. Water supply,distribution and /or storage

2.b. Waste water,collection and disposal

2.c. Drainage

2.d. Garbage,collection and disposal

2.e. Vehicular and pedestrian roads treatment.

2.f. Sanitation campaign

3. General guidelines were drafted for the:

3.a. Short term

3.b. Medium term

3.c. Long term.

4. Costs. The technical studies include the determination of unit costs by each technical aspect included in each project.

II.2. Land Use. According to the different types of settlement capacity studies were carried out that include:

2.1. Potential adjustments to land use allocations. (residential,public,road system).
2.2. Adjustments to tenancy and urban layout
2.3. Adjustments of roading system
2.4. Projection of the given capacity to the urban scope.

3. Alternatives of adjustment to land use at city level. These consist in the summation of variables for each barrio and are then projected to the city level according certain given premises.

The variables are:dwelling type,infrastructure type, type of barrio,potential of technical infrastructure, physical restrictions.
The premises are: present restraints on investment in the city, the need to intervene in different way according to the type of settlement.

3.1. Alternative 1.
3.2. Alternative 2.
3.3. Conclusions:
a.Areas to be consolidated and developed.
b.Location of empty land potential urbanized for inmediate use.
c.Location of places to be infilled in medium range term

III. 1. Directors plans for the five selected barrios that represent the totality of barrios of the city.
1. Director Plans for Camilo Ortega and Adolfo Reyes.
2. Director Plan for Ciudad Sandino,Jonathan Gonzalez and B15.
3. Pilot projects in the 5 barrios.
a.Feasibility and pre-investment plans
b.Definitive projects.Phasing and programming
c.Implementation.

IV. 1.0. Evaluation and Prioritization of intervention programmes.
1.1. Selection of urban indicators.
1.2. Characterization and weighting of the urban indicators.
1.4. Testing of the system in two barrios.
2.0. Annual Action Plans.
2.1. Agreement on criteria for setting priorities and selection of action plans: ALMA,MINVAH,INAA,MINSA (Municipality,Ministry of Housing, Water and Sewerage Institute,Ministry of Health.)
2.2. Pre-investment plans for the 54 high priority barrios of the city.

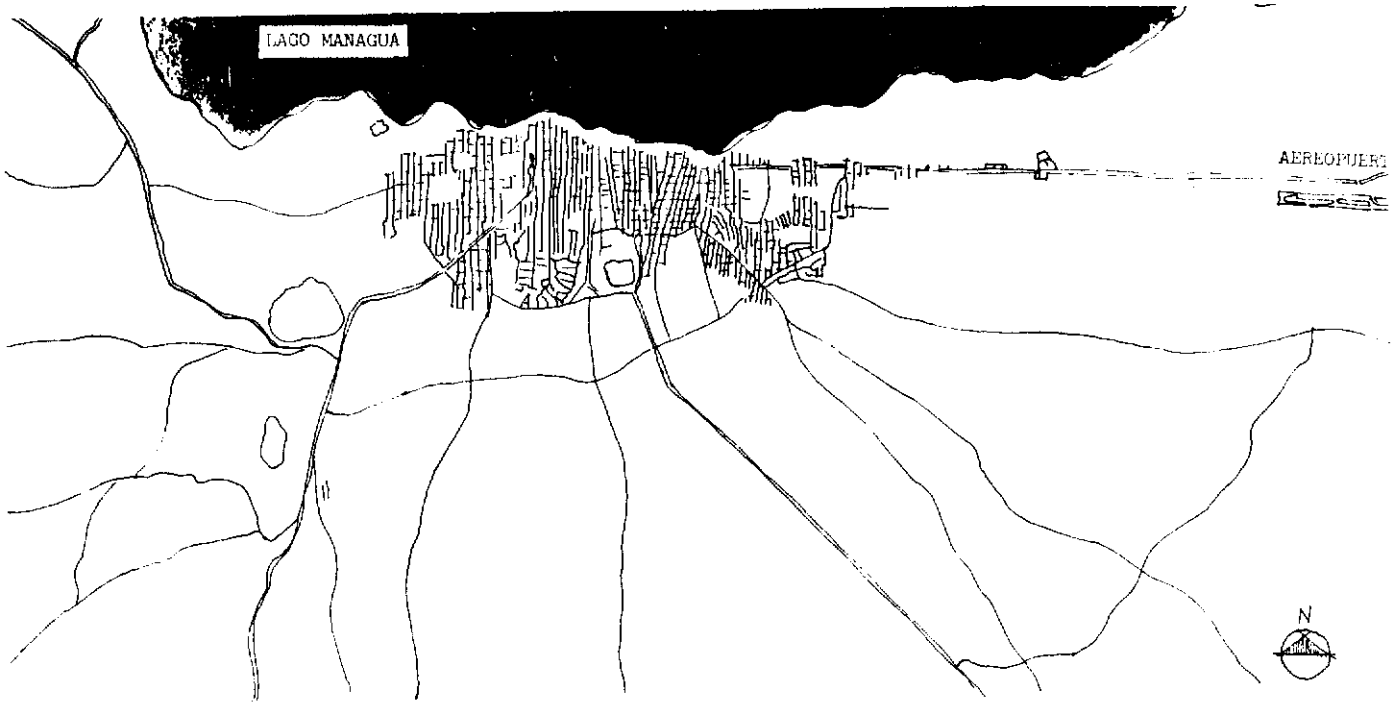
RESEARCH LEVELS. INTEGRATED UPGRADING PLAN . MANAGUA.

LEVEL	ANALYTICAL UNIT	PROGRAMME FOR ANALYSIS	INFORMATION UNIT	CRITERIA FOR THE FORMULATION OF ALTERNATIVES	ASPECTS OF INTERVENTION	SHORT TERM PROGRAMMES	LONG TERM PROGRAMMES
CITY	BASIC UNIT	1 DIAGNOSIS OF URBAN DEVELOPMENT -ANALYSIS OF PRODUCTTIVE PROCESSES -ANAL. DWELLING INFRASTRUCTURE SERVICES -ANAL. COMMUNICATION -ANAL. URBAN CONTROL & ACTION -DIAGNOSIS GROWTH & PLANS	5 URBAN DEVELOPMENT SCHEME -REGIONAL STUDY -DEMO/EMPLOYM. STUDY -LAND-USE BALANCE -COMMERCIAL ACTIVITY -CITY CENTRES -SOCIAL SERVICES -INFRASTRUCTURE -TRANSPORT & COMMUNIC. -RECREATION	9 ECONOMIC PROGRAMME OF THE MUNICIPALITY (f.e.)-INVESTMENTS: .WORKS IN SUPPORT OF PRODUCTIVE ACTIVITY .FISHING&AGRO/RURAL DEVELOPMENT WORKS .COMMITMENTS TO ORGANIZATIONS .PROGRAMMES IN COURSE	13 RAINWATER DRAINAGE -PRIMARY SYSTEM -SECONDARY SYSTEM .SURFACE: channels reads .UNDERGR:wells, manholes, pipelines etc ROAD NETWORK:constr/maint TRAFFIC SYSTEM TREEPL. -PRIMARY SYSTEM -SECONDARY SYSTEM GARBAGE, CIVIL WORKS	17	21
BARRIO	BARRIO TYPE	2 DIAGNOSIS OF HOMOGENEOUS AREAS -ANAL, INFRASTRUCTURE -LAND-USE TYPOLOGY -SOCIAL TYPOLOGY -NORMATIVE RELATIONS -RELATION EMPLOYMENT-DWELLING -TRANSFORMATION TENDENCIES	6 COMPARATIVE ANALYSIS OF THE BARRIOS -NETWORKS/SERV.CAPAC. -TOTAL AREA BARRIOS -PRIVATE/PUBLIC AREA -COMMUNAL AREA -No. DWEL/HOUSEHOLDS -Ml/Ha/Dw INFRASTRUCT -RESTRUCT. POSSIBIL. -HOUSEHOLD INCOME -PARTICIPATION GRADE	10 DIFFERENTIATED PROGR.: -DETERIORATING BARRIO -DEVELOPING BARRIO -CONSOLIDATING BARRIO INTEGRATED PROGR; FOR BARRIO DEVELOPMENT: -STRENGTHENING OF SOCIAL ORG./SERVICES -IMPROVE PRODUCTION & INCOME GENERATING ACT	14 RAINWATER DRAINAGE ROAD NETWORK GARBAGE ELIMINATION CIVIL WORKS INTEGRATED RROGR. TO REDUCE OVERCROWDING -LAND-USE RESTRUCT./ POSSIBILITIES FOR INTERINSTITUTIONAL COORDINATION	18	22
COMMUNITY	NEIGHBOURHOOD	3 COMMUNITY DIAGNOSIS -LAND-USE TYPOLOGY -SOCIAL TYPOLOGY -NORMATIVE RELATIONS -REL. EMPLOYM.-DWEL. -TRANSFORMATION TEND.	7 COMPARATIVE ANALYSIS OF COMMUNITIES -OVERCROWDING LEVELS -BLOCK & LOT AREAS -STATE OF DEVELOPM.: .PHYSICAL .COMUNAL -SELF HELP UNITS	11 DIFFERENTIATED PROGR.: -DETERIORATING BARRIO -DEVELOPING BARRIO -CONSOLIDATING BARRIO INTEGRATED PROGR. FOR BARRIO DEVELOPMENT: -STRENGTHENING OF SOCIAL ORG./SERVICES -IMPROVE PRODUCTION & INCOME GENRATING ACT.	15 ROAD NETWORK GARBAGE ELIMINATION PHYSICAL RESTRUCTURING ACCORDING TO INTEGRAEED PROGRAMMES	19	23
DWELLING	HOUSEHOLD	4 DWELLING DIAGNOSIS -LAND-USE TYPOLOGY -SOCIAL TYPOLOGY -NORMATIVE RELATIONS -REL. EMPLOYM.-DWEL.	8 COMPARATIVE ANALYSIS OF DWELLINGS -DWELLING TYPOLOGY -PHYSICAL STATE .DWELLING .INFRASTRUCBURE -DEMO/EMPLOYM & DW. -TRANSFORMATION HYPOTHESES	12 DIFFERENTIATED PROGR. -DETERIORATING BARRIO -DEVELOPING BARRIO -CONSOLIDATING BARRIO	16 INTERINSTITUTIONAL COORDINATION UPGRADING EXTENSION SANITARY WORKS	20	24

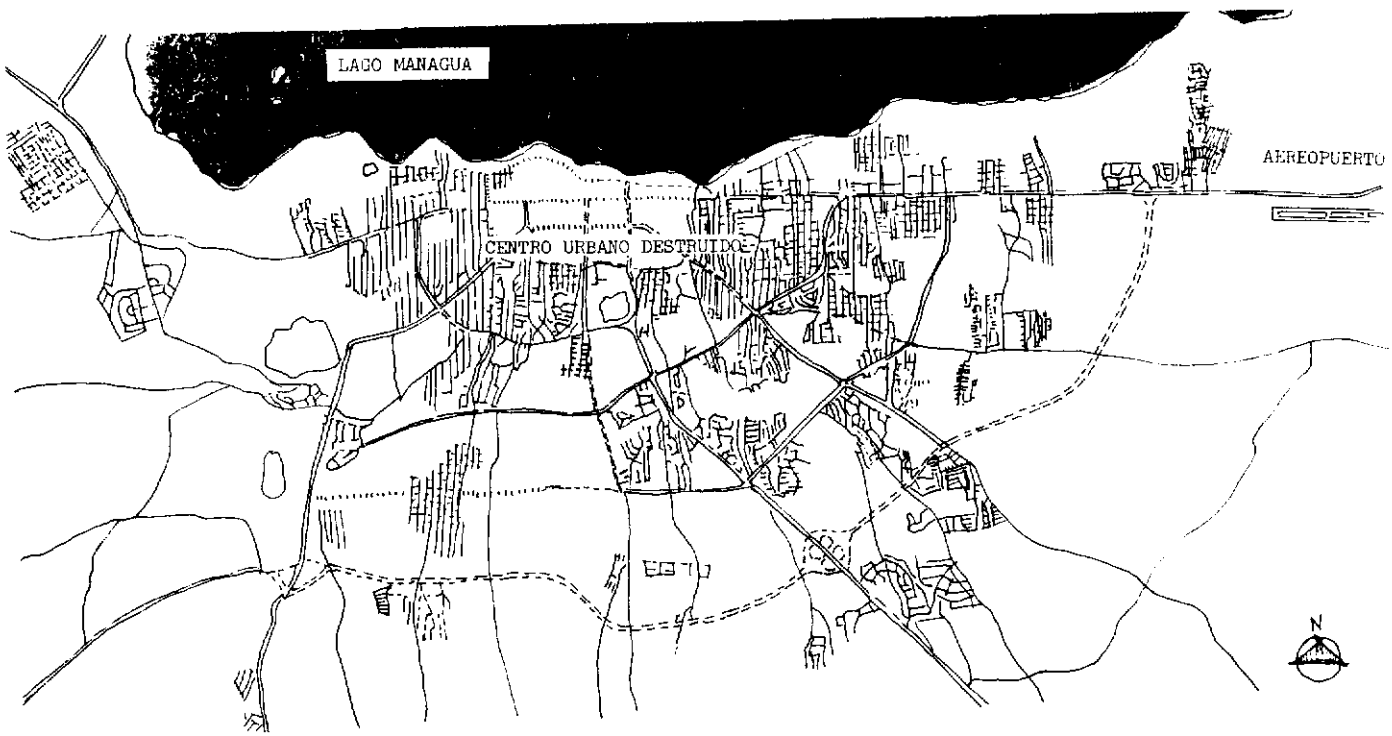
I N T E G R A L P L A N F O R S L U M U P G R A D I N G

I.1. Characterization of the urban reality

I.2. Diagnoses for slum upgrading.



Managua
Before the earthquake



Managua
After the earthquake

I.1.Characterization of the urban reality.

I.1.1. The growth of Managua and the housing question.

At present Managua has an urban population of around 750.000 . 84% of the inhabitants of the region in which the city is located. The city occupies 9.418 ha.at a density of 80 inhabitants per hectare.The preliminary Diagnoses of the Managua Urban Development Scheme is based on an hypothesis that contemplates the reduction of the present annual rate of population growth from 7.2% to 6.05%,which would give the city a population of 2.1 million in the year 2000. In that year Managua would have 40% of the total population and 56.8% of the urban population of the country (hypothesis 3).The size of the Economically Active Population in the year 2000 has been estimated at 639.588.An EAP of this size would require the creation of 412,000 new jobs by that year (hypothesis 1 of the "Estudio demo-laboral,Esquema de Desarrollo Urbano"),a rate of increase of 24,236 jobs a year.

Managua's current population is made up of 142,000 households.yet the total housing stock is 115,000 dwellings.About 20% of this stock cannot be repaired because of its precarious condition. (e.g.dwellings in seismic zones,flood areas,'cuarterias'etc.). The increase in the number of households is around 6.000 per annum.and the rate of obsolescence (end of the life-span of the unit)is more than 1%, about 3.400 dwellings per year. The combined deficit therefore amounts to about 57,000 units.
Given the size of this deficit it is not surprising that the rate of overcrowding is very high: one out of every five households in Managua is living with relatives in the same units. Data from the 1984 MINVAH programme indicates the enormous gap between housing deficits and existing supply:

Type of solution	No. of solutions	cost per solution (cordobas)
Finished housing	885	148,790
Building material	750	35,114
Progressive Urbanization	3000	2,194

The size of the housing deficit has an effect on land requireements.Since 1982 Managua has ex-perienced massive occupation of vacant urban land.In addition to the structural causes of the existing housing deficit,inherited from the previous administration.Managua has also experienced intensified migration from those regions affected by the war.Urban demands and the floods of 1982-1983 have also generated land illegal occupations. The housing deficit can also be seen in terms of the requirements for new urbanized land,improvements in infrastructure and services an in building requirements in general (repairs,renewal extensions and new construction).Central Managua has large areas of land available for housing purpose since the old city centre was totally destroyed by the 1972 earthquake.

I.1.2. The socio economic context.

The effects of Managua's growth must be placed in a national context and in terms of the socio-economic aspects of development.The main analysis of these aspects is dealt with in the economic section of the Characterization of the Urban Reality,1985.However a number of preliminary remarks have to be made.
At the moment it appears that the mixed economy model is experiencing serious constraints in the existing transition phase.These constraints limit the possibilities for improving the incomes of the population in the short term,and this short term subsistence level of living wil continue to be found amongst the very low income groups.

The analysis of the economic situation in Nicaragua has to be based on the fact the point of departure is a popular Revolution that has as its goal the transformation of the political and social structure of the country.
For this reason the use of traditional economic parameters is by itself an insuficient basis for an effective socio-economic diagnosis or analysis of the possible ways of occupying the territory.
Nicaragua is a society that is currently subjected to structural changes and the pressures of war,a situation in which both economic and spatial structures have not yet reached a definitive profile. A large number of issues must be studied in order to more completely understand the relations between the economic and spatial structures.These include: the impact of war,the new economic measures,the struggles against market speculation and their effect on migration flux;the impact of urban reform and of the changes in land rent etc. The reconstruction of the economy has demanded a large investment effort which has brought pressures to bear on the external sector and consumption levels and patterns.In recent years the war has affected the country's capacity for replacement of machinery and equipment and has resulted in higher material cost.In 1983 damages amounted to one third of the value of exports,and even higher levels were recorded in 1984.

Defence expenditure which has risen in response to U.S. military escalation,has greatly affected the investment capacity and consumption levels of the population.The as yet unconsolidated structural transformations of the economy have also resulted in a transitory loss of economic efficiency.Moreover,the changes in the ownership structures and the productive system have generated a new dynamic and new problems.One such problem is the intensification of immigration to Managua,and the extraordinary growth of the so called 'informal sector' of the economy.

At the moment the indications are that conditions in the external sector will continue to deteriorate in the near future.
The availability of loans has been constrained because of external political pressures,and no increases in Nicaraguan export returns are anticipated.In the near future it is probable that more rigurous measures will be required in order to control the economy.

These measures will aim at diminishing the fiscal deficit (which today stands at 25%of GDP) and at reducing the current imbalance in import/export payments by further restricting imports.Building activities will therefore be affected by these constraints.In view of the growing budgetary demands of the defence sector (currently standing at 40% of the national budget),any attempt to reduce the fiscal deficit would mean a diminution in current expenses and investments which are not related to the defence of the nation.
A reduction in imports would demand greater efforts to increase production for the internal market without imported inputs and without reducing consumption.
The indications are therefore that there should be a modification in the system of prices and the structure and level of salaries in order to create more incentives for national production.

These considerations of the general situation in Nicaragua have led to a proposed programme of public interventions in human settlements that is based on the existing reality of a country that is moving towards a mixed economy under conditions of military agression.This programme will be based on a number of premises concerning the form of occupation of land, family and spatial typology and community organization.

I.1.3.Urban Planning.

Modern Urban Planning in Managua can be considered as starting after the destruction of the city with the 1972 earthquake. Nevertheless several factors have influenced its structure and produced delays in the delivery of concrete results.
Amongst other,the factors are:

* The different nature of political regimes of the Somoza and Sandinista periods.
* The economic crisis affecting Central America, and the typical constraints of starting a process of transition to socialism.
* The dramatic economic and human effects of the war,disturbing planned growth strategies,intensification of rate of rural - urban and intra- urban migration,the accelerated squatting rate of the capital and secondary cities and the accentuation of non-productive activities.

During the Somoza period and particularly after the earthquake of 1972,urban planning was based at the Vice Ministry of urban Planning.The principal driving force in this planning process was the conflicting interest of the three dominant economic groupings at that time,the BAVINIC,the Bank of America and the Somoza family.The groups monopolized in general all agricultural and industrial stock,the urban land,property development,construction material sectors and the media in particular.All three also had a very close relationship with bilateral lending agencies such as US-AID and BIDF and with the large multinational corporations controlling the Central American Common Market.
These interests all resulted in the heavy concentration of public and private investments in some privileged areas of the city of Managua.
By the time of the Sandinista triumph in 1979.Managua contained about 25% of the country's population,32,7% of the economically

active population and about 60% of all infrastructure investments.It also contributed 34,1% of the country's Gross National Product.The dependent capitalist development of the country's economy resulted in a highly uneven distribution of capital and labour power expressed at national level within the severely underpopulated Atlantic Coast region and within Managua itself. Managua's growth rate (in mid 70's) was the highest in the country,about 6,5% per annum,and only 3.3% of this was attributable to natural increase.In 1975 almost two thirds of its population (61%) lived in self-built mud dwellings,over a third (36%) had no drinking water,almost a half (46%) had no connection to a sewerage system and almost a quarter (23%) lived in rooms occupied by more than five persons.

In 1982,the City Council of Managua and the Ministry of Housing and Human Settlements (MINVAH),initiated a study on long range Urban Development of Managua.Since 1983 the City Council,assisted by Delft University of Technology and the Institute of Technological Research of Sao Paulo,is involved in the development of a study that would determine the feasibility of slum improvement based on short term direct action plans and linked to the general premises of the Urban Development Plan of Managua city. This study is called the " Plan for the Integrated Upgrading of slum areas" (in spanish is summarized as PSIB).
The scarcity of resources and other difficulties constraining the Sandinista revolution together with the wishes of advancement towards a more even society serve to emphasize the need for planning.
General economic planning,as well as that of each of the economic sectors,leads to the search for forms which will to improve the balance of payments,expand employment,reduce costs and make the benefits of development open to a large sector of the population. The willigness to plan is hampered by numerous limitations restricting the reliability of these plans in the medium and long term.These restrictions apply to both the formulation and the implementation of plans.

At the present time there are about 800.000 inhabitants in Managua unevenly distributed over about 9.500 urbanized,semi-urbanized and unused hectares. The devastation wreaked on the city by the 1972 earthquake and the subsequent diversion of international aid into land speculation practices by the formerly named economic groups,has created great inequalities in the urban structure, and a unique situation where large empty spaces coexist in central areas adjacent to well developed areas. This is responsible for the low density ratio of Managua as a whole (84,2 inhabitants per ha.).
Over half of the city's residents live in 200 illegal sub-divisions with very low densities (around 20-25% dwellings per ha). A further quarter of the population lives in a zone of old squatter housing constructed along the lake shore (where 17 open sewage drains constitute a serious health hazard). The high and middle income sectors, which constitute 2% of the city's population,occupy around a quarter of the land within the city limits.More than 20 "city centres" are spread all over the city area in a non structurated basis.

The present extremely high growth rate of the city (about 7%) and the transformations that occur daily also restrict the gathering of base line data.Part of the Plan Regulador,that was realized in March 1982,became obsolete because of the worsening of the housing problem following the floods in May of that same year.The illegal land occupation and progressive urbanization programmes began rapidly to consume unused expropiated areas,undermining the possibilities to plan the future growth of the city.

I.1.4.The present stage.

The **Urban Development Plan** (in Spanish known as EDUM) is the answer to the need to plan in a way enabling adjustment to the conditions of the country.
The EDUM for Managua was carried out in a joint venture by the MINVAH and the City Council, receiving advice from the Cuban Institute for Physical Planning (JUCEPLAN).The Scheme for Development of Cities in Cuba is linked with a global regional economic development plan. However,given the low level of knowledge of the urban and territorial reality ,the planning method used in Managua did not need to depart from overall regional data. The method used in Nicaragua is adequate for their own reality,and the first phase is limited to the aspects of physical planning,reducing the total urban scale to smaller and more realistic dimensions of understanding, namely the neighborhood scale.
The city for this purpose has been divided into 116 Basic Units, territorial units with a radius of about 600 m.
The EDUM of Managua distinguishes two stages:

a. The Urban development Scheme for the city,which formulates its structure on the long range,specifying the intermediate phases of development.
b. A Director Plan,that starts from these first steps of development of the city. guides the process of investments, establishes zoning regulations and proposes outlines for urban and architectural projects.

The PSIB in its turn combines two distinct levels and can be divided in four stages. The first level is the urban regional dimension of the up-grading problem,based upon studies of the socio-economic reality and the strategies of development, and coincides with the stage of diagnosis of the EDUM with respect to simulation of population and location.ecological potential of areas and the potential of services and infrastructure.The second level is the settlement dimension.This level is defined on the basis of an analysis of the physical and socio-economic reality in the neighborhoods and coincides with the EDUM through the analysis of the specific premises and basic urban indicators.

The gathering of base line information on Basic Units determines the urban structure in zones that can be consolidated,developed or cleared up. These, and other regional urban guidelines of the EDUM will establish the general aspects involved in improving the infrastructure and organization of the barrios. PSIB will elaborate the crossing and the evaluation of the urban social and technical components and will establish short and medium term alternatives as well as the type of works to be carried out and the priorities of investments involved.

I.1.5. The strategy concerning the Building Sector.

An analysis of the building sector is obviously critical for assesing the feasibility of projects to improve the built environment of Managua.The sector is indeed very important within the national economy providing over 4.6% of total employment (national) and contributing 44.2% of the gross domestic product in 1984 (1),providing 37.000 working places,which corresponds to 20.6% of the national secondary sector,to which Managua contributes 50%.Studies in the building sector done by FINAPRI,characterize the existing strategy within national aims.

I.1.5.1.Rate of growth of Gross National Product (GNP).

In countries like Nicaragua where the physical capacity for the production of investment goods is so limited,the availability of foreign exchange restricted,and where there have been rapid changes in the economic situation,it is obviously very difficult to predict the long term trend in the growth of GNP.Investment capacity is strongly related to the possibility of achieving a growth in GNP between 1982-1988 which was commensurate with the rate of national population increase (3,3% per year). At the end of this period it was considered that the maturation of new agricultural investments could increase this rate to around 5.0% per year.The value of GNP in 1981 was C 23 thousand million cordobas.

I.1.5.2. Growth strategy in the building sector.

The FINAPRI study traced the difficulties associated with opening up the Nicaraguan economy to international commerce that were derived from balance of payments problems. These difficulties were outlined as follows:

1. the aims of achieving a redistribution of income leads to a consideration of measures of self-reliance in relation to a range of products.
2. The low availability of foreign loans restricts the capacity to import advanced technology in an indiscriminative fashion.The substitution of labour intensive by capital intensive technology is a very delicate matter given high rates of unemployment and the population growth.

The need to secure the efficient use of national resources in order to increase competiveness in international commerce,demands the further expansion of agricultural frontiers.This in its turn creates a demand for the expansion of physical infrastructure.These factors structure the demands made on the building sector.Public investments will be chanelled towards productive (particularly agro-industry) and the physical infrastructure.It is expected that these investments will expand employment,thus facilitating the increase and redistribution of incomes.Under this approach there will be a medium-term delay in social investments until the time when these investments have made an impact on the dynamism of the chosen productive sectors.The investment plan for the building sector contemplates three periods:

1st Period 1982-1987.
A period of public investments in the productive and energy sectors distributed according to the following pattern: Infrastructure 69,4%.Building 16,5% (includes agro-industrial buildings 10.0%),Housing 11.1%,Urbanization 3.0%.

2nd Period 1987-1992.
A small reduction in the proportion of investments going to energy,an increase in transport and a slow increase in social investments especially housing.Infrastructure 42.0% buildings 8.0%,housing 38.0% urbanization 12.0%

3rd Period after 1992.
A gradual increase in all sectors is anticipated including the social sectors,according to the same distribution.

I.1 5.3. Investments programmes.

In 1982 public investments both in housing and urbanization amounted to C 208.2 mill.,in 1983 c 377.4 mills.,and in March 1984 it was estimated that at the end of the year figure would amount to C 663.0 mills..Projects range from renewal and sites and services to social housing of about 45m2,including a number of wooden houses).All regions of the country benefitted following decentralizations aims and priority was given to border regions with Honduras and Costa Rica (2).
In the city of Managua the building programme was supported by a soft loan from IDB,the Inter American Bank for Reconstruction and Development.The loan was for US$ 13 million ,which corresponds to 70% of the projected investment programme.This programme was directed at the rectification of war damage,improvement of settlements and flood control.The programme resulted in investment of C 57.6 thousand millions 1981,C 74.6 thousand millions in 1982 and C 55.8 thousand millions in 1983 (3).In the period 1980-1982 these levels of investments were sufficient only to pave 80 kms of the city's streets (around 450 km or a half of the city's streets remain unpaved) and about 8 km of rain water drainage channels.In addition about 36 settlements were provided with emergency services (amongst other water,electricity and safety walls against erosion).
At the end of 1983 the whole building programme was subordinated to the new National Economic Programme which was oriented towards the need for maximun defense strategy and priority investment in strategic sectors.This limited more investments in building programmes and priority was given only to the satisfaction of the most basic needs.The political military situation imposed the need for high standards of rationality and efficiency in the use of resources for planning.In Managua this meant that 22 settlements improvement projects received C 206.3 million. (cordobas of 1983);2.130 m2 of rainwater drainage channels were repaired and a small scale enterprise sector was initiated for productive and servicing activities.In 1984 the military situation demanded even further constraints.At the end of the year new measures were taken against the unproductive and speculative sector that affected about a third of Managua's E.A.P..These measures were directed at reducing demand and stimulating more productive activities.They included a wage freeze,withdrawal of subsidies on basic products and the

establishment of control over the black market.The City Council has stressed the need to develop the small scale enterprise sector in coordination with the Ministry of Industry.The principal aim is to alleviate the balance of payments problem through the substitution of imports in basic consumer goods by local materials (e.q.cooperatives for making shoes,clothes etc.).These small scale enterprises are also directed towards the provision of basic services to the deprived population such as local trade,popular restaurants,recreational centers.
In 1984 building activities were restricted to a budget of only C 142.84 mills. and only one settlement was assisted with a financial investment of C 5.2 mills.
In the city as a whole only 1.300 lineal meters of streets were paved.Nevertheless special priority was given to the rural areas by the Department of Managua and some projects in Managua itself with a special strategic importance were also carried out.
The 1985 Programme similarly reflects the crisis imposed on the country by the military situation. The priorities established are:

1. Support for those works directly related to productive activities.
2. Support for rural road construction in order to improve agricultural activity and rural living-conditions.
3. Support for those programmes which have been discussed in public with the organized community and which have political importance.

I.1.6. Characterization of the human settlements.

I.1.6.1. Classification of the `barrios' of Managua.

The first classification identified Barrios according to their physical housing conditions (both dwelling and technical infrastructure). This study has been performed by MINVAH in 1983, and has provided us with a preliminary image of 192 residential areas, representing a population of 754.195 people housed in 108.822 dwelling units. These figures have been updated in 1985; resulting in 866.533 and 117.557 respectively. (Appendix 1).

The analyses of the physical state of the cities' residential areas was based upon field-observations of the following issues:

1. Housing typology determined by the constructive elements;
2. Physical state and life-span of the dwelling according to its constructive elements;
3. Internal technical infrastructure and services per dwelling unit;
4. Technical infrastructure network of the settlement.

Classification according to housing typology made use of the following categories: **ruins; precarious-deteriorating** (squatter); **precarious-improving** (or`urbanizaciones progresivas'.including all new site and services programmes); **popular individual of wood** or a mixture of wood and masonry; **popular individual of masonry; social housing projects in wood; social housing projects in masonry; traditional** (from before the earthquake of 1972 and built of `Taquezal'); **social residential housing projects; individual residential; luxurious residential.**

According to the physical state and life-span of the dwellings, the types are classified in: **very bad; bad; moderate; good.**

According to the internal infrastructure four categories were established:

A. **drinking water** provided **outside** the dwelling, either individually or collectively; **plus latrine;**
B. **drinking water inside plus latrine;**
C. **drinking water** provided **inside or outside** the dwelling plus **internal or external sanitary provision;**
D. **internal** provision of **drinking water plus** internal (individual) **sanitary.**

With respect to the technical infrastructure networks, the level of development is measured in terms of the number of services as follows:

1. **drinking-water and electricity (illegal);**
2. **drinking-water and electricity (legal);**
3. **drinking-water, electricity and sanitary sewerage;**
4. **drinking-water, electricity, sanitary sewerage and rainwater drainage;**
5. **drinking-water, electricity, sanitary sewerage, rainwater drainage and telephone.**

In general there exists a relation between the type of housing and the quality of the infrastructure networks.
The combination of housing types, life span of the dwelling units and the level of domestic (interior) infrastrure services results in the types of residential areas as follows:

type of residential zone	inhabitants %	dwelling units, %	inh/dw
1. ruins/infrastr. C	0.7	0.8	6.2
2. precarious-deterior.	6.9	6.8	7.0
3. prec.-impr./infrastr. A	5.8	7.8	5.2
4. traditional/infrastr. C	9.6	7.5	8.8
5. pop.wood/very bad/inf.A	0.6	0.7	5.9
6. pop.wood/very bad/inf.C	0.5	0.4	8.2
7. pop.wood/bad/infrastr.C	2.7	3.3	5.5
8. pop.wood/bad/infrastr.B	0.3	0.5	4.9
9. pop.wood/mod./infra. C	16.9	17.6	6.6
10. pop.wood/mod./infra. B	3.2	3.0	7.3
11. pop.wood/good/infra. D	7.2	7.3	6.9
12. pop.wood/good/infra. C	7.6	7.4	7.2
13. pop.wood/good/infra. B	7.7	6.8	7.8
14. pop.mason./good/infra.C	1.6	1.2	7.5
15. pop.mason./good/infra.B	0.3	0.4	4.8
16. pop.mason./good/infra.D	15.1	13.9	7.5
17. residential/infrastr. D	13.3	14.6	6.2
ALL TYPES:	100.0 (754 195)	100.0 (108 822)	6.9

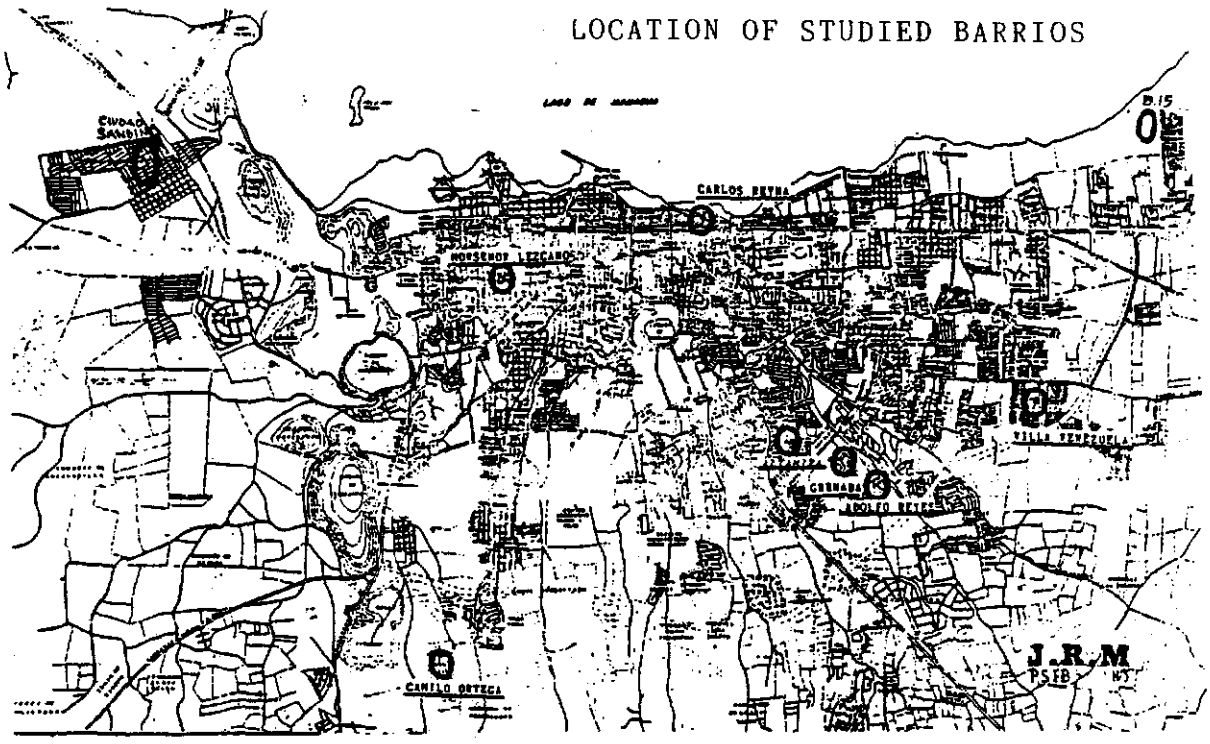
(note: data 1983).

CHART 1.

I.1.6.2. **Typology of Barrios.**

For the purpose of this characterization, that is to say an investigation into the feasibility of upgrading actions, a new classification was carried out,in which factors concerning the habitat conditions (dwellings and infrastructure) as well as the conditions that influenced the origins and development of the settlement, are introduced.
These conditions are amongst others: the location, the character of land occupation; either spontaneous (individual or collective) or planned (by private or public sector), the forms of consolidation, building modality (mutual or self-help), etc..
The combination of all these factors determines the classification of all barrios in a number of categories,and for effect of this study a representative barrio was selected on each of them.

LOCATION OF STUDIED BARRIOS



I.6.3.1. **Spontaneous settlements.**
Those settlements that arise on invaded land in a massive or gradual way. They present in general a high degree of over-population and a total lack of planning. These settlements are roughly divided into two groups:

a. Traditional spontaneous (before 1979): in this case the people have settled individually and gradually throughon the years. They are generally found on the outskirts of the city.
b. New spontaneous settlements (after 1979): they are produced in a massive way and are located within the urban structure.

The dwellings existing in a. correspond to the type 'precarious in deterioration'and in b. to the type 'precarious in process of improvement'. These types have been established by the Housing Study. made by the MINVAH in 1982.
Examples of spontaneous settlements are: Barrio Carlos Reyna. along the shore of Lake Managua.and the settlement known as B15 along side the lake an near Jose Benito Escobar.

I.6.3.2. **Progressive development.**(Urbanizaciones progresivas)
They have originated after 1979 due to relocations of population that lived in areas which are not suitable for urban development. They are in general located along the main circulation axes. The type of dwellings correspond in this case to the 'precarious in process of improvement. These settlements have minimum infrastructural services (tap water ,street lighting.latrine. some unpaved road patterns).
Examples of these settlements are: Barrio Grenada and Jonathan Gonzalez.

I.6.3.3. **Barrios.**
These are either old or new settlements where the low and middle-low income sectors of the population live. Here some

infrastructure services are available, such as water supply, electricity and garbage collection and in some cases drainage and sewerage disposal. They are divided into three groups:

a. Old barrios: before the earthquake of 1972. These are located mainly around the central area of Managua.e.g Barrio Monsenor Lezcano.
b. Popular planned barrios, They correspond to the type of planned housing schemes designed with minimum dimensions according to the concept of progressive growth. In this case the main infrastructure networks and services such as garbage collection are present. e.g. Villa Venezuela and Ciudad Sandino.
c. Private initiative popular barrios. These barrios emerged within the subdivisions made by landowners. They were illegal because they were sold without any state control and without the minimum infrastructure services. After the 1979 revolution they came under state control, waiting for legalization (repartos intervenidos).e.g. Adolfo Reyes, Camilo Ortega.

I.6.3.4. **Residential.**
These are the new urbanizations produced before and after the 1972 earthquake for the middle and upper classes. In this case all the infrastructure networks and services are present.
They are scattered over the periphery of the city and have been divided into three groups:
a. Social residential. Consist in general of row houses with an average of 8 m2 per person.e.g.Barrio Rafaela Herrera.
b. Residential. Include row and detached houses with an average of 14 m2 per person.e.g. Altamira
c. Luxureous residential. All free-standing houses with an average of 20 m2 per person. eg Las Colinas, Altos de Santo Domingo.

CHART 2.

BARRIO CLASSIFICATION - PSIB 1986

Description	Inhab.	%of tot.	m^2	%of tot.
Old spontaneous settl.	66.869	8,9	2.518,475	4,7
New spontaneous settl.	n.d.		413,357	0,8
Progressive urbanizations	28.081	3,7	1.769,537	3,3
Old barrios	77.750	10,3	5.997,241	11,3
Popular planned barrios	159.699	21,2	3.971,758	7,4
Popular barrios	259.587	34,4	20.060,271	37,6
Social residential	58.646	7,7	2.331,987	4,37
Residential	89.736	11,9	11.551,973	21,6
Luxurious residential	3.980	0,5	4.724,192	8,9
Cuarterias & restriction	10.194	1,4		
Total	754.542	100,0		100,00

This chart shows the uneven distribution of land in relation with the various residential areas given in the city.

I.1.7.Socio Economic Aspects of the Population.

In order to make a Diagnoses of the city's slum areasa a classification of typical residential areas was done and one settlement was choosen from each of the given popular areas. In order to have a reference to the rest of the city.a middle class settlement was also choosen.Altamira.In the five barrios a survey was carried out specifically designed for the elaboration of a Diagnoses for slum improvement. Several institutions in Managua have been recently involved in studies concerning urban marginality and survival conditions,therefore this survey was generally directed at the physical conditions of the settlements and the dwellings.the aspiration of the people and the feasibility of carrying out economic and physical interventions.
However this first survey did suffer from certain limitations:
1. It had to be carried out in a very short time,during the election campaign of November 84.Elections in Nicaragua were a new experience and a survey could be considered by the people as government interferance.
2. The uneven scope of the survey,while in Adolfo Reyes and Camilo Ortega (both Popular Barrios of Private Initiative) 50% of the dwellings were surveyed.in Carlos Reyna (old illegal settlement) was only 20%,in Grenada (Sites and Services)10% and Altamira (Residential) less than 1%.
This produced severe distortions in the representation of the reality ,specially in the old settlements,the Sites&Services and the Residential one.
In the following phase,the micro-diagnoses (at the interior of the "bloc"),a new socio-economic survey was carried out with complete success.
In this report it is worthwhile to refer briefly to some of this information:
a. Population and Gender.
Managua contains a very young population,with extended nuclear families composed of parents,children and grandparents.There is an average of 3.8 children per family.

The female population is 51% of the total and it appears that this number has increased,with the increase in female households.The causes for this are to found in the habits and social behaveour of the men,males entering on military service and labour movility .

b.Origins of the Population.
50% of the population comes directly from Managua,30,7% of which from Managua's urban are and 19,3% from the rural area around Managua.others come from the "dormitory cities",Masaya,Carazo,Granada and Leon,which historically housed commuters coming to Managua to work.The rest of the poipulation comes from the cattle zone Boaco and Chontales,and war zone,Matagalpa,Jinotega and Esteli.
With respect to the length of time people have lived in the different settlements,the survey proved a starting hypothesis which have characterized the given typologies.
Carlos Reyna,as an old illegal settlement built prior to the 1972 earthquake.These contain a high level of human mobility due to the dilapidated housing and contaminated locations.Camilo Ortega and Adolfo Reyes as settlements resulting from illegal developments and having initiated their own organization since

the early '70s
c.Employment If we consider an economically active person as being between 16 an 65 years old,the chart shows that this corresponds to an average of 47.2% of the total population. However only 29% of this average are "working".In other words 18.2% of the E.A.P. do not have a proper job. Of the 29% in work 61% are male and 39% are female.
The 1149 persons categorised as working correspond to 29% of the total of the surveyed population .This is distributed as follows,21.75% working in the tertiary sector,6.25% in the secondary sector (3.28% building)and 1% in the primary sector. The tertiary sector represents 3.6% in the commerce,4.5% of woman working as domestic help and remaining 13.65% in services,being 3.78% professionals,6.76% low technicians and 3.21% services (drivers,cleaning etc)
In respect to the incomes, 53% of the surveyed households earn 90 dollars (1984),27% earn between 90 and 180 dollars,11% between 180 and 300 dollars and 9% more than 300.This datas includes Altamira.

d.Popular Participation.Since the revolution a number of popular organization have arisen,the important one being the CDS (Sandinistas people Committe)which has as goal the support of the revolutionary process,AMLAE.women's organization,ANS children organizations.CST organization of workers,MPS popular milicias, Juventud Sandinista 19 de Julio,Young Sandinistas etc.
The survey shows that 68% of all the surveyed population are organized within one or other group.In the two first Pilot Barrios this proportion is even greater.

e. Aspirations.Socio-economical aspects,literacy and type of work analysed according to the form of occupation of the lot,the state of the dwelling and the aspirations concerning improvement in living conditions.
The result is summarized as follows:

CHART 3.

ASPIRATIONS: Order of priorities

ALTAMIRA	ADOLFO REYES	CAMILO ORTEGA
1.additional job:27%	1.permanent work:62%	1.perm. work:54%
2.others: » 23%	2.improv. barrio:19%	2.addit.work:18%
3.permanent work:14%	3.additional job:11%	3.impro.barr:17%
GRENADA	CARLOS REYNA	
1.permanent work:42%	1.permanent work:68%	
2.barrio improv.:35%	2.addition. work:12%	
3.additional job:23%	3.barrio improv.:12%	

Is not surprizing that in middle-income barrios,such as Altamira,the improvement of the settlement is not the highest priority nor is permanent work because a good level of employment exists.for the popular settlements the aspirations for permanent work always score highly in priorities.For a Progressive Urbanization,in an initial stage,with scarce collective water taps and without sewerage,it is logic that the improvement of the barrio is also important.

CHART 4.

Age /Sex	ALTAMIRA M	ALTAMIRA F	GRENADA M	GRENADA F	C.ORTEGA M	C.ORTEGA F	A.REYES M	A.REYES F	C.REYNA M	C.REYNA F	TOTAL M	TOTAL F	%
0 - 2	2	4	12	9	137	94	31	24	12	11	194	142	
3 - 5	7	2	14	16	138	133	34	21	14	16	207	188	38,4
6 -12	9	12	22	21	269	277	75	73	19	20	394	403	
13 -17	6	4	4	4	164	182	52	65	7	11	233	266	12,6
18 -59	35	43	38	39	536	579	153	200	34	50	796	911	42,9
60 -more	4	4	3	3	68	56	46	40	8	10	129	113	6,1
Total	63	62	94	118	1312	1323	391	423	94	118	1953 49%	2023 51%	100%

CHART 5.

YEARS LIVING IN THE BARRIO BARRIO	YEARS 1-3	4-6	7-9	10-12	13 a +	no answ.
ALTAMIRA	4	7	6	4	-	1
GRENADA	24	1	-	-	-	1
CAMILO ORTEGA	37	45	41	75	186	1
ADOLFO REYES	4	6	1	32	68	4
CARLOS REYNA	7	6	2	2	8	-
TOTAL	76	65	50	113	262	8
%	13%	11%	8%	20%	46%	2%

CHART 6.

NUMBER OF PERSONS WORKING BARRIO	MASCULINE	FEMENINE	TOTAL
Altamira	30	32	62
Grenada	38	18	56
C. Oretega	478	293	771
A. Reyes	135	79	214
C. Reyna	27	19	46
TOTAL	708	441	1.149
%	61%	39%	100%

CHART 7.

ORGANIZED PERSONS INCOME	ALTAMIRA SI	ALTAMIRA NO	GRENADA SI	GRENADA NO	C.ORTEGA SI	C.ORTEGA NO	A.REYES SI	A.REYES NO	C.REYNA SI	C.REYNA NO	TOTAL SI	TOTAL NO
.1 - 4.500	-	-	14	5	197	25	43	-	16	4	270	34
4.501 - 9.000	4	2	2	2	83	11	36	15	3	1	128	31
9.001 - 15.000	4	3	1	-	21	-	8	-	1	-	35	3
15.001 a más	7	2	2	-	7	2	3	-	-	-	19	4
no work	-	-	-	-	40	-	10	-	-	-	50	-
T O T A L	15	7	19	7	348	38	100	15	20	5	502	72
% ORGANIZED PERSONS	68%		73%		90%		87%		80%		87%	

CHART 8.

DEPARTMENT	ALTAMIRA RU.	ALTAMIRA UR.	GRENADA RU.	GRENADA UR.	C.ORTEGA RU.	C.ORTEGA UR.	A.REYES RU.	A.REYES UR	C.REYNA RU.	C.REYNA UR.	TOTAL RU	TOTAL UR.	%
MANAGUA	-	5	3	7	91	102	17	47	-	17	111	178	50.3
MASAYA-CARAZO GRANADA-RIVAS	-	7	4	2	42	18	15	12	3	-	64	39	18.0
LEON-CHINANDEGA	-	4	6	1	23	13	4	3	2	1	35	22	9.9
BOACO-CHONTALES	1	1	1	-	5	-	2	1	-	-	9	2	1.9
JINOTEGA-MATAGALPA N.SEGOVIA-ESTELI MADRIZ	1	3	2	-	10	5	5	2	1	-	19	10	5.0
ZELAYA	-	-	-	-	3	1	-	-	-	-	4	1	0,8
Other Countr.	-	-	-	-	-	1	-	-	-	-	-	2	0.3
no answer	-	-	-	-	72		7		-	-	79		13.8

CHART 9.

NUMBER OF PERSONS WORKING

EDAD ANOS	ALTAMIRA SI	ALTAMIRA NO	GRENADA SI	GRENADA NO	C. ORTEGA SI	C. ORTEGA NO	A. REYES SI	A. REYES NO	C.REYNA SI	C.REYNA NO	TOTAL SI	TOTAL NO	%
1.- 0 - 5	-	15	-	53	-	531	-	240	-	48	-	887	
2.- 6 - 10	-	16	-	36	2	380	1	18	-	57	3	573	49.5%
3.- 11 - 15	-	14	2	12	18	354	7	86	3	13	31	479	
4.- 16 - 20	3	3	6	7	121	220	36	71	2	13	168	314	
5.- 21 - 25	7	8	7	7	143	85	40	39	8	11	205	150	
6.- 26 - 30	20	5	15	1	113	60	25	14	15	9	188	89	
7.- 31 - 35	8	1	12	1	73	48	10	18	3	4	106	72	
8.- 36 - 40	7	1	7	2	92	31	31	9	3	-	140	43	47.7%
9.- 41 - 45	5	-	-	-	60	18	19	4	3	-	87	22	
10.- 46 - 50	5	-	1	3	44	19	15	10	2	1	67	33	
11.- 51 - 55	3	-	2	2	39	24	7	6	3	2	54	34	
12.- 56 - 60	-	1	3	2	35	29	7	5	3	-	48	37	
13.- 61 - 65	1	2	-	2	10	15	4	6	-	2	15	27	
14.- 66 - 70	2	1	1	1	9	10	5	4	1	1	18	17	
15.- 71 - 75	-	1	-	-	7	13	-	2	-	-	7	16	2.8%
16.- 76 a +	2	-	-	-	10	21	-	10	-	5	12	36	
T O T A L	63	68	56	129	776	1.858	207	605	46	135	1.149	2.831	
											29%	71%	100%

CHART 10.

INCOME	ALTAMIRA	GRENADA	C.ORTEGA	A.REYES	C.REYNA	TOTAL	%
1.- 1 - 1.500	-	6	31	9	8	55	
2.- 1.500- 3.000	-	10	118	23	6	157	53%
3.- 3.001- 4.500	-	3	73	14	6	96	
4.- 4.501- 6.000	2	2	42	25	3	74	
5.- 6.001- 7.500	1	2	27	13	1	44	27%
6.- 7.501- 9.000	3	-	25	9	-	37	
7.- 9.001- 10.500	1	1	6	4	1	13	
8.-10.501- 12.000	2	-	10	4	-	16	
9.-12.001- 13.500	2	-	3	-	-	5	11%
10.-13.501- 15.000	2	-	2	-	-	4	
11.-15.001 a mas	9	2	9	4	-	24	
12.- No trabajan	-	-	40	10	-	50	9%
T O T A L	22	26	386	26	115	574	100%

f. Overcrowding.
Overcrowding.being a structural problem.it becames necessary to analyse further the reality of sanitation related to the type of barrio. On a micro-level the chart 5 shows the relation between nuclear families and the number of relatives per dwelling.
It was possible to identify here a certain tendency that shows the large amount of "allegados"(family relatives or friends living in the same house due to the lack of housing).that without any exception are present in all the popular barrios of Mangua.
Fifteen different variables of kindred relations and frienship were identified such as :father.mother.children.grandparents.nephew.brother in law.son in law.brother. etc. The concept of of extended nuclear family was used and means that within the nuclear family itself.the grandparents or parents in law and grandchildren.are included.The case of married children living in the same house.are here considered as two potential families.The rest of kindred relation were classified as relatives (allegados).Later on.when analysing this in the micro-diagnoses.these variables combined with ages.incomes and characteristic of the dwelling.
This survey shows that the average size of an "extended nuclear family"is 5.92 persons (very near to the 6.0 found by the MINVAH for planning minimum dwelling).It varies from 6.84 in the settlements which are in a process of deterioration such as Carlos Reyna and 4.7 in the residential Altamira used as reference.

However in the distribution of "allegados".some peculiar situations appear that should be explained by the interrelation of several factors.such as size of the house.socio-economical conditions.inter-uran and inter-rural family relationships. Only in this way one could explain the high degree of relatives (2.92) living in Altamira.most are students and where there is a middle economical level and the houses are large.
In Adolfo Reyes.it could be explain because the houses are already consolidated.In the Barrio Grenada.on the contrary, the very high level of overcrowding existing in the dwellings expresses conditions of extreme poverty.
In order to study the feasibility of land use modifications (including sub-division of large plotas) and following the search for new technological alternatives to obtain the most economical infrastructure provision.it is further more necessary to go even deeper into the analysis of the clusters.the lots.the units and the family space.This was called the micro-diagnoses.

CHART 11.

AVERAGE NUMB. OF PERSONS PER "AMPLIFIED NUCLEAR FAMILY" AND AVERAGE NUMBER OF RELATIVES

Name of Barrio	Average N° pers./nucl. fam.	Average N° relatives/ fam. with rel.	Average N° of relatives
Camilo Ortega	6,3	1,76	0,45
Adolfo Reyes	6,16	3,25	0,45
Grenada	5,5	3,54	1,5
Altamira	4,7	2,92	1,9
Carlos Reyna	6,84	2,45	1,08

CHART 12.

Typology	Barrio	%of total dwellings of barrio	N°of surveys	N°ofpers. interview.
Residential	Altamira	1%	22	132
Progress. urbanizat.	Grenada	10%	26	185
Spontaneous old settl.	Carlos Reyna	20%	25	212
Pop. unplanned barrio	Adolfo Reyes	50%	115	814
	Camilo Ortega	50%	386	2.635
Total of sample			574	3.978

CHART 13.

Name of Barrio	Total no. of dwellings of the barrio'	no. of surveyed dwellings	% surveyed in relation to total no. of dwellings	No households withouth relatives (extended nuclear families)	% households withouth relatives	no. of households with relatives	no. of persons in extended nuclear family	no. of relatives	% of nuclear families (perons)	% related persons	TOTAL	Average extended nucl. family	Average in dwellings with relatives	Average of relatives in total dwellings
Camilo	867	381	43.9	284	74.54	97	2402	171	93.1	6.6	2575	6.3	1.76	0.45
Adolfo	418	115	27.5	79	68.69	36	709	117	85.8	14.2	826	6.16	3.25	1.02
Grenada	415	26	6.26	15	57.69	11	146	39	78.9	21.2	185	5.6	3.54	1.5
Altamira	2220	20	0.9	7	35.0	13	94	38	71.2	28.8	132	4.7	2.92	1.9
Carlos	151	25	16.55	14	56.0	11	171	27	86.4	13.6	198	6.84	2.45	1.08
AVERAGE	814.2	113.4	19.02	79.8	58.3	33.6	704.8	78.4	83.08	16.8	783.2	5.92	2.78	1.19

I.2.Diagnoses of the technical Infrastructure.

Specific observations concerning the technical infrastructure will be made both at macro and at micro level. At macro level the technical infrastructure is analyzed in quantitative and qualitative terms as well its costs in relation to the overall urban fabric.

The micro level will deal with parameters that influence the redesign of alternative systems according to the characteristics of every settlement.

I.2.1.Diagnoses of the different aspects of intervention. Macro-level.

I.2.1.1.Drinking water.

The present data concerning consumption levels and the percentage of the population that is reached by this service presents some discrepancies according to the observations of the IPT's consultants.Therefore it was recommended that the data be verified by INAA (Water and Sewerage National Institute).
Figures for 1985 are as follows:

-estimated population	836.934 inh
-estimated production	53 mgd
-non-registered percentage of the total volume	36%
-actual deficit	23 mgd
-consumption per person (according to the norm)	70 gdp
-served population	91%.

These figures indicate that the demand is higher than the present capacity of the sources.The situation is aggravated each day,due to a high population growth rate,a high proportion of water leakages.high levels of water consumption by foreign patent sanitation devices and also the habits of the people.
INAA expects to complete the first phase of the "Master Plan for improvement and extension of the water supply system of the city of Managua" in 1988,with an increase in the production of drinking water by 35 (mgd).This should cover the deficit that has been growing since 1980.

I.2.1.2.Waste water collection and disposal.

The sewerage system has a total length of 857 km and consists of concrete pipes with diameters between 8" and 30". The entire system functions by gravity-forces and discharges the waste water,without any treatment,into Lake Managua. The main network covers approximately 87% of the urbanized area and could have the potential to serve 100% of the actual population.At present,65% of the people are making use of the system through the existing 64.929 connections in the city of Managua.
Map 1 identifies the critical areas,giving the capacity and poptentials of the existing network in the different zones. It can be seen that in the expansion zones (location at some distance from the centre),there are no extensions of the sewerage network.Solutions for this situation require high investment.In

such cases a local destination for the waste-water will be required taking advantage,where ever possible,of favourable conditions for evapo-transpiration system.

I.2.1.3.Drainage.

Superfluous rainwater in the basin of Managua is carried by gravity-force,through natural ditches in the rural (sub-urban) zones and through natural streams or covered ditches in the urban zones. At present in Managua there are approximately 237 km of installed drainage pipelines but 30% of the surface drainage intakes do not function effectively.Moreover the actual condition of about 60% of the pipelines in the central area is unknown.
This data shows that the drainage system is not effective,to which can be added problems involving the type of coverage (adoquin) of the ditches,the absence of drainage networks in spontaneous settlements, progressive urbanizations or other type of popular settlements and finally the increase of water in sub-urbanized zones,because erosion of upper land caused by an inadequate use of land for agriculture. However,the macro-drainage problems of Managua seem to be satisfactorily evaluated by engineers of the Municipality but the resulting solution require high investments in order to be effective.The proposal to construct mini-dams near urban locations suggest the possibility of multiple use for the reservoirs tanks,such as using the stored waterr for industrial and irrigation purpose.In this way,the shortage of water could also be reduced.
With respect to micro-drainage,the PSIB will search for alternatives to simplify the system of water collection and to reduce its costs.

I.2.1.4.Road network development.

The present road system of Managua is of radial and ringshaped type,and totals 970 km.The main road system has a length of 184.6 km.The distribution of type of road-material is as follows:

Adoquin (street blocks)	171 km	18%
Asphalt	366 km	37%
Unpaved	433 km	45%
Total	970 km	100%

Between 1979 and 1982 some 80 km of the network were paved,that is 20% of the existing streets.(Financed by IBRF)
Of the 537 km of paved road, 450 kms are in good condition. In 1984 only a further 1.3 km of road were paved and from 1985 onwards no more road-paving has been carried out inside Managua.This because priority was given to rural zones.
The road network of Managua provides for acceptable vehicular circulation and about 15% of the population uses buses as a means of transportation. The urban public transport network covers 176.4 km which includes 95% of Managua's main roads.

I.2.2. Cost of infrastructure networks related to the urban fabric.
The analysis of the present urban fabric as related to infra-structure cost is of great importance when looking for adequate technological alternatives for low-income settlements.Most of these alternatives might be seen in conventional technical

infrastructure systems which are used generally and which represent an ultimate aspiration of people and administrations. Other systems regarding progressive development of networks are also studied,including which costs are related to the existing urban fabric (i.e.the capacity and the rentability of the net).

From a macro point of view,various studies have pointed out that the topography and the ground resistance (within certain limits), as well as the form of the city and that of its basin or sub-basin, have very little influence on the variation of infrastructure network costs.

According to MASCARO (1979),there are only two important variables that remain which are determinants of the network cost for every serviced unit.These variables are:

a. The type of existing or adopted road network.
b. The housing density.

The grid pattern inherited from the colonial period. when there were no infrastructure networks, is presently (there now a being a completely different service system and transport structure) the most anachronistic and uneconomic one.

Managua represents a dramatic example of this pattern. having in the central areas underutilized infrastructure networks which were badly damaged by the 1972 earthquake, while on the periphery there is no sewerage network at all.
As has been proven in several studies this "roman-spanish" grid pattern results in an increase of the costs of the networks of 20 to 30 %,depending on the given case,compared to those road patterns where the frontage of the plots are always in the same direction.For example the so-called "fish-bone" road pattern. where there is a primary road to which the secondary roads (usually with cul-de-sac design) come in more or less perpendicularly way.Here the fronts of the plots are generally parallel. In this case the connection to the service networks are confined to the secondary roads and need only 40 to 50% of the networks which brings with it savings of 30 to 40% of the costs.
This road pattern has an additional advantage in that the main traffic roads seldom have to be excavated because they contain only master pipes.
The secondary roads,mainly the dwelling distribution roads,contain most of the pipelines.In these roads most of the excavations for connections and damage repairs occur.
The cost of infrastructure networks per hectare vary relatively little with the population density. The costs of the great majority of networks are more related to their extension (amount of meters per hectare,for example) than to their capacity (amount of liters or cubic meters per hectare). In this way, the urbanization of one hectare for 500 inhabitants will cost little more than the urbanization of the same area for only 50 inhabitants. Most of the pipelines have,for technical reasons,standards minimum diameters ,thereby having sufficient capacity for high average densities. For this reason reducing these densities does not result in any decrease on the costs per hectare.

One case worth mentioning is the sewerage cost per hectare. The costs per hectare are practically the same except that in cases of networks for low densities it is necessary to include special works to avoid sedimentation and overcome obstructions. Therefore these sewerage networks can be more expensive per hectare than those serving higher densities.

The relatively constant costs per hectare make the costs per dwelling strongly variable with the density-almost inversely proportional to the costs as we can see in Table I and figure 1 and 2.

The costs of the road system which includes the pavement and drainage network carries between 55 and 60% of the total network costs.Therefore and in order to save costs,it became more important to study alternative pavements and road patterns such as those that permit that part of the road only will be paved for light and occasional traffic. One method of achieving this is with cul-de sac patterns.
It is worthwhile mentioning that because of the average low densities of many Latin American cities,the cost of the road network in the total infrastructure costs is higher.In some cases it is necessary to invest 2/3 for these networks and 1/3 for the others.
Table II,Table III and Table IV.
The Map 2 shows the relation of the different urban layouts in the city of Managua.

I.2.3. The different observations for planning the technical infrastructure.

I.2.3.1.Observations concerning Topography and Soil Analysis.

Managua is built on the lower part of a basin which is enclosed by the Managua mountains.Topographical and soil issues are important in the study of the provision of water and waste disposal systems. Deforestation of the middle and lower parts of the basin as a result of agricultural development has produced severe problems of soil erosion and the silting-up of natural and artificial drainages ditches. The diagnoses includes two classifications of settlements one based on geomorphological and socio-economic criteria and a second that take into account the variations in slope and the level of the water table in specific situations.The form and the lay-out will have a direct impact on the determination of the feasibility of adequate technologies for domestic and settlement sewerage and for the necessary adjustment to the natural drainage network.

I.2.3.2. Observations about the level of the water table.

The existence of a watertable at relatively high levels makes the utilization of some non-conventional solutions difficult in many parts of the city, especially in those areas lying on flat land. Moreover,other solutions,based on local infiltrations of waste water,including some conventional pipelines-effluent and septic-tanks solutions,are similar inappropriate. In other cases, on the periphery ,where the water table is low,it is crucial to bear in mind soil components when considering solutions based on local infiltration and systems based on the principle of progressive

CHART 14.

Figure 1.

Costs of the urban services per dwelling (in US$, *january* 1977) in relation with the population density

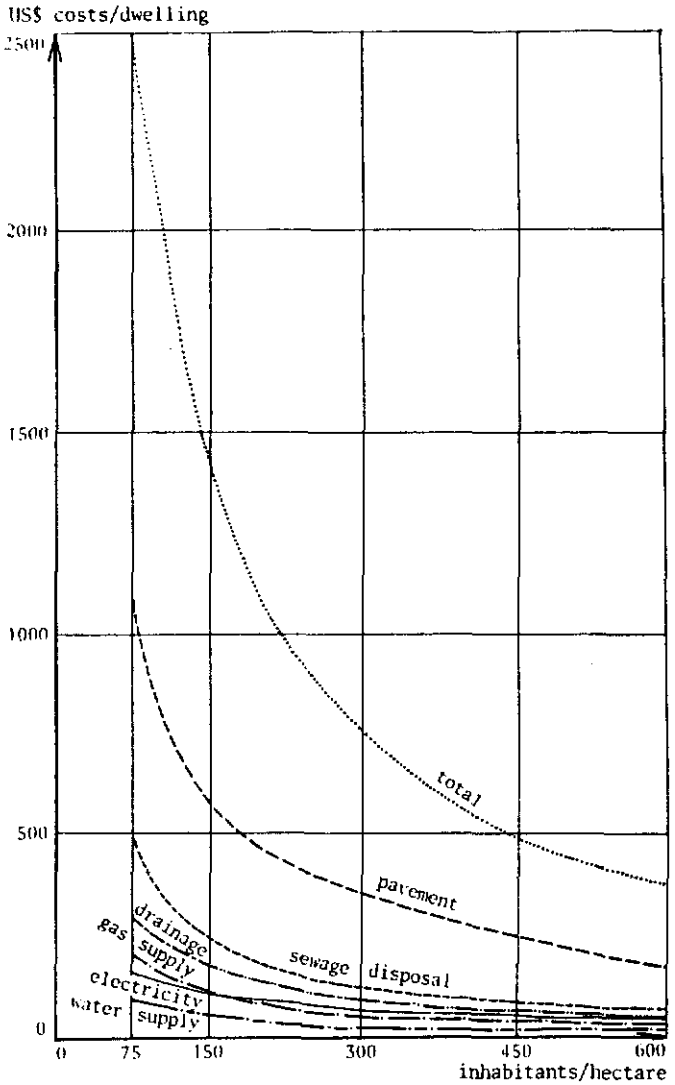


CHART 15.

Table I.

Medium costs of urban networks according to density (in dollars, 1977)

Network	Costs per unit density[1] 15/75	density 30/150	density 60/300	density 120/600	Costs per hectare density 15/75	density 30/150	density 60/300	density 120/600
Pavement	1.099,60	571,30	305,20	159,30	16.494	17.131	18.327	19.124
Drainage	388,40	207,20	106,20	54,40	5.976	6.215	6.375	6.534
Water supply	87,10	47,80	29,20	19,80	1.307	1.436	1.753	2.367
Sewage disposal	488,70	247,00	126,10	63,80	7.331	7.410	7.570	7.649
Gas supply	217,80	121,40	66,60	39,20	3.267	3.641	3.995	4.701
Electricity	168,90	125,70	97,10	63,80	2.534	3.769	5.823	7.665
Total	2.460,50	1.320,30	730,40	400,30	36.908	39.603	43.842	48.040

1) Densities: units per hectare/inhabitants per hectare

Note: the costs include only the urban networks but exclude the unitary works.

CHART 16.

Figure 2.

Costs of the urban services per hectare (in US$, january 1977) in relation with the population density

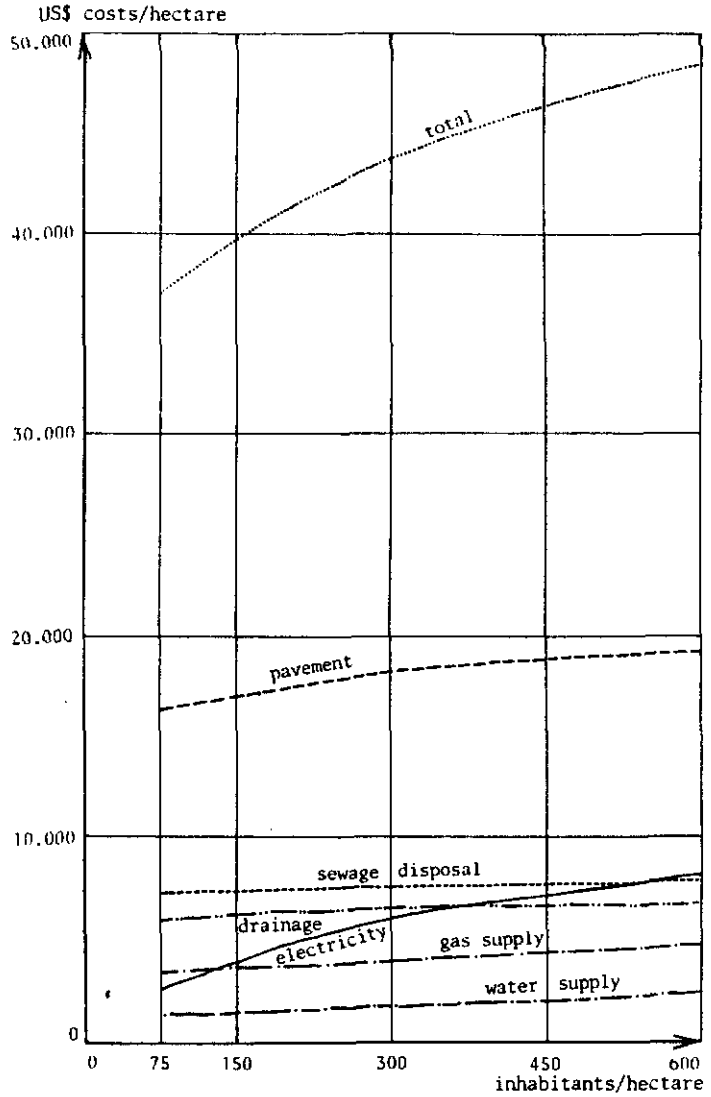


CHART 17.

Table II.

Costs per user at urban level for medium size cities (in dollars, 1977)

Network	Costs for the networks min.[1]	Costs for the networks max.[2]	Costs for the connections to the houses min.	Costs for the connections to the houses max.	Medium costs for the complementary equipment min.	Medium costs for the complementary equipment max.	Total min.	Total max.
Pavement	305	1.100	-	-	-	-	305	1.100
Drainage	106	388	-	-	-	-	106	388
Water supply	29	87	29	176	191		249	454
Sewage disposal	126	489	6	46	380		512	915
Gas supply	67	218	27	156	450		544	824
Electricity	97	169	37	170	400		534	739
Public lighting	7	29	-	-	20	80	27	109
Total	737	2.480	99	548	1.441	1.501	2.277	4.529

1) Density: 60 units per hectare

2) Density: 15 units per hectare

Tables III & IIIa in page 42

development for either individual or collective use.

I.2.3.3.Observations on Forms of Occupation and Land Use.

Densities and land use patterns are important variables to be considered in determining the feasibility of alternative technologies.In particular they influence the determination of optimal distance between service units,both in the case of sub-superficial infiltration solutions which are based upon the utilization of large surface areas for their effective functionning.It is necessary to differentiate the apparent and real occupation of land given the low housing densities in most of the settlements types. This real occupation of land can be determined by subtracting the as yet unoccupied land from the total area.Failure to do this will conceal the real potentiality for increasing densities and for infillings in specific settlement types. Other land use issues that are relevant for the consideration of questions such as the maintenance of septic tanks,include the pattern of traffic networks, accessibility and pedestrian circulation.Of important is the crossing of variables including types of dwelling and expected life span,in many cases existing housing units are built of throw-away-material of low commercial cost which is far from being a restraint to removing it in favour it of a more productive sanitation system.

I.2.3.4. Prevailing characteristics of the dwellings.

A detailed and systematic study of the condition of the housing stock. including an analysis of the building materials that are in predominant use and of the level of development of building technology is important for the determination of a technologically appropriate hydraulic sanitation solution at household level. Other variables that have to be taken into account include the availability and organization of space and the possibilities for improvements and repair of buildings components (eq.reinforcement of walls,of floors etc.)MINVAH has carried out a study of the existing condition of the housing stock and has a classification combining housing types and level of infrastructure.An issue to which we will return further on.

I.2.3.5. Availability of drinking water.

The aforementioned studies also permit the identification of other important variables that are significant in considering the availability of drinking water.These include: the nature of the source of delivery (eq.regional,local,springs and wells etc),the existing quality of the water delivered; the way in which water is provided to the consumer (public tanks or taps,domestic installations etc) and the percapita patterns of water consumption associated with these different types of water supply systems.

I.2.3.6.Relation rainwater and sewerage disposal system.

Variables that have been considered here are the morphology of the land and the physical obstacles that affect the rainwater and sewege disposal.The relationship between the disposal of sewage and rainwater is an important consideration particularly in those settlements built on difficult sloping topography.In settlements

built on flat land with high water table levels it is necessary to analyze the specific topographical conditions in order to identify obstacles that may interrupt the effectiviness of septic-tanks.Given the scarcity of financial resources it is important to seriously consider alternatives to the existing separation of rainwater and sewage,which is extremely costly, given moreover the progressive provision of the different services.It has been noticed that as services are provided by different institutions (water and sewage INAA, drainage and pavement ALMA and sometimes MINVAH) there is a lack of coordination between them resulting in double works (i.e. topographical works,socio-economical surveys etc.) One possibility of combining sewerage and drainage is the use of tipping buckets as surge generators that cleanse the drainage network yet use minimun quantities of water.Other alternatives should also be seriously investigated.

I.2.3.7.Socio-economic conditions of the users.

The study of the socio-economic conditions of the users has to be integrated into wider perspective that includes medium term expectations of achievements of the current economy strategy,the dynamism of popular demands as well as the termination of the war of aggressions. The urban nature of these settlements precludes any consideration of individual or closed systems that may be feasible in the rural context as definitive solutions in the long term. This suggests keeping account of progressive improvements in researches and the requirement of continued integrated development.The presence of a conventional main system of hydraulic sanitation that covers a great part of the city area, but which leaves large areas without secondary systems despite the potentiality of connections, increases popular expectations for similar types of solutions. The great variation in the physical and economic conditions within the city suggests the need for exploring a wider range of technical alternatives all of which should not exclude the ability to progressively improve the facilities to levels acceptable to the urban population.In this context the experience of the Pilot Plans is important as it amongst other things will establish the capacity of local leaders to organize community into commercial type organizations geared towards providing this service through the combination of labour power and commodity purchases and exchange which take account of considerations of increases in productivity.Unlike conditions involved in the provision of electricity and running water,the very nature of sewerage provision makes its resolution through the collective self-help initiative of the population more difficult.

I.2.3.8.Conditions of the sanitary installations.

It is necessary to construct a detailed inventory of the various forms of hydraulic sanitation that already exist within the settlements.The complete water cycle and each stage in the cycle (delivery,use and elimination) must be studied. In particular it is important to consider the effects of changes in the water cycle on the role of women in Nicaraguan society and vice versa,and the potentialities that emerge for securing the increased participation of women in the paid labour force.Given the great variations between and within settlements in the

provision of this service,it is of little value to draw up a generale profile but rather it is better to give alternative solutions that are geared towards specific settlement conditions.

I.2.3.9.The multiple use of water by consumers.

Patterns of multiple use of water by consumers will be studied in detail.Existing shortages in the supply of water have already established a habit for the multiple use of water. In many cases the water used for washing-up,laundry and personal hygiene is obtained from different sources (and is used successively for these purposes)from that obtained for direct consumption. This recycling tendency introduces the need to study the hierarchy of use and the correct location of the different sanitary components (sink,shower,wc tank ,etc.).

I.2.3.10.Locational and qualitative aspects of sanitary spaces.

Existing studies suggest the possibility of formulating a range of alternative locations for the different sanitary installations.Different possibilities can be formulated in relation to given socio-cultural preferences and changes currently occuring in Nicaraguan society.The qualitative aspects of which are especially concerned with social and individual concepts of privacy.

I.2.3.11.The use of building materials and marketed components.

From the Diagnoses it was concluded that there exists a wide range of materials and low cost market components.This range includes the appreciable presence of conventional materials e.g. watertaps,pipelines and sanitary equipment as well as the use of improvised throwaway materials.
The study of materials has to be carried out within the sectorial policies established by the Nicaraguan Government. The already named 1982 FINAPRI study,Alternatives for the Expansion of the Building Materials Industry in Nicaragua,outlines the possibility of improving the mechanical and environmental quality of housing, emphasizes those alternatives that will alleviate balance of payments difficulties and which secure the expansion of employment and diminution of cost. However, the persistence of the war and the worsening of the already precarious living conditions in the human settlements make it necessary to look first for minimum survival actions which influences the choosing of alternative technologies at very short term and that are totally to be found in the present availability of local materials.
The study of FINAPRI gives a quantitative and qualitative inventory of the totality of productive apparatus in the building material sector;it proposes an alternative plan for the coming years and criteria for the replacement of inadequate building materials.
The study examines the question of building materials in relation to the following aspects;employment,shadow prices,productivity, the different energy cost of building materials and the mechanical and sanitary quality of materials.
Given the serious unemployment problem it would seem correct in the short term and perhaps also in the medium term for the building industry to adopt labour intensive technologies.However

if it is considered that the central elements of the Nicaraguan development strategy should be the expansion of agriculture and agro-industrial activities,then the present labour-surplus would be largely required to meet the needs of this sector.It should also be remembered that a large proportion of the unemployed and underemployed have recently migrated from the rural areas and have not yet acquired the necessary building skills.MINVAH has pointed out the shortages in medium skilled labour yet the relative abundance of unskilled labour.
The pre-revolutionary period in Nicaragua was characterized by the substitution of traditional materials for industrialized materials e.g.cement blocks instead of bricks for walls and floors and asbest cement instead of clay tiles for the roofs This process occured as a result of market forces in combination with the interlocking interest of public administration and the private sector and the cultural penetration of foreign consumption patterns encouraged by the power of mass advertising. The question of which building material to use is further complicated when basic local materials are already being produced using a rural and underpaid labour force for their extraction, assembly and primary transformation.A final but vital aspect to be considered is the magnitude of the needs which will have to be satisfied by the building sector in order to overcome existing shortages and satisfy future aspirations.
As was said already, in Nicaragua the shortage of houses will increase by 40.000 per year (20.000 natural growth and 15.000 from obsolescence).At the same time there is a shortage of 50.000 dwellings,146.000 are in a bad estate and 181.000 are dwellings of only one room. These data reveal a total national population of 3.227.000 inhabitants,559,000 families and 510.000 houses. (Characterization page 84,chart 6).
This magnitude indicates the need to utilize manufactured building materials in the first phase (perhaps for the next 15 years) and the use of assembly-based building systems in the next phase.This seems to be the only known way of significantly reducing costs through productivity gains and efficient use of resources. This analysis presents a series of technological building systems that ranges from conventional rationalized masonry,wooden pre-fab systems and concrete pre-fab systems and discount the feasibility of expanding the artisanl building materials sector to meet these anticipated demands.
In summary the goals of the building materials strategy adopted in Nicaragua are as follows:

1. to attempt to eliminate imported building materials
2. to diminuish the use of the locally produced building materials which are heavily based on imported inputs.
3. to expand employment through housing and building investments within an acceptable range of productivity
4. to lower the real cost of building performance
5. to improve the mechanical and sanitation qualities of the constructions.

I.2.4. Comparative analysis of homogenous areas.
A comparison of use land and eficiency of technical infrastructure is carried out in the settlements choosen as typological representative.
The following chart summarize the results.
CHART 18.

COMPARISON OF THE EFFICIENCY OF LAND-USE AND OF TECHNICAL INFRASTRUCTURE IN THE BARRIOS OF HOMOGENEOUS TYPOLOGY IN THE PISBA

ASPECT		VILLA VENEZUELA	ADOLFO REYES	CAMILO ORTEGA	GRENADA	ALTAMIRA	CARLOS REYNA	MONSEÑOR LEZCANO
Useful Area	ha	73.2	10.8	28	14.2	55	5.32	1.2
Habit. unit	Unidad	2.532	418	867	415	2.220	151	3.115
No. persons	persona	19.701	3.816	6.934	1.990	11.283	1.027	30.509
No. dwellings/ha	Unidad	35	38	31	29	41	28.3	27.8
Average lot size	m^2	176	163	212.9	187	195	246	230
% residential area	%	61.47	67:06	66	54.2	80	70	64%
% communal area	%	11.53	6.94	8	17.5	4.5	1	21%
% circulation area	%	26.97	26	26	28.3	15.5	29	15%
Gross density	hab./ha	269.13	353,35	201. 56	140	205	193	272.4
Total circul net	ml.	29.460	3.548	7.485	4.215	10.680	1.580	30.840
Circulation net	m^2	97.684	28.080	89.440	40.186	85.250	15.800	169.620
pedestrian network	ml./ha	230.56	217.59	139.19	99.67	-	-	660
pedestrian network	m^2 / ha	1;983.4	1.479	1.600	797.36	-	-	3.63o
Vehicular network	ml./ ha	71.35	110.92	81.39	177.6	194.18	296.99	30.23
Vehicular network	m^2/ha	713.5	1109.2	1.000	2.132	1.550	2969.9	166.265
Pedestrian area	%	19.84	25	16	21.32	0	0	2%
Vehicular area	%	7.13	11	10	7.97	15.5	29	13%
Tot.drinking w. area	ml.	19.025	3.776	7;485	-	11.485	1.393	30.840
net/ha	ml./ha	259.90	349.62	267.32	-	208.81	261,84	275.3
net/habit unit	ml.	7.5	9.03	8.63	-	5.17	9.22	9.9
Tot.sewerage network	ml.	16.650	3.584	-	-	10.930	250	29.950
net/ha	ml./ha	227.45	228.5	-	-	198.72	46.99	267.4
net/habit. unit	ml./vivi,	6.57	8.48	-	-	4.92	1.66	9.6

From this chart is conluded that:
1. None of the studied barrios represent optimal efficiency in land use in relation to MINVAH's norms.
2. Contrary to what could be deduced from the city density,not all the popular barrios contain large lots.
3. All adjustments to land use of the city must be based on an in-depth study of the unused empty areas between settlements and in the re-study of the spaces actually defined as green areas and communal spaces that seems to be badly hierarchized. Specially is the definition of land use in seismical (red) risk zones.
4. It was also concluded that MINVAH's minimum standards norms are adequate to the sort of dwelling and the growth tendencies found in the different cases.
5. That fundamental differences exist in urban layout between settlements previously planned institutionaly and those less formal planning (illegal).These differences score negatively in the cost of the secondary networks.
6. Mainly recently planned settlements,such as the progressive urbanizations (eq.Grenada)must drastically adjust their layout. As goal to make the supply of technical

infrastructure and land use more economic.

7. Many barrios lack secondary networks and it is necessary to study the feasibility of supply with alternative system.
8. In many popular settlements the existing generous plot sizes allow for an increase in the density and for consolidation without requiring major financial investments.This can be achieved by subdivisions of lots,infilling of empty lots and rehabilitation of dilapidated areas.
   Experience has shown that together with improvement in household incomes.a process of housing enlargment begins,that in many cases ends in the building of a second house for rent or for close relatives (eg.Villa Venezuela)
   However in other settlements,specially those whose origin is the illegal occupation of land,land adjustments would be needed *before starting a settlement consolidation.*
9. A grave problem that could affect the up-grading in the popular barrio is the excessively spacious street and the lack of a hierarchy of networks in the planned barrios.
10. The popular barrios contains net densities of 193 to 353 inh/ha.with lots size of 163 to 246 m2 and a % of residential area that varies from 54.2% to 70%, resulting between 20 and 25 dw/ha.

from page 36

Table III.

Share of the network costs in the total costs of each supply system (as percentage)

Network	Share of each network in the total network costs		Share of the network costs in the costs of the complete supply system	
	low density areas	high density areas	low density areas	high density areas
Pavement	41,38%	44,35%	100%	100%
Drainage	14,38%	15,65%	100%	100%
Water supply	3,93%	3,50%	12%	19%
Sewage disposal	17,10%	19,73%	25%	53%
Gas supply	9,09%	8,79%	12%	26%
Electricity	13,16%	6,81%	18%	23%
Public Lighting	0,96%	1,17%	26%	27%

Table IIIa.

Average share of the different elements in the total costs of urban systems *(as percentage)*

Network	Networks	Connections to the houses	Complementary equipment	T o t a l
Pavement	100,0%	-,-	-,-	100,0%
Drainage	100,0%	-,-	-,-	100,0%
Water supply	15,5%	25,5%	59,0%	100,0%
Sewage disposal	39,0%	3,0%	58,0%	100,0%
Gas supply	19,0%	12,0%	69,0%	100,0%
Electricity	20,5%	15,0%	64,5%	100,0%
Public lighting	26,5%	-,-	73,5%	100,0%

I N T E G R A L P L A N F O R S L U M U P G R A D I N G

II.1. Technical Alternatives

II.2. Alternatives for urban consolidation

II.1. Technical alternatives.

In order to carry out the analysis of the different technical aspects included in this study,the typical **sanitation problems** occurring in the city were identified. This identification was carried out both by the ALMA and the Ministry of Housing.
The sanitation problems were projected to the already selected settlement types.In this way, 5 barrios were finally chosen which are representative of both the sanitation problems and the different types of popular settlements existing in the whole city.
This identification results also in the selection of the 5 barrios where Pilot Plans are to be carried out.

The development of technical alternatives includes the following aspects:

1. Water supply
2. Sewage and waste water disposal
3. Rainwater drainage
4. Garbage collection and disposal
5. Road system.

The chosen barrios are the following:
Spontaneous urbanization: B-15 instead of Carlos Reyna.
Sites & Services (progressive urbanization):Jonathan Gonzales instead of Grenada.
Planned popular Barrio: Ciudad Sandino instead of Villa Venezuela.
Popular Barrios of private initiative: The initially chosen two barrios remain:Camilo Ortega and Adolfo Reyes.

In the last chapter, concerning the Pilot Plans, the projection of this typologies are seen in relation to the number of needed interventions in the city as a whole.

II.1.1. Criteria for the search for technical alternatives are the following:
II.1.1.a. General criteria:
- To look for adequate technologies which can solve the problems of the secondary network system in the popular zones.
- To control the use of water in the system of disposal of waste water.
- To search for methods of increasing densities in the cases of popular urbanization in process of development and to make ordening in the layout of barrios with consolidated dwelling units more efficient.
II.1.1.b. Specific criteria.
-Road system. Hierarchization of roads.Leaving at least one vehicular street in each barrio.In the case of very spacious streets patterns.to use those spaces for adjustments in communal spaces. (recreational,treeplanting).The pedestrian street can accomodate simple solution such as combining drainages devices with harder soil foot-paths.Systems for the mantaintion of unpaved streets shall also requires study.

- Water.Waste Water and Drainage.
Integrated system of water will be studied.Preferably using

system with a very low level of water consumption. Climatic

conditions which seem to favour infiltration and evapotranspiration system are also considered. Preference will be given to studies of local system in situation without a primary system in order to avoid continuing the pollution of the Lake Managua.Bearing in mind that in the long term when the problems of the primary sanitation system have been solved these zones can ultimately be connected.
New methods of channeling must be sought in order to be adapted to each local reality without continuing to use standards norms ,that answer to foreign conditions.other densities and other urban layouts and which not considered organised communitary labour in the excecution of building works.
Laying channels through the pedestrian streets and/or backyards of plots is sometimes more siutable because it does not require design for the bearing capacity required for vehicular circulation and therefore can use less critical material (smaller diameter) and be shallower.

-Garbage Collection.
Given the scarcity of overseas funds ,the magnitude of extensions to the city and the low density it is necessary to search for systems with the lowest energy costs. It is necessary to look for solutions that avoid total reliance on petroleum.
In the short term it is necessary to find integrated solutions for local disposal of garbage in the form of bio-digestors or similar.

II.1.2.TIPICAL SOLUTIONS

Through careful examination of the five settlements which represent the worst environmental conditions, it is possible to draw a common profile of the typical urban infrastructure problems in the barrios of Managua:
-In general , the lack of public water supplies threatens the population with contamination risks. Such risks are worsened because of the rudimentary nature of private water installations (which usually consist of a number of flexible hoses connected to one source), and because of the absence of the hygienic sewage disposal (in most of the examined cases),conbined with local floods. Further, rainwater accumulates in the lower parts of the settlements, raises the water table and then where there is an interruption to the water supply, water contaminated by contact with pit-latrines is drawn back into the system through the flow-off points of the connections (figure 1).
-The problems related to rainwater drainage,are generally worsened by the dumping of garbage, which in many cases, causes total or partial obstruction of the drainage ditches. All the five settlements present local rainwater drainage problems, sometimes accompanied by erosion of the collector due to their insufficient capacity.
-Concerning sewage disposal, it was verified that in the settlements without public sewerage (four of the five analized),rudimentary pit-latrines are being used. Generally these have a short life and are unhygienic. Many inhabitants refered to the necessity of constructing new pit-latrines because the existing ones are full. Also, their location and type of construction increase the risks of pollution of any nearby public network or the private installations.

-(Non-sanitary) waste water is generally collected at the out-flow of the multi-purpose washing units (frecuently near the public road).and later either disposed of or used for cleaning floors. In those cases where overflows occur. or when thes waters are thrown directly onto the streets. accumulation of fatty and organic matter takes place.
-The generalized habit of raising pigs wiyhout the minimum hygienic care and allowing them to run loose through the lots, makes the sanitary conditions even worse.
The following proposed solutions aim to solve these problems.This can be achieved through integrated technological alternatives for improving: water supply. sewage and waste water disposal, rainwater drainage. road systems and garbage disposal.

II.1.2.1. Improvement of water supply conditions:

II.1.2.1.1. Rudimentary storage

-Application field: All domestic installations.
-Specific aims: Control of cross contamination caused by syphoning at hose ends. Improvement of storage conditions.
-Proposed actions:
.To encourage the population to stop the habit of submerging the ends of hoses in water tins, pools or any other place where water (clean or used) is being stored. The preferred method is to fix hooks above the overflow levels of tanks, etc. where the hoses end.
.To lower the overflow levels of rudimentary receptacles by making holes approx. 15 cm. below the rim.
.To cover the tanks. or metal receptacles preferably with wooden panels.
.To draw the water through the flexible hose by a siphon system thus avoiding the need to immerse receptacles in the storage tanks.
.To alert the population to the necessity of periodical cleaning (see illustration S-01).

II.1.2.1.2.Storage of water with a direct exit

-Application field: All domestic hydraulic installations. mainly those having a multiple washing unit (dishes and laundary), as is found in most of the observed dwellings.

-Specific aims: Control of cross contamination. Improvement of storage conditions and certainty of a stored supply for water consumption in times of public supply cuts.

-Proposed actions:
.The development and installation of reinforced concrete tanks which are provided of a device to carry water to the storage tanks of the multi-washing units.
.To level the tanks by adjusting their supports.
.To eliminate rudimentary metal storage receptacles.
.To recomend that water used for consumption be taken directly from the tank without intermediate storage.

- Complementary development: the installation of floating ball taps (automatic closing system) to control water entering the tanks (se schematic drawing S-02).

II.1.2.1.3. Progress towards complete domestic plumbing installations

-Sanitary equipment: w.c. with holding tank for discharges-kitchen sink -handbasin -laundary sink.
-Application field:Dwellings which are connected to the public network or with water-based on site sewage systems (septic pit with final disposal).

-Concrete actions:
. The strict observation of the sanitary sewage conditions.
. The prevertion of blackflow through the equipment by careful observance hydric connections in the discharge tanks and of levels of overflows.

II.1.2.2. Improvement of sewage disposal conditions.

II.1.2.2.1. (Non- sanitary)waste water disposal.

For the disposal of waste water, the system in drawing S-03 is recommended,it is based on separating out any fatty matter in a simplified box and then storage,with an overflow device leading to the rainwater system. The fatty matter box must be constructed with cement-sand-concrete using the same method of manufacture as for the other components (ie.tanks.etc).Their exteriors dimensions are similar to those of the sewage instection cases normally used by the INAA, except that they are deeper. The boxes must be covered to avoid smells from the organic matters. It would be necessary to instruct the population on how to mantain them: this requires the periodical removal of fatty matters floating on the top and of sediment at the bottom since this can cause obstruction in the passage between the chambers

II.1.2.2.2.Disposal of sewage in ventilated double latrines.
Ventilated double latrines are proposed as satisfactory solutions for the disposal of human faeses. The chambers must be used alternately for periods for approximately ten month to a year. The full chamber is covered hermetically and the sanitary seat is relocated over the empty chamber .After a year the closed chamber is emptied and used again,while the other is hermetically closed.Dealing with this material (mud) after a year is relatively inoffensive,because almost all the pathogenes have been neutralized in this period (with the exception of some "ASCARIS LUMBRICOIDES" eggs that may have survived).
The removed mud can then disposed be of together with residual solids in compost units,or in sanitary landfills. It is even possible to use its as low-quality manure for crops which are not to be eaten raw.
Drawing S-04 shows chambers designed to be used by ten persons during 1 year (accumulation rate of 0.06m3 per person + 30% free space),for each chamber.
The internal and external slabs an the sanitary seats are proposed to be constructed in reinforced concrete, while the partial coating of the holes and the structural base must be constructed of concrete blocks, ceramic tiles or "cartera" stone.The wooden structure is designed with posts and planks of dimentions normally find in Nicaraguan market,using a construction technology similar to the one used in the "mini-skirt"(mini-falda) production which is in common used throughout

the country (see photos 37 and 38).
In the following table the minimum distances to be mantained between pit latrines and other installation elements are shown.
Table 1. Minimum distances between ventilated pit latrines and other elements.

Description	water connection	lot boundery	water table	other pit-latrine
Dry zones	8	1.80	15	3.60
Flooding Zones	15	1.80	30	3.60

II.1.2.2.3.Double ventilated pit-latrine for combined compost with solid residual.
A preliminary composting alternative for human faeces combined with solid residual is proposed in S-05.
The chambers are designed to receive the solid residual and body wastes of maximum 5 persons based on feaces accumulation of 0.06 m3/year and solid residual accumulation of 0.216 m3/year/person The figure for solid residual /person was obtained by taking the daily weight (o.6kg),dividing it by two because of the possible presence of inorganic matters packeging material and other component to be separated and calculating a density of 0.5 t/m3 for organic garbage .These indications are obviously tentative because they lack field work confirmation.
This alternative can be recommended -with reservations- only in the case of Ciudad Sandino.since the compost could be used as manure in the neighbouring agricultural areas.Even so the excavation works and the materials necessary for the construction of chambers. plus the maintanance difficulties make this solution appear not to be economically competitive with the eventual communal compost units.

II.1.2.2.4.Evolution towards (water based on-site) humid sewerage system.
The progressive dvelopment towards the use of these systems (ie.septic pit-latrine with final disposal),could take place in locations were the basic conditions from the sanitary and the operational point of view are found and can be met.
From the sanitary point of view, the verification of water table regime and rate of percolation is required .It is important that the eventual infiltration of efluents does not endanger the underground water sources (the main risk of this being in Ciudad Sandino and B.15).
From the operational point view it is necessary that the minimum maintenance resources are available,such as pit-cleaning trucks and systematically monitoring of collective infiltration/evapo-transpiration units is carried out.
Of the four Barrios not having conventional collector networks, which were studied (Ciudad Sandino,Camilo Ortega, Jonathan Gonzalez and B.15),not one present inmmediat conditions for the installation of a septic pit-latrine system. The domestic water installations here are so rudimentary that such a system would be largely sub-utilised and therefore would not justify the costs of installation.Even though the septic pit-latrine systems with evapo-transpiration of final effluents appears to be highly suitable for the environmental and climatic condition of Managua (see figures S-06),such a solution does not look suitable for realization in the short term.It would only be possible a decision is taken to subtantially altere the existing equipment

and domestic water installation patterns.

II.1.2.3. General Sanitary Improvement Measures.

Local action concerning the collection and disposal of water services will only be effective when accompanied of general sanitary improvement measures .

II.1.2.3.1. Confinement of the pigs.
One of the most evident hygiene problems are the pigs which wander the streets and lots. Their droppings are generally seen on the streets and it mixes with the muds in the flood zones and with the garbages which is scattered by the same animals.
The public health problems caused by this situation are notorious.It is thus recommended that the responsibles bodies (MINSA and MINVAH) educates the population and provide the means to confine the pigs.

II.1.2.3.2. Solid garbage disposal.
The sanitation of barrios depends on provition for garbage disposal. Garbage disposal in the ditches (mainly in Barrio Camilo Ortega) and garbage channels ,makes it difficult for the rainwaters to drain and causes proliferation of insects (vectors).Systematically urban garbage collection and disposal would preferably be tackled by the Municipality for the city as a whole. This is because it is a generalised problem not suitable for solutions at settlement level. However a solution likely to be reccomended is the use of local compost units or of small sanitary land fills. Nevertheless.such solution requires a local collection organization , which would usually be based on manual transportation of by animal traction. This is because one of the bottle necks in the conventional garbage collection system is the lack of appropriate vehicules and their is no prospect of new acquisitions in the short of medium term. The formulation of more detailed technological alternatives for the above mentioned systems depends on an in depth study of urban garbage in Managua and of the availability of the Municipality's resources. The individual compost alternative like the ones suggested in combination with the double ventilated pit-latrines have limited applicability and serious opperational problems.Ones the compost has been removed. it must be transported and again there is the basic problem of its collection.These alternatives are thus not proposed as possible solutions on a macro-scale.

II 2.ALTERNATIVES OF URBAN CONSOLIDATION.

II.2. Crossing of variables.

The last phase of the Plan is to present a synthesis of above mentioned variables.Assumptions have been made concerning the following aspects :

1.Concerning the classification of the dwelling types and technical infrastructure.
2.Concerning minimun residential densities (dw/ha) that would be acceptable for each sort of dwelling and residential area.
3.About housing land-use of the different zones of the city.

1. An inventory of all settlements of the city has been inventory according to the following criteria :

Type of dwelling and infrastructure	symbol	dwelling state
Cuarteria	C	
Spontaneous Settlement	A	BAD
Dilapidated deteriorating	VA	
Ruins	VC	
Dilapidated improving	VB	
Progressive Urbanization (S&S)	U	REGULAR
Popular wood individual	VD	
Popular wood in serie	VF	
Popular cement bloc individual	VE	
Popular bloc in serie	VG	
Traditional	VJ	GOOD
Residential in serie	VK	
Residential Individual	VL	
Residential Luxurious	VM	

2. All settlements are classified in the following categories:

a. Barrios to be **CONSOLIDATE**
b. Barrios to be further **DEVELOPE**
c. Barrios to be **RE-STUDIED** and / or to be demolished.

The **barrios to be consolidated** are those that do not need greater land-use amendments.
The **barrios to be developed** are those that need first land-use amendments, increase the density,overcome the shortage of public service area and some corrections on the urban layout.
The **barrios to be re-studied** are those that present serious restrictions in respect to land-use,therefore cannot be developed under rational costs requirements.

This classification approach only to physical conditions, therefore does not regard any prioritization of interventions and building works.The evaluation for the formulation of Action Plans lately would include these physical parameters together with the one related to the urban system,the socio-economic conditions and the technical feasibility.

The first group includes both residential areas of high and middle incomes as popular areas that present relatively good urban layout.This can include settlements with an illegal origin and years of progressive development that present good infrastructure pattern as well as newly built progressive urbanizations (planned S&S).However a high or middle income settlement can not necessarily be regarded as a barrio to be consolidated. There exist a large number of high income residential areas with a very low level of land occupation ,presenting a complete infrastructure network which needs to be further developed.
Also exist high income areas with a very low ratio of dwellings per hectare an incomplete infrastructure network.
Most of the residential areas built by building entrepreneurs for middle income sectors meet the criteria of barrios to be consolidated.
Concerning the infrastructure network, most barrios are supplied with primary networks of water and sewerage.Old planned barrios also present the complte secondary system. In the case of the peripheral high income settlements the urbanizations has taken place generally with on site disposal of waste water.

It is necessary to note that for the purpose of this classification the existence and quality of the infrastructure service is not a condition for the classification,nor is the sort of popular organization of the given settlement.or the level of overcrowding existing in the housing-unit.

Most of the popular settlements which have had certain degree of control of the land use are classified here as barrios to be developed. Generally these are barrios that need some corrections on plot bounderies adjustments,limits,re-design of streets patterns-that are in the majority very spacious-and present, a very small amount of communal and recreational space and very few dwelling per hectare.On the other hand a large amount of high income settlement, generally located in peripheral locations, are barrios where the densities must be increased,some roads patterns re-studied and some location for further residential development reserved.Most of these type of settlements are well served with primary networks and are potentially able to be connected to sewerage and water supply.

All the barrios classified to be re-studied present their dwelling units in a state of deterioration and/or are dwellings in a regular state located on non residential areas.Most of these are very old illegal developments, that present a high degree of overcrowding. and a high rate of dwelling per hectare-regarding its dilapidated dwelling typology.They have shortages of recreational and public service areas.Most of these residential areas, because of being located in central areas, are well served by primary and secondary networks.

II.2.Partial conclusions.

Concerning the above mentioned variables the settlements considered as typological representatives of all residential areas of the city has been classified as following.

Altamira. Social residential type with more than 25 dwellings per hectare is classified as a Barrio to be **consolidated**. However **Altamira del Este** is considered as a barrio to be developed because presently its contains scarcely netto 19 dw/ha, in spite of having luxurious dwelling units.
Villa Venezuela, a planned popular barrio, is a barrio to be consolidated.It presents houses in a continuously improving process and a good urban layout.
Jose Benito Escobar is also a popular planned barrio,which is already consolidated and has 35.08 dw/ha.
Nevertheless the **B.15** located alongside the former is an illegal occupation on a floody and seismical location and therefore a barrio in **re-study**.
One third of **Adolfo Reyes** and a half of **Ciudad Sandino** can be inmediately **consolidated**.The first, a popular settlement originated by an illegal development, with water and sewerage the second a planned site and services of about 15 years old.
but a limited water supply.The rest are still zones which require further improvments of land-use.Half of the area of Ciudad Sandino contains 18 dw/ha, large street patterns,lack of community services, lack of technical infrastructure, in spite of having dwelling units in a very advanced level of consolidation.
Camilo Ortega is also an area in **development**, is a well structured popular settlement originating from an illegal site and service development of about 20 years old.It contains 23.72 dw/ha, with small and deep lots,no sewerage and without potential for connection to the main network.
Monsenor Lescano a residential area of the traditional type,is considered here as an area to be **developed**.This is because of being part of the old urban center (Spanish-grid)built in an initial stage of the partition of the original bloc.It contains old houses in regular and bad states and areas needing corrections to their land use patterns and urban layout. On the other hand is a sector with good supply of technical infrastructure but inefficiently used.
Grenada is a progressive urbanization with a very initial level of development of their housing units and a incipient process of development is ongoing.Has water supply of the communitarian type. The rest of the technical infrastructure is inexistant but presents good potential to be connected to the primary network.
Nevertheless it has 23,72 dw/ha in a very bad urban layout. Grenada is classified as a barrio to be **developed**. Next to the progressive urbanization sector is an illegal occupation,also named also Grenada, this part is to be re-studied and present 50 dw/ha.
Jonathan Gonzalez, an old illegal occupation, re-designed recently by Minvah and transformed to a progressive urbanization is considered to be a settlement to be **developed**.This is because the initial stage of development of the housing units,and the existence of sectors yet to be re-designed.It is also a barrio with various restrictions concerning ground level with respect to the main surrounding roads.Present communal taps can be connected to the main sewerage system at reasonable cost.
Carlos Reyna an old illegal occupation at the border of the lake. It presents all the features of a barrio to be **re-studied**.
In spite of not having a high number of dw/ha ,it presents high household overcrowding,an unplanned urban layout, housing units in a process of deterioration and a great turnover of occupants. Potentially is an area easily connected to the nearby sewerage

network,but presents restrictions due to superficial water table and flood potential.

II.3. Land use alternatives in residential areas.

Having in mind MINVAH's minimum norms for social housing (chart 3) and for Progressive Urbanization (chart 4),two alternative has been studied in order to start evaluating the possibility of adjustment and the future capacity of actual residential areas. In general terms these two alternative are described as follows:

II.3.1. ALTERNATIVE 1.

The first alternative that has been studied is the one that has classified as **barrios to be consolidated** all those locations that present dwellings, both in good and as regular states, with 25 and more dwellings per hectare.
Barrios to be developed and the densities increased, are all those with good and regular housing units with less than 25 dwellings per hectare.
Barrios to be re-studied are all Barrios that present very bad housing conditions ,a process of deterioration and are located in non-permissible locations, i.e. along the polluted lake-coast, in seismical zones (red risks), in the central area reserved for future development .etc.

II.3.2. ALTERNATIVE 2.

The second alternative presents a more radical option concerning corrections of land-use and is closer to existing housing norms for the new social-housing development (Minvah 1983).
This second alternative considers 30 dw/ha a minimum in residential zones.

A 47.43% of Managua's barrios can be classified as barrios to be consolidated,from these 17.83% are Residential type and 29.6% are popular.
A 38,88% are barrios that can be classified as barrios in an ongoing developing process. Which are classified as 14,24% residential and 24.64% popular. Remaining 13,69% are barrios to be re-studied and which can generally be considered as settlements with people to be relocated.

The following charts present the present land-use of the urban structure of the city and the resulting capacity if aforementioned alternative are chosen.

DWELLINGS AND POPULATION DISTRIBUTION ACCORDING TO DENSITIES CHART 19.

Density	N°dwellings	population	% of total Dwellings	n° settlements
40 y más	38.371	273.010	32.63	66
30 y 40	24.381	190.752	20.73	69
20 y 30	33.118	245.457	28.17	79
0 y 20	17.726	138.221	15.10	129
cuarter.	3.961	20.251	3.37	51
TOTALES	117.557	867.691	100.00	393

DENSITIES RANGES

CHART 20.

Code	N°settl.	%dwell.	N°dwellings	population	ha	densities
1	51	3.37	3961	20251	-	cuarterías
2	18	11.61	13652	91494	180.8	+60viv/h
3	19	8.29	9746	61433	190.9	50+60viv/h
4	29	12.73	14973	120083	342.7	40-50viv/h
5	29	8.64	10164	82888	273.1	35-40viv/h
6	40	12.09	14217	107864	441.9	30-35viv/h
7	46	18.92	22241	156360	820.45	25-30viv/h
8	32	9.25	10877	89097	480.2	20-25viv/h
9	30	7.55	8846	72968	487.3	15-20viv/h
10	99	7.55	8880	65253	1608.75	0-15viv/h
	393	100.00	117557	867691	4826.1	

DISTRIBUTION OF DWELLING TYPES ACCORDING TO DENSITIES

CHART 21.

density range	Dwelling good state.masonry	Dwelling regular state.wood.	Dwelling bad state	Total Dwellings
40 y más	2107	8821	2724	13652
2-3-4.	3470	5681	595	9746
	6075	7046	1852	14973
	11652	21548	5171	38371
30-40viv/h	6923	6292	1002	10164
5-6	2376	6972	816	10164
	9299	13264	1818	24381
20-30viv/h	4184	16276	1781	22241
7-8	4045	5882	950	10877
	8229	22158	2731	33118
0-20viv/h	4483	3664	699	8846
9-10 .	4028	3141	1711	8880
	8511	6805	2410	17726
]			+ 3961	
TOTAL	37691	63775	16091	117557

AREA DISTRIBUTION IN RELATION TO THE TYPE OF DWELLING AND DW/HA.

CHART 22.

code	n°sett	Total ha.	Dwel.good state		dwel.regular state		dwel.bad state	
			N°settl	ha	N°settl.	ha	n°sett	ha
1	51	0						
2	18	180.8	2	32.2	8	114.4	8	34.2
3	19	190.9	5	64.2	10	115.6	4	11.1
4	29	342.7	5	64.2	10	115.6	4	11.1
5	29	273.1	6	62.6	17	189.5	6	21.0
6	40	441.9	12	214.6	18	196.2	10	31.1
7	46	820.45	10	153.35	24	604.2	12	62.9
8	32	480.2	9	177.3	14	260.3	9	42.6
9	30	487.3	14	253.2	9	197.1	7	37.0
10	99	1608.75	53	1140.4	22	303.0	24	165.35
TOTAL	393	4826.1	121	2236.15	138	2144.0	83	445.95

II.4.1.Applicability of **ALTERNATIVE 1.**

In this alternative it is assumed that is feasible to increase the density of those areas which are actually occupied by dwellings of "residential" type and present very low density, (average 16.5 dw/ha). We are concerned here with 1.570.9 ha. We assume here that densities can be increased in these areas in the short and long term,by means of "infillings"programmes,such as family houses or small flats buildings between 2 to 3 floors. The capacity of these areas could increase from 34.571 (increasing to 30 dw/ha) to 157.090 dwellings(increasing to 100 dw/ha). The areas occupied with the regular state type of dwelling, namely of wood and in the process of. improvement,could be siutable to increase their density using programmes of social -housing and/or sites and services (progressive urbanization). Both types of "infillings"are especially important in those areas close to future extension zones.
The areas with low density are 12.681 ha and present an average density of 16.67 dw/ha. Because they are low income areas.it is not feasible to increase the density to over 40 dw/ha.

The zones that are actually occupied with bad state dwelling in a process of deterioration are concentrated mainly in the core of the city, the central area destroyed by 1973 earthquake.i.e.in the areas best served with technical infrastructure.In this area it is proposed to increase the capacity to 100 dw/ha,which could give as maximun capacity of 28.504 new dwelling (excluding the actual 16.091 bad dwellings,a number that includes the existing cuarterias).

II.4.2. Applicability of **ALTERNATIVE 2.**

In this alternative it is assumed that is feasible to increase the density of areas actually occupied with "residential" dwelling types and low density (average 9.7 dw/ha). We are refering to 1.720 ha.It is here assumed that the density of these areas could be increased on medium and long range terms with "infilling" programmes.
Family houses as well small flat department between 2 or 3 floors high could be built here.The capacity of these areas could increase between 34.987 (increasing to 30 dw/ha) to 157.090 (increasing to 100 dw/ha).
The density of the areas actually occupied by wooden houses in a regular state and in a progressive improvement process,could be increased in the short range with social housing programmes and/or Sites and Services programmes (progressive urbanization). Both of the type of "infillings" are siutable those zones close to the future extensions of the city .The low density areas comprise a total of 1.364.6 ha and present an average of 21.2 dw/ha. Since these are areas of low income sectors it is assumed that densities could not be increased above 40 dw/ha.
For the zones with housing stock in a process of deterioration,the same land-use capacity as that of the former alternative applies.

ALTERNATIVE 1. (25 dw-ha)

CHART 23.

Settlement	Good state	n°settlem.	ha	Regular state	N° settl.	ha	bad state	N° settl.	ha
Consolidated zones + 25 dw-ha (average dw/ha)	25.135	45	665.25 37.78	51.088	93	1383.6 36.92	8770	43	201.0 43.63
Zones in developing -25 dw/ha (average dw/ha)	12.556	76	1570.9 16.5	12.681	45	760.4 16.67	3360	40	244.9 13.71
ALTERNATIVE ACCORDING CAPACITY OF INCREASING DENSITIES IN DEVELOPING ZONES OF BELOW 25Dw/ha.									
capacity 30 dw-ha	+34,571			+10.131			*-2306		
capacity 40 dw/ha	+50.280			+17.735			*+1747		
capacity 60 dw/ha	+81.698						*+10.666		
capacity 100 dw/ha	+157.090						*+28.504		

DISTRIBUTION OF THE POPULATION ACCORDING TO THE TYPE OF BARRIO

ALTERNATIVE 1	Type of Settlements	D W E L L I N G S good state	regular state	deterioration
	CONSOLIDATED + 25 dw/ha	25.135 (21.38%)	51.088 (43.45%)	
	DEVELOPMENT - 25 dw-ha	12.556 (10.68%)	12.681 (10.79%)	
	RE-STUDY			16.091 (13.69%)

ALTERNATIVE 2 (30 dw-ha)

CHART 24.

ALTERNATIVE 2			
	CONSOLIDATED +30 dw/ha	20.951 (17.83%)	34.812 (29.60%)
	DEVELOPMENT -30 dw/ha	16.740 (14.24%)	28.963 (24.64%)
	RE-STUDY		16.091 (13.69%)

TYPES OF SETTLEMENTS	Good state	N°settlem.	ha	Regular state	N°settl	ha	Bad state	n°settl.	ha
zones in consolidation + 30 dw/ha (average dw/ha)	20.951	35	511.9 40.92	34812	69	779.4 44.6	6.989	31	138.1 50.6
Zones in development -30 dw/ha (average dw/ha)	16.740	86	1724.25 9.7	28963	69	1364.6 21.2	5.141	52	307.85 16.7

ALTERNATIVES ACCORDING CAPACITY OF INCREASING DENSITIES IN DEVELOPING ZONES BELOW 30 dw/ha

capacity 30 dw/ha	34.987		11.987		-2.306		
capacity 40 dw/ha	50.280		17.735		1.747		
capacity 60 dw/ha	81.698				10.666		
capacity 100 dw/ha	157.090				28.504		

ALTERNATIVE 1. BARRIOS WITH DWELLINGS IN GOOD STATE AND MORE THAN 25 dwel./ha.
(groups 2- 3- 4- 5- 6- 7)

CHART 25.

2 +60vi/ha

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Villa Libertad	2	VG	1733	12766	26	66.65	491.00	7.37
Miguel Gutierrez	2	VG	374	2913	6.2	60.32	469.84	7.79
			2107	15679	32.2			

3 50-60viv/ha

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Primero de Mayo	2	VG	1190	9634	22.6	52.65	426.28	8.10
Batahola Sur	2	VG	1000	8533	17.4	57.47	490.40	8.53
Tenderi	2	VG	441	3500	8.8	50.11	397.73	7.94
San Jacinto	2	VG	512	3358	9.4	54.47	357.23	6.56
Ruben Dario	2	VG	327	3192	6	54.50	532.00	9.76
			3470	28217	64.2			

4 40-50viv/ha

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Monsenor Lezcano	2	VJ	1755	19713	39.2	44.77	502.88	11.23
Unidad de Proposito	2	VG	790	6361	18.9	41.80	336.56	8.05
Morazan	2	VG	584	6346	12.9	45.27	491.94	10.87
Bosques de Altamira	2	VK	1050	6174	26.2	40.08	235.65	5.88
Maximo Jerez	2	VG	618	5997	12.5	49.44	479.76	9.70
El Pilar	2	VE	511	5470	10.4	49.13	525.96	10.70
Unidad de Proposito	2	VG	210	2726	5	42	545.2	12.98
Villa Fraternidad	2	VG	333	1997	8	41.63	249.63	6.00
Colombia	2	VG	99	916	2.2	45.00	416.36	9.25
Colonia Managua	2	VG	125	906	3	41.67	302.00	7.25
			6075	56606	148.3			

5 35-40 viv/ha

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Villa Progreso	2	VG	675	4932	18.1	37.29	272.49	7.31
Rubenia	2	VK	639	3757	16	39.94	234.81	5.88
Maestro Gabriel	2	VK	330	3256	8.8	37.50	370.00	9.87
Blanca Segovia	2	VE	467	2428	13	35.92	186.77	5.20
Nicarao 15%	2	VG	204	1810	5.1	40.00	354.90	8.87
Plan Piloto	2	VG	61	434	1.6	38.13	271.25	7.11
			2376	16617	62.6			

6 30-35viv/ha

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Centroamerica	2	VK	1251	10374	37.5	33.36	276.64	8.29
Bello Horizonte 75%	2	VK	1571	10347	50.2	31.29	206.12	6.59
Batahola Norte	2	VG	1000	8533	29.7	33.67	287.31	8.53
De Junio 10	2	VG	748	5900	24	31.17	245.83	7.89
Miguel Gutierrez	2	VG	557	4274	16.5	33.76	259.03	7.67
Las Mercedes	2	VK	391	3167	12.9	30.31	245.50	8.10
Heroes y M.del Bocay	2	VK	469	3150	14.6	32.12	215.75	6.72
Cristian Perez	2	VK	184	1536	5.3	34.72	289.81	8.35
Las Mercedes	2	VK	168	1357	5.5	30.55	246.73	
Don Bosco 66%	2	VG	326	1136	10.2	31.96	111.37	3.48
Los Caidos	2	VG	95	322	2.9	32.76	111.03	3.39
Don Bosco 33%	2	VG	163	5.3	5.3	30.75	1.00	0.03
			6923	50101.3	214.6			

7 25-30viv/ha

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
De Septiembre 14	2	VG	961	9630	37.2	25.83	258.87	10.02
Santa Ana 50%	2	VJ	483	5524	18.1	26.69	305.19	11.44
Altamira 1 y 3	2	VL	730	3301	26.3	27.76	125.51	4.52
Nueve de Junio	2	VG	449	2910	16.4	27.38	177.44	6.48
Loma Verde-Seminario	2	VL	409	2714	13.7	29.85	198.1	6.64
Jardines de Veracruz	2	VK	336	2668	13.1	25.65	203.66	7.94
Los Arcos	2	VK	252	1347	9	28.00	149.67	5.35
Centroamerica 9%	2	VK	110	844	3.8	28.95	222.11	7.67
Rafael Herrera 75%	2	VG	227	822	7.6	29.87	108.16	3.62
San Antonio	2	VG	227	723	8.15	27.85	88.71	3.19
			4184	30483	153.35			

Note: viv. = dweeling
tipo = type

ALTERNATIVE 1. BARRIOS WITH DWELLINGS IN REGULAR STATE AND MORE THAN 25 dwel./ha. (groups 2- 3- 4- 5- 6- 7)

2 +60 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
San Judas Norte 80%	1	VD	3814	21854	50	76.28	437.08	5.73
Schick No3	1	VD	1207	10958	14	86.21	782.71	9.08
Revolucion	1	VD	1356	7837	19	71.37	412.47	5.78
Schick 2	1	VD	603	5478	8.4	71.79	652.14	9.08
Salomon Moreno	1	VD	800	4780	11.2	71.43	426.79	5.98
Germen Pomares	1	U	675	3577	8.2	82.32	436.22	5.30
Germen Pomares	1	U	225	1193	1.4	160.71	852.14	5.30
Ducuali	1	VD	141	1035	2.2	64.09	470.45	7.34
			8821	56712	114.4			

3 50-60 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Sol de liberted	1	VF	2502	10821	42.1	59.43	257.03	4.32
Riguero	1	VD	1328	10299	26.2	50.69	393.09	7.76
San Cristobal	1	VD	729	2401	13.4	54.40	179.18	3.29
Mexico 50%	1	VD	169	1759	3.3	51.21	533.03	10.41
Libia	1	U	219	1229	4.2	52.14	292.62	5.61
Ruben Dario	1	VD	360	1070	19.2	55.73	55.73	2.97
Manuel Olivares	1	U	207	836	4.1	50.49	203.90	4.04
Alemania Dem. 1/3	1	VB	97	393	1.9	51.05	206.84	4.05
Montoya 1-2	1	U	40	240	0.7	57.14	342.86	6.00
Jose Dolores Estrada I	1	U	30	180	0.5	60.00	360.00	6.00
			5681	29228	175.6			

4 40-50 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
San Judas Norte 20%	1	Va-VD-	1986	12724	49.4	40.20	257.57	6.41
Larreynaga	1	VD	995	7829	23.8	41.81	328.95	7.87
Ducuali	1	VD	800	6427	16.7	47.90	384.85	8.03
Barri. 66% y S. Luis N.	1	VD	596	4267	12.7	46.93	335.98	7.16
Schik 1	1	VD	460	4001	10.8	42.59	370.46	8.70
Jose Isaias Gomez	1	VF	468	2822	11.1	42.16	254.23	6.03
Adolfo Reyes 66%	1	VD	279	2719	6	46.50	453.17	9.75
Liberia	1	VD	235	2335	5.7	41.23	409.65	9.94
Farabundo Marti	1	U	244	1464	5.5	44.36	266.18	6.00
Selim Schible (Dom.Lugo)	1	U	198	1188	4	49.50	297.00	6.00
La Esperanza	1	U	100	1026	2.24	44.64	458.04	10.26
Julio Buitrago	1	U	165	990	4	41.25	247.50	6.00
Ninos H.y M. Ayapal	1	U	208	950	5.1	40.78	186.27	4.57
Rafael Rios	1	U	134	804	2.7	49.63	297.78	6.00
Portezuelo	1	VB	106	570	2.3	46.09	247.83	5.38
Sector U-1	1	U	72	432	1.7	42.35	254.12	6.00
			7046	50548	163.74			

5 35-40 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Jose Benito Escobar	1	VD	1512	14968	43.1	35.08	347.29	9.90
Venezuela	1	VD	1172	9588	32.3	36.28	296.84	8.18
Costa Rica	1	VD	872	7047	22.3	39.10	316.01	8.08
Maria Auxiliadora 30%	1	Vd	248	6721	6.7	37.01	1003.13	27.10
Andres Castro	1	U	552	5337	15	36.80	355.80	9.67
Ariel Darce 33%	1	VD	506	4193	14	36.14	299.50	8.29
Rene Cisneros	1	U	475	2850	12.8	37.11	222.66	6.00
Laureano Mairena	1	U	362	2316	9.3	38.92	249.03	6.40
Costa Rica	1	VD	195	1653	5.2	37.5	317.88	8.48
Adolfo Reyes 33%	1	VD	139	1315	3.5	39.71	375.71	9.46
Jonathan Gonzalez	1	U	204	1224	5.6	36.43	218.57	6.00
Espana	1	U	160	980	4.2	38.10	233.33	6.13
Oscar Turcios	1	U	148	888	4	37.00	222.00	6.00
Edgar Munguia	1	U	126	672	3.4	37.06	197.65	5.33
Alemania Democrat.	1	U	103	618	2.7	38.15	228.89	6.00
Santa Elisa	1	VD	150	326	4.2	35.71	77.62	2.17
Wesleia	1	U	48	288	1.2	40.00	240.00	6.00
			6972	60984	181.9			

ALTERNATIVE 1. Continuation: dwellings in regular state

6 30-35 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Altagracia 45%	1	VD	1168	12084	37.2	31.40	324.84	10.35
Villa Revolucion	1	VF	739	7837	24.3	30.41	322.51	10.60
De Junio 14	1	VD	538	5774	17	31.65	339.65	10.73
Santa Ana 38%	1	VD	458	5157	14.9	30.74	346.11	11.26
Maria Auxiliadora 70%	1	VD	577	4401	18.4	31.36	239.18	7.63
El Recreo	1	U	817	4330	23.4	34.91	185.04	5.30
Osvaldo Manzanares	1	U	486	2576	14.2	34.23	181.41	5.30
Union Sovietica	1	U	264	1584	8.2	32.20	193.17	6.00
Camilo Ch. (Oscar Lino)	1	U	233	1398	7.7	30.26	181.56	6.00
Edgar Lang	1	U	171	1026	5.2	32.88	197.31	6.00
Catorce de Septiembre	1	U	128	768	4.1	31.22	187.32	6.00
Edgar Munguia	1	U	126	673	3.7	34.05	181.89	5.34
Mireflores	1	U	106	636	3.2	33.13	198.75	6.00
El Cortijo	1	U	96	576	3.1	30.97	185.81	6.00
Costado Cruz Roja	1	U	83	498	2.5	33.20	199.20	6.00
Lote A	1	U	63	378	1.8	35.00	210.00	6.00
Villa Roma	1	VD	215	302	6.6	32.58	45.76	1.40
Celfida Miranda	1	U	24	195	0.7	34.29	278.57	8.13
			6292	50193	196.2			

7 25-30 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
C.Sandino3/6,Bella Cruz	1	VD	2565	22042	101	25.40	218.24	8.59
Villa Venezuela 81%	1	VF	2057	17153	71	28.97	241.59	8.34
Sierra Maestra	1	VD	1269	11807	49.6	25.58	238.04	9.30
Camilo Chamorro	1	VD	1359	8238	53.4	25.45	154.27	6.06
Jorge Dimitrov	1	U	1040	6240	35.6	29.21	175.28	6.00
Domitila Lugo	1	VD	691	5653	27.4	25.22	206.31	8.18
Jose Dolores Estrada	1	VD	926	5479	35.4	26.16	154.77	5.92
El Eden	1	VD	622	4642	23	27.04	201.83	7.46
Carlos Sanchez	1	VD	924	4351	31	29.81	140.35	4.71
Georgino Andrade	1	U	725	4350	25.2	28.77	172.62	6.00
Selim Schibles	1	VD	416	3836	16.4	25.37	233.90	9.22
Socrates Sandino	1	VD	330	3101	11	30.00	281.91	9.40
Los Laureles	1	VD	751	2803	28.6	26.26	98.01	3.73
Granada	1	U	411	2466	14.9	27.58	165.50	6.00
Bertha Calderon	1	U	401	2406	15.3	26.21	157.25	6.00
Villa Austria	1	U	350	1855	12.7	27.56	146.06	5.30
Bertha Diaz	1	VD	524	1791	18.9	27.72	94.76	3.42
Mexico 50%	1	VD	170	1709	6	28.33	284.83	10.05
Minsa 1 y 2	1	U	224	1344	8.5	26.35	158.12	6.00
Nombacho	1	VD	211	908	7.5	28.13	121.07	4.30
Carolina Calero	1	U	130	780	4.7	27.66	165.96	6.00
Casimiro Sotelo	1	VB	103	625	4.1	25.12	152.44	6.07
Los Angeles 5%	1	VD	34	273	1.3	26.15	210.00	8.03
Ducuali	1	U	43	258	1.7	25.29	151.76	6.00
			16276	114110	604.2			

ALTERNATIVE 1. BARRIOS WITH DWELLINGS IN BAD STATE AND MORE THAN 25 dwel./ha. (groups 2- 3- 4- 5- 6- 7)

2 +60 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Quinta Nina		3 A	890	6185	11.2	79.46	552.23	6.95
Benedicto Valverde		3 VA	458	4394	5	91.60	878.80	9.59
Barricada		3 A	500	3207	6.4	78.13	501.09	6.41
Comunidad Bulgaria		3 A	400	2779	4.5	88.89	617.56	6.95
Pablo Ubeda		3 A	170	1090	2.7	62.96	403.70	6.41
Frente a la Normal		3 A	86	551	1.3	66.15	423.85	6.41
Chico Pelon		3 A	150	501	2.3	65.22	217.83	3.34
Camino Solo		3 A	70	396	0.8	87.50	495.00	5.66
			2724	19103	34.2			

3 50-60 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Granada II		3 A	270	1732	5.1	52.94	339.61	6.41
Los Angeles		3 A	180	1250	3.5	51.43	357.14	6.94
Madres Martires de Pant.		3 A	90	577	1.5	60.00	384.67	6.41
Las Torres 6X		3 A	55	429	1	55.00	429.00	7.80
			595	3988	11.1			

4 40-50 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Las Torres 94X		3 A	839	6733	17.8	47.13	378.26	8.03
Acahualinca		3 VA	868	5186	19.6	44.29	264.59	5.97
Gracias a Dios		3 A	145	1010	3.3	43.94	306.06	6.97
			1852	12929	40.7			

5 35-40 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Jose Benito Escobar		3 A	300	1924	7.5	40.00	256.53	6.41
El Rodeito		3 A	215	1309	5.7	37.72	229.65	6.09
Waspan		3 A	165	1146	4.2	39.29	272.86	6.95
San Sebastian		3 A	60	384	1.7	35.29	225.88	6.40
Los Cocos		3 A	56	364	1.4	40.00	260.00	6.50
Monsenor Lezcano		3 A	20	160	0.5	40.00	320.00	8.00
			816	5287	21.0			

6 30-35 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Sur Xolotlan		3 A	400	2779	12.5	32.00	222.32	6.95
Enrique Schmidt		3 A	127	602	4.2	30.24	143.33	4.74
La Cruz		3 A	80	555	2.5	32.00	222.00	6.94
San Jacinto		3 A	84	538	2.6	32.31	206.92	6.40
Acahualinca Norte		3 A	70	449	2	35.00	224.50	6.41
Aqui Nicaragua		3 A	66	423	2	33.00	211.50	6.41
Enrrique Schmidt		3 A	66	311	2.1	31.43	148.10	4.71
Los Laureles		3 A	40	277	1.2	33.33	230.83	6.93
Laureano Mairena		3 A	35	242	1	35.00	242.00	6.91
Angel B. Barrios		3 A	34	236	1	34.00	236.00	6.94
				6412	31.1			

7 25-30 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Jonathan Gonzalez		3 A	546	3502	18.6	29.35	188.28	6.41
De Julio 19		3 A	382	2450	12.8	29.84	191.41	6.41
Los Robles 50X		3 VL	212	1743	7.7	27.53	226.36	8.22
Batahola		3 A	150	975	5.8	25.86	168.10	6.50
Motastepe		3 A	134	859	5.1	26.27	168.43	6.41
Sur de Villa Flor		3 A	90	585	3.4	26.47	172.06	6.50
La Cuaresma 50X		3 VA	90	530	3	30.00	176.67	5.89
Casimiro Sotelo		3 A	53	341	2	26.50	170.50	6.43
Las Piedrecitas		3 A	42	269	1.5	28.00	179.33	6.40
Los Maranones		3 A	30	213	1.1	27.27	193.64	7.10
Casimiro Sotelo		3 A	27	172	1	27.00	172.00	6.37
Modesto Bejarano		3 A	25	128	0.9	27.78	142.22	5.12
			1781	11767	62.9			

ALTERNATIVE 1. BARRIOS WITH DWELLINGS IN GOOD STATE AND LESS THAN 25 dwel./ha. (grouns 8- 9-10)

8 20-25 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Monsenor Lezcano	2	VJ	712	9357	31.1	22.89	300.87	13.14
Rigoberto Lopez Perez	2	VJ	983	8037	40	24.58	200.93	8.18
Nicarao 85%	2	VG	567	5186	25.2	22.50	205.79	9.15
Bello Horizonte 25%	2	VK	524	3449	21.2	24.72	162.69	6.58
San Jose Oriental 50%	2	VS	255	3220	12.4	20.56	259.68	12.63
Valle Dorado	2	VK	167	2065	7.6	21.97	271.71	12.37
Villa Flor	2	VK	462	1627	22.5	20.53	72.31	3.52
Xolotlan	2	VK	218	1389	10	21.80	138.90	6.37
Linda Vista Sur	2	VK	157	1077	7.3	21.51	147.53	6.86
			4045	35407	177.3			

9 15-20 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
San Jose Oriental 50%	2	VJ	81	3270	14.8	5.47	220.95	40.37
Pancasan 66%	2	VL	390	3211	52.1	7.49	61.63	8.23
CHamorro-Riguero N.	2	VG	332	2412	28.1	11.81	85.84	7.27
Largaespada 5/6	2	VL	189	2132	33.7	5.61	63.26	11.28
Martha Quezada	2	VG	245	1930	24.4	10.04	79.10	7.88
Pancasan 33%	2	VL	194	1604	38	5.11	42.21	8.27
Las Palmas	2	VL	158	1580	19.7	8.02	80.20	10.00
Linda Vista Norte	2	VK	213	1480	19.7	10.81	75.13	6.95
Miguel Bonilla	2	VG	170	1084	12.5	13.60	86.72	6.38
Jardines de Santa Clara	2	VM	92	919	8.5	10.82	108.12	9.99
Villa Panama 50%	2	VM	104	757	31.9	3.26	23.73	7.28
San Patricio	2	VL	120	641	30.3	3.96	21.16	5.34
Nejapa Sur	2	VL	100	630	19.9	5.03	31.66	6.30
Bolonia 60%	2	VM	114	609	51.7	2.21	11.78	5.34
Belmonte	2	VL	54	606	13.9	3.88	43.60	11.22
Santo Domingo	2	VM	94	552	32	2.94	17.25	5.87
Colinas 60%	2	VM	130	543	60	2.17	9.05	4.18
Motastepe	2	VL	61	487	24.5	2.49	19.88	7.98
Silvio Mayorga	2	VE	74	474	5.1	14.51	92.94	6.41
El Carmen	2	VL	183	447	30.8	5.94	14.51	2.44
Bolonia 40%	2	VM	76	406	34.6	2.20	11.73	5.34
Guadelupe	2	VL	30	384	15.1	1.99	25.43	12.80
Villa Panama 25%	2	VM	52	364	15	3.47	24.27	7.00
Villa Panama 25%	2	VM	52	363	6.6	7.88	55.00	6.98
Laguna de Tiscapa	2	VE	62	333	5	12.40	66.60	5.37
El Mirador 75%	2	VM	47	272	30.5	1.54	8.92	5.79
Colinas 30%	2	VM	66	271	84.5	0.78	3.21	4.11
Bosque de Bolonia	2	VM	50	265	6.7	7.46	39.55	5.30
Santa Ana 3%	2	VJ	14	255	1.2	11.67	212.50	18.21
Bosque de Bolonia	2	VM	43	235	6.7	6.42	35.07	5.47
San Juan 30%	2	VL	25	229	10.8	2.31	21.20	9.16
San Juan 70%	2	VL	25	229	12.8	1.95	17.89	9.16
Altos Santo Domingo 55%	2	VM	36	210	66.8	0.54	3.14	5.83
Los Bomberos	2	VL	16	204	9.6	1.67	21.25	12.75
Serrano	2	VL	34	198	4	8.50	49.50	5.82
Edo.Contreras La gruta	2	VM	30	192	95.4	0.31	2.01	6.40
Vista Hermosa	2	VE	64	183	4.8	13.33	38.13	2.86
Santo Domingo	2	VM	29	172	18	1.61	9.56	5.93
Belair	2	VL	29	167	2.5	11.60	66.80	5.76
Tiscapa	2	VL	22	161	3.2	6.88	50.31	7.32
Jardines de Managua	2	VL	22	148	6.3	3.49	23.49	6.73
Kilocho	2	VL	19	132	13	1.46	10.15	6.95
El Cortijo	2	VJ	17	115	2.5	6.80	46.00	6.76
Las Colinas 10%	2	VM	21	89	25.4	0.83	3.50	4.24
La Aviacion	2	VL	13	73	2.3	5.65	31.74	5.62
El Mirador 15%	2	VM	9	55	23	0.39	2.39	6.11
Bosque el Recreo	2	VL	9	50	5.9	1.53	8.47	5.56
Las Flores	2	VL	8	42	7.8	1.03	5.38	5.25
El Mirador 10%	2	VM	6	36	25	0.24	1.44	6.00
Frowley	2	VL	4	18	2.4	1.67	7.50	4.50
Altamira	2	VL			2.2	0.00	0.00	ERR
Pedro Joaquin CHamorro	2	VK			18	0.00	0.00	ERR
Country Club	2	VM			21.2	0.00	0.00	ERR
			4028	31219	1140.4			

10 0-15 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Altagracia	2	VJ	527	12071	27.7	19.03	435.78	22.91
Las Brisas	2	VK	924	6064	49.2	18.78	123.25	6.56
Ciudad Jardin	2	VK	619	4580	37	16.73	123.78	7.40
Altamira de Este	2	VK	440	2587	23.2	18.97	111.51	5.88
Roberto Huembes	2	VK	401	2401	23.2	17.28	103.49	5.99
Javier Cuadras	2	VJ	405	2342	25.8	15.70	90.78	5.78
Miraflores	2	VL	338	2305	18.3	18.47	125.96	6.82
Los Robles 50%	2	VM	211	1743	13.9	15.18	125.40	8.26
Cementerio	2	VJ	227	1328	12	18.92	110.67	5.85
San Martin	2	VL	92	791	4.9	18.78	161.43	8.60
Javier Cuadras	2	VJ	100	577	6	16.67	96.17	5.77
Largaespada 1/6	2	VL	83	425	5.4	15.37	78.70	5.12
Mantica	2	VL	52	331	3	17.33	110.33	6.37
Santa Ana 9%	2	VJ	64	158	3.6	17.78	43.89	2.47
			4483	37703	239.2			

ALTERNATIVE 1. BARRIOS WITH DWELLINGS IN REGULAR STATE AND LESS THAN 25 dwel./ha. (groups 8- 9- 10)

8 20-25 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Ariel Darce 66%	1	VD	872	7896	38	22.95	207.79	9.06
Santa Rosa	1	Vd	891	7262	43.2	20.63	168.10	8.15
Camilo Ortega	1	VD	797	6820	33.6	23.72	202.98	8.56
Rene P. y Schick No 4	1	VD	796	6211	33.9	23.48	183.22	7.80
Waspan	1	VD	764	5538	34.5	22.14	160.52	7.25
El Paraiso	1	VD	437	4150	18.1	24.14	229.28	9.50
Altagracia 10%	1	VD	321	2942	15	21.40	196.13	9.17
Julio Buitrago	1	U	295	1770	12.1	24.38	146.28	6.00
Francisco Meza	1	U	199	1194	8.9	22.36	134.16	6.00
De Mayo 1	1	U	173	1038	7.6	22.76	136.58	6.00
Camilo Chamorro	1	U	131	786	6.2	21.13	126.77	6.00
La Esperanza	1	VB	98	531	4.8	20.42	110.63	5.42
Camilo Ch. (Q. Pacheco)	1	U	76	456	3.1	24.52	147.10	6.00
Casimiro Sotelo	1	VB	32	197	1.3	24.62	151.54	6.16
			5082	46791	260.3			

9 15-20 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
C. Sandino 2/6, Bella Cruz	1	VD	1711	15194	90.6	18.89	167.70	8.88
C. Sandinol/6, Bella Cruz	1	VD	858	7106	44.2	19.41	160.77	8.28
Cuba	1	VB	226	2914	13.5	16.74	215.85	12.89
Barricada 33%	1	VD	307	2187	18.6	16.51	117.58	7.12
Omar Torrijos	1	VB	330	1873	17.1	19.30	109.53	5.68
San Ignacio de Boles	1	U	80	480	4.4	18.18	109.09	6.00
La Esperanza	1	VB	70	459	3.5	20.00	131.14	6.56
Lote C (42%)	1	U	50	300	3.3	15.15	90.91	6.00
Camilo Ortega	1	U	32	193	1.9	16.84	101.58	6.03
			3664	30706	117.1			

10 0-15 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Ville Venezuela	1	VF	475	3909	35.5	13.38	110.11	8.23
Los Angeles 95%	1	VP	447	3673	32	13.97	114.78	8.22
Bello Amanecer	1	VD	550	2905	63.1	8.72	46.04	5.28
San Luis Sur	1	VD	364	2737	27.4	13.28	99.89	7.52
Cuba Libre	1	VD	180	2270	18	10.00	126.11	12.61
San Judas Sur 1/6	1	VD	203	1436	16.7	12.16	85.99	7.07
Ariem Siu	1	VD	150	1089	25	6.00	43.56	7.26
Ticomo	1	VD	88	637	17.5	5.03	36.40	7.24
Pacto Andino	1	VF	78	555	6.7	11.64	82.84	7.12
Cuadras (Santa Julia)	1	VD	75	516	6.5	11.54	79.38	6.88
Cuadra	1	VD	51	496	4.9	10.41	101.22	9.73
Daniel Chavarria	1	U	82	492	7.4	11.08	66.49	6.00
Manzana Gadala Maria	1	U	72	432	0.9		480.00	6.00
San Ignacio	1	U	55	385	3.7	14.86	104.05	7.00
Alfredo Silva	1	U	60	360	5	12.00	72.00	6.00
Alemania democrat. 1/3	1	VB	49	294	6.9	7.10	42.61	6.00
Habana	1	VD	48	286	4.5	10.67	63.56	5.96
San Pedro	1	VD	43	247	8.9	4.83	27.75	5.74
Alemania Dem. 1/3	1	VB	32	197	6	5.33	32.83	6.16
Oscar Robelo	1	U	20	120	1.7	11.76	70.59	6.00
Colonia Militar	1	VF	19	42	1.5	12.67	28.00	2.21
Selim Schible	1	U			3.2	0.00	0.00	
			3141	23078	303			

ALTERNATIVE 1. BARRIOS WITH DWELLINGS IN BAD STATE AND LESS THAN 25 dwel./ha. (groups 8-9-10)

8 20-25 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Santos Lopez	3	A	150	1817	6.8	22.06	267.21	12.11
Gracias a Dios	3	A	205	1422	9.4	21.81		6.94
La Cascada	3	A	200	1176	9.6	20.83	122.50	5.88
Villa Rosa 50%	3	A	150	1042	6.7	22.39	155.52	6.95
El Rodeo	3	A	120	679	4.8	25.00	141.46	5.66
Miguel Gutierrez	3	A	45	270	1.9	23.68	142.11	6.00
Costado Cruz Roja	3	A	35	210	1.6	21.88	131.25	6.00
Frte. Min. Cultura	3	A	30	208	1.2	25.00	173.33	6.93
Rigoberto Lopez Perez	3	A	15	75	0.6	25.00	125.00	5.00
			950	6899	42.6			

9 15-20 dwel./ha

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Carlos Reyna	3	VA	130	1098	6.8	19.12	161.47	8.45
San Cristobal	3	A	152	975	8	19.00	121.88	6.41
Los Cheguites	3	A	150	962	8	18.75	120.25	6.41
Las Jaguitas	3	A	125	694	6.5	19.23	106.77	5.55
Las Piedrecitas	3	A	67	372	3.6	18.61	103.33	5.55
Pista el Dorado	3	A	55	330	3	18.33	110.00	6.00
Esq.opuesta a la Normal.	3	A	20	128	1.1	18.18	116.36	6.40
			699	4559	37.0			

10 0-15 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/vi
Cristo del R.y San S.77%	3	VC	405	3010	42	9.64	71.67	7.43
Altagracia	3	C	231	1262				5.46
De Julio 19 74%	3	VC	177	898	11.8	15.00	76.10	5.07
Mercado Oriental	3	VA	148	841	13.3	11.13	63.23	5.68
S.Sebastian,C.d.Ros 22%	3	VC	87	722	10.6	8.21	68.11	8.30
La Cuaresma	3	VA	90	548	9	10.00	60.89	6.09
Santo Dom. y Buen Air	3	VC	83	446	9.6	8.65	46.46	5.37
Manchester	3	A	60	416	4	15.00	104.00	6.93
Santo Domingo	3	A	60	416	5.1	11.76	81.57	6.93
German Pomares	3	A	50	320	4	12.50	80.00	6.40
DE julio 19 26%	3	VC	60	305	6.8	8.82	44.85	5.08
Montefresco	3	A	40	275	3.3	13.03	83.33	6.40
Fte. Restaur. Tinajones	3	A	30	208	3	10.00	69.33	6.93
Omar Torrijos	3	A	30	208	2.9	10.34	71.72	6.93
El Chorizo	3	A	25	173	2.1	11.90	82.38	6.92
S.Sebastian,C.d.Rol/19	3	VC	22	166	1.6	13.75	103.75	7.55
Marcos Carrion	3	A	20	138	1.5	13.33	92.00	6.90
Entr.Jardines Veracruz	3	A	20	128	2.4	8.33	53.33	6.40
Martha Quezada	3	A	18	125	9.75	1.85	12.82	6.94
Rotonda Diana	3	A	18	115	1.8	10.00	63.89	6.39
Van Pac	3	A	16	111	2.4	6.67	46.25	6.94
Camino Sto Domingo	3	A	8	51	1.9	4.21	26.84	6.38
Biblioteca Bo Central	3	A	7	42	2.8	2.50	15.00	6.00
Candelaria	3	VC	3	32	13.7	0.22	2.34	10.67
			1711	10956	165.35			

ALTERNATIVE 2. BARRIOS WITH DWELLINGS IN GOOD STATE AND MORE THAN 30 dwel./ha. (groups 2- 3- 4- 5- 6)

CHART 26.

2-3-4 40 +- dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Villa Libertad		2 VG	1733	12766	26	66.65	491.00	7.37
Miguel Gutierrez		2 VG	374	2913	6.2	60.32	469.84	7.79
			2107	15679	32.2			

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Primero de Mayo		2 VG	1190	9634	22.6	52.65	426.28	8.10
Batahola Sur		2 VG	1000	8533	17.4	57.47	490.40	8.53
Tenderi		2 VG	441	3500	8.8	50.11	397.73	7.94
San Jacinto		2 VG	512	3358	9.4	54.47	357.23	6.56
Ruben Dario		2 VG	327	3192	6	54.50	532.00	9.76
			3470	28217	64.2			

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Monsenor Lezcano		2 VJ	1755	19713	39.2	44.77	502.88	11.23
Unidad de Proposito		2 VG	790	6361	18.9	41.80	336.56	8.05
Horazan		2 VG	584	6346	12.9	45.27	491.94	10.87
Bosques de Altamira		2 VK	1050	6174	26.2	40.08	235.65	5.88
Maximo Jerez		2 VG	618	5997	12.5	49.44	479.76	9.70
El Pilar		2 VE	511	5470	10.4	49.13	525.96	10.70
Unidad de Proposito		2 VG	210	2726	5	42	545.2	12.98
Villa Fraternidad		2 VG	333	1997	8	41.63	249.63	6.00
Colombia		2 VG	99	916	2.2	45.00	416.36	9.25
Colonia Managua		2 VG	125	906	3	41.67	302.00	7.25
			6075	56606	138.3			

5 35-40 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Villa Progreso		2 VG	675	4932	18.1	37.29	272.49	7.31
Rubenia		2 VK	639	3757	16	39.94	234.81	5.88
Maestro Gabriel		2 VK	330	3256	8.8	37.50	370.00	9.87
Blanca Segovia		2 VE	467	2428	13	35.92	186.77	5.20
Nicareo 15%		2 VG	204	1810	5.1	40.00	354.90	8.87
Plan Piloto		2 VG	61	434	1.6	38.13	271.25	7.11
			2376	16617	62.6			

6 30-35 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Centroamerica		2 VK	1251	10374	37.5	33.36	276.64	8.29
Bello Horizonte 75%		2 VK	1571	10347	50.2	31.29	206.12	6.59
Batahola Norte		2 VG	1000	8533	29.7	33.67	287.31	8.53
De Junio 10		2 VG	748	5900	24	31.17	245.83	7.89
Miguel Gutierrez		2 VG	557	4274	16.5	33.76	259.03	7.67
Las Mercedes		2 VK	391	3167	12.9	30.31	245.50	8.10
Heroes y M.del Bocay		2 VK	469	3150	14.6	32.12	215.75	6.72
Cristian Perez		2 VK	184	1536	5.3	34.72	289.81	8.35
Las Mercedes		2 VK	168	1357	5.5	30.55	246.73	
Don Bosco 66%		2 VG	326	1136	10.2	31.96	111.37	3.48
Los Caidos		2 VG	95	322	2.9	32.76	111.03	3.39
Don Bosco 33%		2 VG	163	5.3	5.3	30.75	1.00	0.03
			6923	50101.3	214.6			

ALTERNATIVE 2. BARRIOS WITH DWELLINGS IN REGULAR STATE AND MORE THAN 30 dwel./ha. (groups 2-3-4-5-6)

2-3-4- 40 and + dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
San Judas Norte 80%		1 VD	3814	21854	50	76.28	437.08	5.73
Schick No3		1 VD	1207	10958	14	86.21	782.71	9.08
Revolucion		1 VD	1356	7837	19	71.37	412.47	5.78
Schick 2		1 VD	603	5478	8.4	71.79	652.14	9.08
Salomon Moreno		1 VD	800	4780	11.2	71.43	426.79	5.98
Germen Pomares		1 U	675	3577	8.2	82.32	436.22	5.30
Germen Pomares		1 U	225	1193	1.4	160.71	852.14	5.30
Ducuali		1 VD	141	1035	2.2	64.09	470.45	7.34
			8821	56712	114.4			

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Sol de libertad		1 VF	2502	10821	42.1	59.43	257.03	4.32
Riguero		1 VD	1328	10299	26.2	50.69	393.09	7.76
San Cristobal		1 VD	729	2401	13.4	54.40	179.18	3.29
Mexico 50%		1 VD	169	1759	3.3	51.21	533.03	10.41
Libia		1 U	219	1229	4.2	52.14	292.62	5.61
Ruben Dario		1 VD	360	1070	19.2	55.73	55.73	2.97
Manuel Olivares		1 U	207	836	4.1	50.49	203.90	4.04
Alemania Dem. 1/3		1 VB	97	393	1.9	51.05	206.84	4.05
Montoya 1-2		1 U	40	240	0.7	57.14	342.86	6.00
Jose Dolores Estrada		1 U	30	180	0,5	60.00	360.00	6.00
			5681	29228	115.6			

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
San Judas Norte 20%		1 Va-VD-	1986	12724	49.4	40.20	257.57	6.41
Larreynaga		1 VD	995	7829	23.8	41.81	328.95	7.87
Ducuali		1 VD	800	6427	16.7	47.90	384.85	8.03
Barri. 66% y S. Luis N.		1 VD	596	4267	12.7	46.93	335.98	7.16
Schik 1		1 VD	460	4001	10.8	42.59	370.46	8.70
Jose Isaias Gomez		1 VF	468	2822	11.1	42.16	254.23	6.03
Adolfo Reyes 66%		1 VD	279	2719	6	46.50	453.17	9.75
Liberia		1 VD	235	2335	5.7	41.23	409.65	9.94
Farabundo Marti		1 U	244	1464	5.5	44.36	266.18	6.00
Selim Schible (Dom.Lugo)		1 U	198	1188	4	49.50	297.00	6.00
La Esperanza		1 U	100	1026	2.24	44.64	458.04	10.26
Julio Buitrago		1 U	165	990	4	41.25	247.50	6.00
Ninos H.y M. Ayapal		1 U	208	950	5.1	40.78	186.27	4.57
Rafael Rios		1 U	134	804	2.7	49.63	297.78	6.00
Portezuelo		1 VB	106	570	2.3	46.09	247.83	5.38
Sector O-1		1 U	72	432	1.7	42.35	254.12	6.00
			7046	50548	163.74			

5 35-40 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Jose Benito Escobar		1 VD	1512	14968	43.1	35.08	347.29	9.90
Venezuela		1 VD	1172	9588	32.3	36.28	296.84	8.18
Costa Rica		1 VD	872	7047	22.3	39.10	316.01	8.08
Maria Auxiliadora 30%		1 Vd	248	6721	6.7	37.01		
Andres Castro		1 U	552	5337	15	36.80	355.80	9.67
Ariel Darce 33%		1 VD	506	4193	14	36.14	299.50	8.29
Rene Cisneros		1 U	475	2850	12.8	37.11	222.66	6.00
Laureano Mairena		1 U	362	2316	9.3	38.92	249.03	6.40
Costa Rica		1 VD	195	1653	5.2	37.5	317.88	8.48
Adolfo Reyes 33%		1 VD	139	1315	3.5	39.71	375.71	9.46
Jonathan Gonzalez		1 U	204	1224	5.6	36.43	218.57	6.00
Espana		1 U	160	980	4.2	38.10	233.33	6.13
Oscar Turcios		1 U	148	888	4	37.00	222.00	6.00
Edgar Munguia		1 U	126	672	3.4	37.06	197.65	5.33
Alemania Democrat.		1 U	103	618	2.7	38.15	228.89	6.00
Santa Elisa		1 VD	150	326	4.2	35.71	77.62	2.17
Wamala		1 U	48	288	1.2	40.00	240.00	6.00
			6972	60984	181.9			

6 30-35 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Altagracia 45%		1 VD	1168	12084	37.2	31.40	324.84	10.35
Villa Revolucion		1 VF	739	7837	24.3	30.41	322.51	10.60
De Junio 14		1 VD	538	5774	17	31.65	339.65	10.73
Santa Ana 38%		1 VD	458	5157	14.9	30.74	346.11	11.26
Maria Auxiliadora 70%		1 VD	577	4401	18.4	31.36	239.18	7.63
El Recreo		1 U	817	4330	23.4	34.91	185.04	5.30
Osvaldo Manzanares		1 U	486	2576	14.2	34.23	181.41	5.30
Union Sovietica		1 U	264	1584	8.2	32.20	193.17	6.00
Camilo Ch. (Oscar Lino)		1 U	233	1398	7.7	30.26	181.56	6.00
Edgar Lang		1 U	171	1026	5.2	32.88	197.31	6.00
Catorce de Septiembre		1 U	128	768	4.1	31.22	187.32	6.00
Edgar Munguia		1 U	126	673	3.7	34.05	181.89	5.34
Miraflores		1 U	106	636	3.2	33.13	198.75	6.00
El Cortijo		1 U	96	576	3.1	30.97	185.81	6.00
Costado Cruz Roja		1 U	83	498	2.5	33.20	199.20	6.00
Lote A		1 U	63	378	1.8	35.00	210.00	6.00
Villa Rosa		1 VD	215	302	6.6	32.58	45.76	1.40
Celfida Miranda		1 U	24	195	0.7	34.29	278.57	8.13
			6292	50193	196.2			

ALTERNATIVE 2. BARRIOS WITH DWELLINGS IN BAD STATE AND MORE THAN 30 dwel./ha. (groups 2- 3- 4- 5- 6)

2-3-4- 40 and= dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Quinta Nina	3	A	890	6185	11.2	79.46	552.23	6.95
Benedicto Valverde	3	VA	458	4394	5	91.60	878.80	9.59
Barricada	3	A	500	3207	6.4	78.13	501.09	6.41
Comunidad Bulgaria	3	A	400	2779	4.5	88.89	617.56	6.95
Pablo Ubeda	3	A	170	1090	2.7	62.96	403.70	6.41
Frente a la Normal	3	A	86	551	1.3	66.15	423.85	6.41
Chico Pelon	3	A	150	501	2.3	65.22	217.83	3.34
Camino Solo	3	A	70	396	0.8	87.50	495.00	5.66
			2724	19103	34.2			

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Granada II	3	A	270	1732	5.1	52.94	339.61	6.41
Los Angeles	3	A	180	1250	3.5	51.43	357.14	6.94
Madres Martires de Pant.	3	A	90	577	1.5	60.00	384.67	6.41
Las Torres 6%	3	A	55	429	1	55.00	429.00	7.80
			595	3988	11.1			

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Las Torres 94%	3	A	839	6733	17.8	47.13	378.26	8.03
Acahualinca	3	VA	868	5186	19.6	44.29	264.59	5.97
Gracias a Dios	3	A	145	1010	3.3	43.94	306.06	6.97
			1852	12929	40.7			

5 35-40 dwel./ha.

BARRIO	grupo	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Jose Benito Escobar	3	A	300	1924	7.5	40.00	256.53	6.41
El Rodeito	3	A	215	1309	5.7	37.72	229.65	6.09
Waspan	3	A	165	1146	4.2	39.29	272.86	6.95
San Sebastian	3	A	60	384	1.7	35.29	225.88	6.40
Los Cocos	3	A	56	364	1.4	40.00	260.00	6.50
Monsenor Lezcano	3	A	20	160	0.5	40.00	320.00	8.00
			816	5287	21.0			

6 30-35 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Sur Xolotlan	3	A	400	2779	12.5	32.00	222.32	6.95
Enrique Schmidt	3	A	127	602	4.2	30.24	143.33	4.74
La Cruz	3	A	80	555	2.5	32.00	222.00	6.94
San Jacinto	3	A	84	538	2.6	32.31	206.92	6.40
Acahualinca Norte	3	A	70	449	2	35.00	224.50	6.41
Aqui Nicaragua	3	A	66	423	2	33.00	211.50	6.41
Enrrique Schmidt	3	A	66	311	2.1	31.43	148.10	4.71
Los Laureles	3	A	40	277	1.2	33.33	230.83	6.93
Laureano Mairena	3	A	35	242	1	35.00	242.00	6.91
Angel B. Barrios	3	A	34	236	1	34.00	236.00	6.94
				6412	31.1			

ALTERNATIVE 2. BARRIOS WITH DWELLINGS IN GOOD STATE AND LESS THAN 30 dwel./ha. (groups 7- 8- 9)

7 25-30 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
De Septiembre 14		2 VG	961	9630	37.2	25.83	258.87	10.02
Santa Ana 50%		2 VJ	483	5524	18.1	26.69	305.19	11.44
Altamira 1 y 3		2 VL	730	3301	26.3	27.76	125.51	4.52
Nueve de Junio		2 VG	449	2910	16.4	27.38	177.44	6.48
Loma Verde-Seminario		2 VL	409	2714	13.7	29.85	198.1	6.64
Jardines de Veracruz		2 VK	336	2668	13.1	25.65	203.66	7.94
Los Arcos		2 VK	252	1347	9	28.00	149.67	5.35
Centroamerica 9%		2 VK	110	844	3.8	28.95	222.11	7.67
Rafael Herrera 75%		2 VG	227	822	7.6	29.87	108.16	3.62
San Antonio		2 VG	227	723	8.15	27.85	88.71	3.19
			4184	30483	153.35			

8 20 25 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Monseñor Lezcano		2 VJ	712	9057	31.1	22.89	300.87	13.14
Rigoberto Lopez Perez		2 VJ	983	8037	40	24.58	200.93	8.18
Nicarao 85%		2 VG	567	5186	25.2	22.50	205.79	9.15
Bello Horizonte 25%		2 VK	524	3449	21.2	24.72	162.69	6.58
San Jose Oriental 50%		2 VS	255	3220	12.4	20.56	259.68	12.63
Valle Dorado		2 VK	167	2065	7.6	21.97	271.71	12.37
Villa Flor		2 VK	462	1627	22.5	20.53	72.31	3.52
Xolotlan		2 VK	218	1389	10	21.80	138.90	6.37
Linda Vista Sur		2 VK	157	1077	7.3	21.51	147.53	6.86
			4045	35407	177.3			

9 15-20 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Altagracia		2 VJ	527	12071	27.7	19.03	435.78	22.91
Las Brisas		2 VK	924	6064	49.2	18.78	123.25	6.56
Ciudad Jardin		2 VK	619	4580	37	16.73	123.78	7.40
Altamira de Este		2 VK	440	2587	23.2	18.97	111.51	5.88
Roberto Huembes		2 VK	401	2401	23.2	17.28	103.49	5.99
Javier Cuadras		2 VJ	405	2342	25.8	15.70	90.78	5.78
Miraflores		2 VL	338	2305	18.3	18.47	125.96	6.82
Los Robles 50%		2 VM	211	1743	13.9	15.18	125.40	8.26
Cementerio		2 VJ	227	1328	12	18.92	110.67	5.85
San Martin		2 VL	92	791	4.9	18.78	161.43	8.60
Javier Cuadras		2 VJ	100	577	6	16.67	96.17	5.77
Largaespada 1/6		2 VL	83	425	5.4	15.37	78.70	5.12
Mantica		2 VL	52	331	3	17.33	110.33	6.37
Santa Ana 9%		2 VJ	64	158	3.6	17.78	43.89	2.47
			4483	37703	253.2			

ALTERNATIVE 2. Continuation: Dwellings in good state

10 15 and - dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
San Jose Oriental 50%		2 VJ	81	3270	14.8	5.47	220.95	40.37
Parcasan 66%		2 VL	390	3211	52.1	7.49	61.63	8.23
CHamorro-Riguero N.		2 VG	332	2412	28.1	11.81	85.84	7.27
Largaespada 5/6		2 VL	189	2132	33.7	5.61	63.26	11.28
Martha Quezada		2 VG	245	1930	24.4	10.04	79.10	7.88
Parcasan 33%		2 VL	194	1604	38	5.11	42.21	8.27
Las Palmas		2 VL	158	1580	19.7	8.02	80.20	10.00
Linda Vista Norte		2 VK	213	1480	19.7	10.81	75.13	6.95
Miguel Bonilla		2 VG	170	1084	12.5	13.60	86.72	6.38
Jardines de Santa Clara		2 VM	92	919	8.5	10.82	108.12	9.99
Villa Panama 50%		2 VM	104	757	31.9	3.26	23.73	7.28
San Patricio		2 VL	120	641	30.3	3.96	21.16	5.34
Nejapa Sur		2 VL	100	630	19.9	5.03	31.66	6.30
Bolonia 60%		2 VM	114	609	51.7	2.21	11.78	5.34
Belmonte		2 VL	54	606	13.9	3.88	43.60	11.22
Santo Domingo		2 VM	94	552	32	2.94	17.25	5.87
Colinas 60%		2 VM	130	543	60	2.17	9.05	4.18
Motastepe		2 VL	61	487	24.5	2.49	19.88	7.98
Silvio Mayorga		2 VE	74	474	5.1	14.51	92.94	6.41
El Carmen		2 VL	183	447	30.8	5.94	14.51	2.44
Bolonia 40%		2 VM	76	406	34.6	2.20	11.73	5.34
Guadalupe		2 VL	30	384	15.1	1.99	25.43	12.80
Villa Panama 25%		2 VM	52	364	15	3.47	24.27	7.00
Villa Panama 25%		2 VM	52	363	6.6	7.88	55.00	6.98
Laguna de Tiscapa		2 VE	62	333	5	12.40	66.60	5.37
El Mirador 75%		2 VM	47	272	30.5	1.54	8.92	5.79
Colinas 30%		2 VM	66	271	84.5	0.78	3.21	4.11
Bosque de Bolonia		2 VM	50	265	6.7	7.46	39.55	5.30
Santa Ana 3%		2 VJ	14	255	1.2	11.67	212.50	18.21
Bosque de Bolonia		2 VM	43	235	6.7	6.42	35.07	5.47
San Juan 30%		2 VL	25	229	10.8	2.31	21.20	9.16
San Juan 70%		2 VL	25	229	12.8	1.95	17.89	9.16
Altos Santo Domingo 55%		2 VM	36	210	66.8	0.54	3.14	5.83
Los Bomberos		2 VL	16	204	9.6	1.67	21.25	12.75
Serrano		2 VL	34	198	4	8.50	49.50	5.82
Edo.Contreras La gruta		2 VM	30	192	95.4	0.31	2.01	6.40
Vista Hermosa		2 VE	64	183	4.8	13.33	38.13	2.86
Santo Domingo		2 VM	29	172	18	1.61	9.56	5.93
Belair		2 VL	29	167	2.5	11.60	66.80	5.76
Tiscapa		2 VL	22	161	3.2	6.88	50.31	7.32
Jardines de Managua		2 VL	22	148	6.3	3.49	23.49	6.73
Kilocho		2 VL	19	132	13	1.46	10.15	6.95
El Cortijo		2 VJ	17	115	2.5	6.80	46.00	6.76
Las Colinas 10%		2 VM	21	89	25.4	0.83	3.50	4.24
La Aviacion		2 VL	13	73	2.3	5.65	31.74	5.62
El Mirador 15%		2 VM	9	55	23	0.39	2.39	6.11
Bosque el Hecreo		2 VL	9	50	5.9	1.53	8.47	5.56
Las Flores		2 VL	8	42	7.8	1.03	5.38	5.25
El Mirador 10%		2 VM	6	36	25	0.24	1.44	6.00
Froylay		2 VL	4	18	2.4	1.67	7.50	4.50
Altamira		2 VL			2.2	0.00	0.00	ERR
Pedro Joaquin CHamorro		2 VK			18	0.00	0.00	ERR
Country Club		2 VM			21.2	0.00	0.00	ERR
			4028	31219	1140.4			

ALTERNATIVE 2. BARRIOS WITH DWELLINGS IN REGULAR STATE AND LESS THAN 30 dwel./ha. (groups 7- 8- 9- 10)

7 25-30 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
C.Sandino3/6, Bella Cruz	1	VD	2565	22042	101	25.40	218.24	8.59
Villa Venezuela 81x	1	VF	2057	17153	71	28.97	241.59	8.34
Sierra Maestra	1	VD	1269	11807	49.6	25.58	238.04	9.30
Camilo Chamorro	1	VD	1359	8238	53.4	25.45	154.27	6.06
Jorge Dimitrov	1	U	1040	6240	35.6	29.21	175.28	6.00
Domitila Lugo	1	VD	691	5653	27.4	25.22	206.31	8.18
Jose Dolores Estrada	1	VD	926	5479	35.4	26.16	154.77	5.92
El Eden	1	VD	622	4642	23	27.04	201.83	7.46
Carlos Sanchez	1	VD	924	4351	31	29.81	140.35	4.71
Georgino Andrade	1	U	725	4350	25.2	28.77	172.62	6.00
Selim Schibles	1	VD	416	3836	16.4	25.37	233.90	9.22
Socrates Sandino	1	VD	330	3101	11	30.00	281.91	9.40
Los Laureles	1	VD	751	2803	28.6	26.26	98.01	3.73
Granada	1	U	411	2466	14.9	27.58	165.50	6.00
Bertha Calderon	1	U	401	2406	15.3	26.21	157.25	6.00
Villa Austria	1	U	350	1855	12.7	27.56	146.06	5.30
Bertha Diaz	1	VD	524	1791	18.9	27.72	94.76	3.42
Mexico 50%	1	VD	170	1709	6	28.33	284.83	10.05
Minas 1 y 2	1	U	224	1344	8.5	26.35	158.12	6.00
Nombacho	1	VD	211	908	7.5	28.13	121.07	4.30
Carolina Calero	1	U	130	780	4.7	27.66	165.96	6.00
Casimiro Sotelo	1	VB	103	625	4.1	25.12	152.44	6.07
Los Angeles 5%	1	VD	34	273	1.3	26.15	210.00	8.03
Ducuali	1	U	43	258	1.7	25.29	151.76	6.00
			16276	114110	604.2			

8 20-25 dwel/ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Ariel Darce 66%	1	VD	872	7896	38	22.95	207.79	9.06
Santa Rosa	1	Vd	891	7262	43.2	20.63	168.10	8.15
Camilo Ortega	1	VD	797	6820	33.6	23.72	202.98	8.56
Rene P. y Schick No 4	1	VD	796	6211	33.9	23.48	183.22	7.80
Waspan	1	VD	764	5538	34.5	22.14	160.52	7.25
El Paraiso	1	VD	437	4150	18.1	24.14	229.28	9.50
Altagracia 10%	1	VD	321	2942	15	21.40	196.13	9.17
Julio Buitrago	1	U	295	1770	12.1	24.38	146.28	6.00
Francisco Meza	1	U	199	1194	8.9	22.36	134.16	6.00
De Mayo 1	1	U	173	1038	7.6	22.76	136.58	6.00
Camilo Chamorro	1	U	131	786	6.2	21.13	126.77	6.00
La Esperanza	1	VB	98	531	4.8	20.42	110.63	5.42
Camilo Ch. (Q. Pacheco)	1	U	76	456	3.1	24.52	147.10	6.00
Casimiro Sotelo	1	VB	32	197	1.3	24.62	151.54	6.16
			5882	46791	260.3			

9 15-20 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
C.Sandino 2/6, Bella Cruz	1	VD	1711	15194	90.6	18.89	167.70	8.88
C.Sandino1/6, Bella Cruz	1	VD	858	7106	44.2	19.41	160.77	8.28
Cuba	1	VB	226	2914	13.5	16.74	215.85	12.89
Barricada 33%	1	VD	307	2187	18.6	16.51	117.58	7.12
Omar Torrijos	1	VB	330	1873	17.1	19.30	109.53	5.68
San Ignacio de Boleo	1	U	80	480	4.4	18.18	109.09	6.00
La Esperanza	1	VB	70	459	3.5	20.00	131.14	6.56
Lote C (42%)	1	U	50	300	3.3	15.15	90.91	6.00
Camilo Ortega	1	U	32	193	1.9	16.84	101.58	6.03
			3664	30706	197.1			

10 15 -+ dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Villa Venezuela	1	VF	475	3909	35.5	13.38	110.11	8.23
Los Angeles 95%	1	VP	447	3673	32	13.97	114.78	8.22
Bello Amanecer	1	VD	550	2905	63.1	8.72	46.04	5.28
San Luis Sur	1	VD	364	2737	27.4	13.28	99.89	7.52
Cuba Libre	1	VD	180	2270	18	10.00	126.11	12.61
San Judas Sur 1/6	1	VD	203	1436	16.7	12.16	85.99	7.07
Arlen Siu	1	VD	150	1089	25	6.00	43.56	7.26
Ticomo	1	VD	88	637	17.5	5.03	36.40	7.24
Pacto Andino	1	VF	78	555	6.7	11.64	82.84	7.12
Cuadras (Santa Julia)	1	VD	75	516	6.5	11.54	79.38	6.88
Cuadra	1	VD	51	496	4.9	10.41	101.22	9.73
Daniel Chavarria	1	U	82	492	7.4	11.08	66.49	6.00
Manzana Gadala Maria	1	U	72	432	0.9		480.00	6.00
San Ignacio	1	U	55	385	3.7	14.86	104.05	7.00
Alfredo Silva	1	U	60	360	5	12.00	72.00	6.00
Alemania democrat.1/3	1	VB	49	294	6.9	7.10	42.61	6.00
Habana	1	VD	48	286	4.5	10.67	63.56	5.96
San Pedro	1	VD	43	247	8.9	4.83	27.75	5.74
Alemania Dem. 1/3	1	VB	32	197	6	5.33	32.83	6.16
Oscar Robelo	1	U	20	120	1.7	11.76	70.59	6.00
Colonia Militar	1	VF	19	42	1.45	12.67	28.00	2.21
Selim Schible	1	U			3.2	0.00	0.00	ERR
			3141	23078	303			

ALTERNATIVE 2. BARRIOS WITH DWELLINGS IN BAD STATE AND LESS THAN 30 dwel./ha. (groups 7-8-9-10)

7 25-30 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Jonathan Gonzalez	3	A	546	3502	18.6	29.35	188.28	6.41
De Julio 19	3	A	382	2450	12.8	29.84	191.41	6.41
Los Robles 50%	3	VL	212	1743	7.7	27.53	226.36	8.22
Betshola	3	A	150	975	5.8	25.86	168.10	6.50
Motastepe	3	A	134	859	5.1	26.27	168.43	6.41
Sur de Villa Flor	3	A	90	585	3.4	26.47	172.06	6.50
La Cuaresma 50%	3	VA	90	530	3	30.00	176.67	5.89
Casimiro Sotelo	3	A	53	341	2	26.50	170.50	6.43
Las Piedrecitas	3	A	42	269	1.5	28.00	179.33	6.40
Los Maranones	3	A	30	213	1.1	27.27	193.64	7.10
Casimiro Sotelo	3	A	27	172	1	27.00	172.00	6.37
Modesto Bejarano	3	A	25	128	0.9	27.78	142.22	5.12
				11,767	62.9			

8 20-25 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Santos Lopez	3	A	150	1817	6.8	22.06	267.21	12.11
Gracias a Dios	3	A	205	1422	9.4	21.81		6.94
La Cascada	3	A	200	1176	9.6	20.83	122.50	5.88
Villa Roma 50%	3	A	150	1042	6.7	22.39	155.52	6.95
El Rodeo	3	A	120	679	4.8	25.00	141.46	5.66
Miguel Gutierrez	3	A	45	270	1.9	23.68	142.11	6.00
Costado Cruz Roja	3	A	35	210	1.6	21.88	131.25	6.00
Frte. Min. Cultura	3	A	30	208	1.2	25.00	173.33	6.93
Rigoberto Lopez Perez	3	A	15	75	0.6	25.00	125.00	5.00
			950	6899	42.6			

9 15-25 dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/viv
Carlos Reyna	3	VA	130	1098	6.8	19.12	161.47	8.45
San Cristobal	3	A	152	975	8	19.00	121.88	6.41
Los Chaguites	3	A	150	962	8	18.75	120.25	6.41
Las Jaguitas	3	A	125	694	6.5	19.23	106.77	5.55
Las Piedrecitas	3	A	67	372	3.6	18.61	103.33	5.55
Pista el Dorado	3	A	55	330	3	18.33	110.00	6.00
Esq.opuesta a la Normal.	3	A	20	128	1.1	18.18	116.36	6.40
			699	4559	37.0			

10 15 and - dwel./ha.

BARRIO	GRUPO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.	Hab/Ha	pers/vi
Cristo del R.y San S.77%	3	VC	405	3010	42	9.64	71.67	7.43
Altagracia	3	C	231	1262				5.46
De Julio 19 74%	3	VC	177	898	11.8	15.00	76.10	5.07
Mercado Oriental	3	VA	148	841	13.3	11.13	63.23	5.68
S.Sebastian,C.d.Ros 22%	3	VC	87	722	10.6	8.21	68.11	8.30
La Cuaresma	3	VA	90	548	9	10.00	60.89	6.09
Santo Dom. y Buen Air	3	VC	83	446	9.6	8.65	46.46	5.37
Manchester	3	A	60	416	4	15.00	104.00	6.93
Santo Domingo	3	A	60	416	5.1	11.76	81.57	6.93
German Pomares	3	A	50	320	4	12.50	80.00	6.40
DE julio 19 26%	3	VC	60	305	6.8	8.82	44.85	5.08
Montefresco	3	A	40	275	3.3	13.03	83.33	6.40
Fte. Restaur. Tinajones	3	A	30	208	3	10.00	69.33	6.93
Omar Torrijos	3	A	30	208	2.9	10.34	71.72	6.93
El Chorizo	3	A	25	173	2.1	11.90	82.38	6.92
S.Sebastian,C.d.Rol/19	3	VC	22	166	1.6	13.75	103.75	7.55
Marcos Carrion	3	A	20	138	1.5	13.33	92.00	6.90
Entr.Jardines Veracruz	3	A	20	128	2.4	8.33	53.33	6.40
Martha Quezada	3	A	18	125	9.75	1.85	12.82	6.94
Rotonda Diana	3	A	18	115	1.8	10.00	63.89	6.39
Van Pac	3	A	16	111	2.4	6.67	46.25	6.94
Camino Sto Domingo	3	A	8	51	1.9	4.21	26.84	6.38
Biblioteca Bo Central	3	A	7	42	2.8	2.50	15.00	6.00
Candelaria	3	VC	3	32	13.7	0.22	2.34	10.67
			1711	10956	165.35			

II.5. UP-Grading alternatives in relation to land-use and at micro-level.

This subject is very broad and it is linked to a determination of an urban-typology (types of urban development layout) a social-typology (family and community organization) and a prototype of building elements for the consolidation and/or building up the infrastructure and the dwelling.
The main issue here is the interrelation between the consolidation of the spatial structure and the social development of the barrios.
Already in the DIAGNOSES (1985) and in the Refflections:Realisin the need for Pilot Plans (1985),the general premises for establishing interventions in the different types of barrios were formulated.These premises had as a starting point the situation of extreme poverty and the physical /social character of each barrio.
Diagnoses emphasised the need to extend the studies of the human factors (survey 86).Such as the demographic ,socio-economic and employment conditions.This meant going deeper into the sub-cultural forms that preceeded the present reality and to look for the tendencies of social changes including the social patologies,social organizations.
The focus is on the relationship between human space.family house and community settlement,not just as a mechanical causal subordination of function to space,but a dialectic involving interaction and reciprocity. In consequence the physical environment can become a powerful instrument in accelerating and facilitating the development of human and communal values,or, from the negative viewpoint,be a source of social pathology (alcoholism.speculation.black market.etc.)and a brake on development. it was noted that the fact that there cannot be a socially meaningful physical environment without the participation of the users.The form of receptivity or rejection of a group with respect to its built environment should be organic and anticipated and stimulated by those who share responsability in establishing them.
The final analysis group participation constitutes the only acceptable pattern of control over and assaesment of the validity of the work of technicians.
Integrated up-grading is a process that implies a continous intervention between the spatial,economic and social components of target groups.In the existing transitional conjuncture Nicaragua is deeply affected by foreign aggresion.and has been forced to orient integrated up-grading towards subsistence forms. These forms permit transitory adjustments to the situation of war and at the same time establish the bases for integrated development. This process includes a gradual incorporation of the community into the benefits of development.Integrated up-grading implies environmental,economic and social improvements of the population.

Managua's barrios have experienced an accelerated process of inmigration from rural areas.in addition to growth from the natural increase of the population.
What is being sought is an equilibrium that allows the interaction of the population in its socio-cultural dimensions with an urban reality that is a result of what are now obsolete interests.This involves searching for elements of a socio-spatial

character both at the family and community levels.which permit the process of integrated development.
At the level of the household elements exist that express forms of cultural authentically and at settlement scale elements exist that strengthen the willingness for social changes.but these achievements are only possible in so far as there exist possibilities for the participation of the people in settlement decision-making at a regional.zonal and settlement scale.This does not however.diminish the fact that the definition of prototypes of habitat and settlements is a theme profoundly related to the planning of regional resources.particularly in relation to the use of certain materials and the production process defined by the national strategy.
In this is included the design of prototype elements for drainage works.channeling of rain water.pavement in general and sewege systems at the household and community level.

II.5.1.General criteria for adjustments to land use.

1. The existing land-use within the barrio is a matter of specific analysis in each particular situation. For these reason a method has been established to evaluate the present situation with a predicted one.(Chapter III).
The predicted situation is not only linked to local imperatives but also with the forms of general urban structure and the feasibilities of economic development.
2. The alternative adjustments of land-use,must mainly consider the present economic and financial limitations of the country,and shall consider the low purchasing potential of the users.Therefore alternatives of low initial cost must be developed.this does not mean a great change in the urban structure,but higher potential could considerable improve the future possibilities for the consolidation and density increases required in the city.
3. It is necessary to guarantee a certain harmony between public and private space according to flexible criteria and the characteristic of each barrio.
To define relationship between public and private space is fundamental when we are faced with into such extreme poverty. The characterizatiuon of family relationships and those of the "allegados" (newcomers sharing a house not necessarily having a blood relationship with the primary household).
The equipment of the house,its defferent spaces,the domestic production,the cycle of using water and the relationship between open and closed spaces are all issues that must be evaluated in each particular situation.
Then the "habitability" of the dwelling is considered within its inmediate location (neighbourhood) and the barrio itself.
The environs of the dwelling (private space) contain the family space and its equipment.which is the nucleus where the family develops,produces and consumes. The neighbourhood space is the area used by a number of houses for shared functions (children playyards,"finding" space.domestic and group production ,etc.)
The communal space are collective Centres which provide functions which do not have a place in the dwelling.
4. To provide the barrio with its future requirements and conmensurated with those spectative of the city. This requires that the land-use alternatives must contain a process of progressive adjustments to the land-use. The studies point out

CHART 27.

I N T E G R A L P L A N F O R S L U M U P G R A D I N G

III.1. System for evaluation and prioritization of interventions
III.2. Action Plans

III. SYSTEM FOR EVALUATION POPULAR SETTLEMENT CONDITIONS.

III.1. The Method.

A method was required in order to evaluate the conditions of the built structure of the city in the different phases of the upgrading and urban planning.

1. There was a need to make an inventory of the existing situation of the popular settlements in relation to the feasibility of up-grading actions in order to establish priorities.
2. There was a need to evaluate the different technical alternatives of improvements.

The first phase requires some general knowledge of the barrios and a number of technical assumptions of an empirical nature. The second requires a deep knowledge of the existing reality of prototype settlement, a good knowledge of the specific problem that is needs to be resolve and comparison it with concrete alternatives.

The evaluation has then two phases:

1. Evaluation of the existing conditions (both at the level of the Basic Unit (a geographical unit used for planning purposes of an area with a radius of about 800 m) and at the level of the settlement itself.

2. Evaluation of alternative projects at the level of DIRECTOR PLANS of prototype settlements (includes technical design and financial options of each project).

The system of evaluation that has been developed in this study is rooted in the METODO DE EVALUACION DE PROYECTOS DE VIVIENDAS of the Plan de Desarrollo Tecnico de la construccion. Direccion de Evaluacion de proyectos. Vicepresidencia de proyectos. Comite Estatal de la Construccion. CUBA.

Only the philosophical and some formal aspects of this study could be adapted to the particular situation of Managua.

The most important starting points, are the following:

-Evaluation implies to weight the present reality of popular settlements and to compare it with the social, technical, political and economic possibilities for improving them.

-We need a methodological model able to evaluate the conditions of every settlement across the whole scope of variables.

- To evaluate means to divide each part of reality and to compare it with a given goal, within a rational range of possibilities.

-Each component of the urban reality is weighted in a different way in relation to the feasibility of up-grading actions, therefore the different BASIC DETERMINANTS of the reality within a "weight system" shows the hierarchy of the different variables on a structured whole.

- Assesment of BASIC DETERMINANTS using values,norms or indicators.Each component contains a problem and a solution.

- To evaluate means to compare a problem with a solution and it is then characterised using an indicator.This involves describing the reality requiring improvement and to evaluating it.
Thus each problem has its reference value. both as a subjective reality (the desires and aspiration of low-income populations) an as an objective reality (the lack or existence of any urban service or technical infrastructure network.
This reference value is derived either from existing data or existing norms. e.g. the Master Plan of the city, Ministry of Housing,building norms,programme of the various institutions-, or the data should be established on an empirical basis which has been prooved by practical demostration.This values are the urban indicators.

- In order to determine the level to which a problem or a solution fulfills the value of the given norm,the unity is used.

III.2. Application of the Method. Determination of order of priority for settlements to be upgraded.

The goal is to select in order of priority those settlements which must be studied in order to initiate and establish action-programmes for each of them.

III.2.1. Basic determinants.

The BASIC DETERMINANTS are divided into two large categories,the one being all those of an **urban-social** nature, and the others all those of a **technical** nature.
A greater weight (value=60%) was given to the urban-social components because social dynamics were considered of higher priority than shortages in technical infrastructure components (40%).
The urban social components comprises three main aspects: socio-economic,land-use and relationship to the Urban Development Plan of the city.Their weighting is 30%,20% and 10% respectively.
The technical infrastructure components comprises :the existing networks (20%) and the feasibility of upgrading (20%).
The socio-economic component has a high weighting because it is an important factor when determining the level of development of the barrios.
The relationship of the existing situation with the Urban Development Plan of the City (EDUM) is not as important given the generally critical situation of the city as a whole. Under these circumstances the short term (emergency) solutions necessary at settlement level are more important than overall city plans.
Use of land.This component has a greater value than the above (EDUM),because it relates to direct actions concerning present emergency level problems (the high rate of rural-urban migration and the need for urbanised land).
Regarding the technical infrastructure aspects both components (existing infrastructure and feasibility of upgrading) score in the same proportion.

II.2.2.Criteria for the Qualification of the Basic Determinants.
In reality a strict fulfillment of the value of the reference or

norm is seldom given. The solution is usually greater or less than the norm value.The observation or non-observation of the norm can be both an advantage or an outrage for the goals of the project.Therefore we differenciate Positive and Negative determinants.

II.2.2.1. Positive Basic Determinants

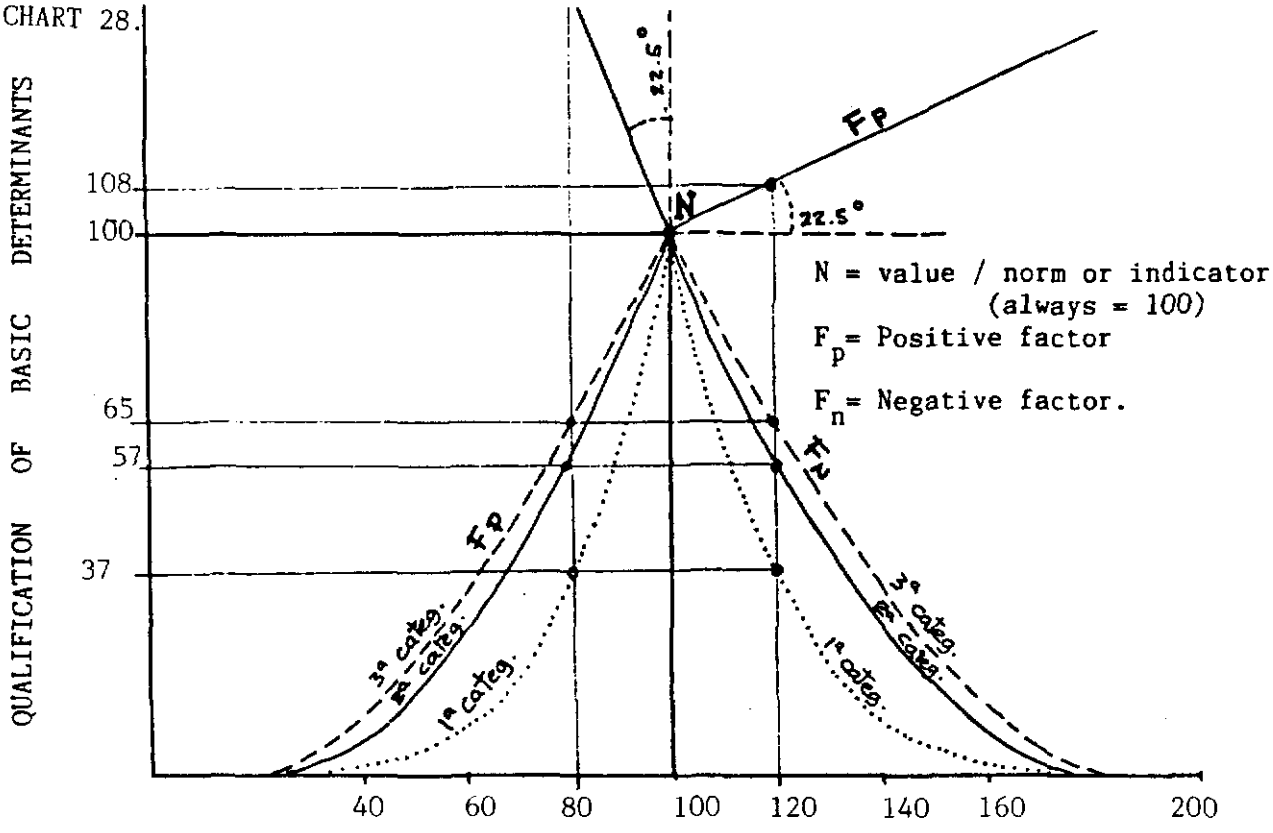
Are those which increase produce an improvement from functional or economic point of vieuw.e.g. A greater rate of popular participation (over the value of the norm) increases the feasibility of the project.

II.2.2.2. Negative Basic Determinants.

Are those which increase is a disadvantage .E.g. Steel input x m2.or a greater amount of lineal pipeline x ha. if the solution greater expenditure is required than is necessary,if it is lesser,economies can be made.

The following chart shows the different weight assigned to positive and negative Basic Determinants. Notice that a Positive or a Negative aspect can both observe or bear no relation to the norm,therefore these are four possible situations.

CHART 28.



III.2.2.3. Differenciated Requirements.

Works assume a different importance according to the size and characteristics of each settlement. Three categories are here differenciated:

I Category Typical Barrios > of 800 dwellings. Planned with conventional norms,Solutions in serie (repetitives)

II Category Barrios a-typical, from 200 to 800 dw.With specific solutions to each barrio

IIICategory Singular solution,less than 200 dw.

Note: The vertical axis indicate the qualification expressed in centesimal.The inclination of the line is 45 /2.The curve of the 2nd category is tangential at the point N to the line F.The curves are paraboles with an exponent based on Vn-2.

III.2.2.4.The following schema shows the applicability of the system that was used for the prioritization of barrios.

CHART 29

BARRIO DATA AND THEIR EVALUATION FOR SANITATION FEASIBILITY.
RANKING OF THE DIFFERENT ASPECTS THROUGH URBAN INDICATORS.

Name of the Barrio:			Number of households:				
Population :			Age of the Barrio :				
OBJECTIVES	COMPONENTS	BASIC DETERMINANTS	weight	Qualification value	ref.	value	I.C.U
URBAN SOCIAL (60%)	SOCIO-ECONOMIC (30%)	. Scholarship	4				
		. Employment	8				
		. Sanitation	4				
		. Popular Particip.	10				
		. Overcrowding	4				
	E.D.U.M. (10%)	. Importance /EDUM	5				
		. Rel.City Centres	5				
	USE OF LAND (20%)	. Useful area	5				
		. Residential area	2				
		. Circulation area	2				
		. Communal area	2				
		. density dw/ha	5				
		. Restrictions	4				
TECHNICAL (40%)	EXISTING NETWORKS (20%)	. Roads phys.state	4				
		. ml/ha sewerage	4				
		. ml/ha drainage	8				
		. ml/ha water	4				
	UPGRADING FEASIBILITY (20%)	. topography	3				
		. relation -networks:					
		- sewerage	3				
		- water supply	3				
		- drainage	5				
		- altern.sewerage	3				
		- altern.drainage	3				

III.2.3.5.Criterias for the weighting of Basic Determinants.

The selection and prioritization of barrios on were to carry out up-grading plans needs to be carefully studied. Overall is the need to create a demonstration effect for to assure re-applicability of popular actions.

The criteria used for the weighting of Basic Determinants and their relationship with each reference value or norm are the following:

1. Level of Education.(4%).

Credit is given to those barrios that contain inhabitants with a higher level of education.It is considered worthwhile to give these greater support because assure greater commitment (political,social direct implementation).in the development and construction work.

Education is evaluated as follows:

Qualification	credit
1 Technical	10
2 University	8
3 Secondary	6
4 Primary	4
5 adult education	2
6 literate	1
7 illiterate	-2

The category of illiterate receives a negative value because it has been proven to delay further development

2.Employment (8%.)

A high value is given for employment in the Public Productive Sector because this is a policy of the present government. A lesser value is given for unemployment and the (informal) sub-employment sector because the economy is presently in crisis and it is not possible to subsidise the non-productive sectors. Service sector employment.including commerce,receives an intermediate value because of its support role to the growth of production and distribution.

Sector	credit
1. Public productive	10
2. Private services and commercial	7
3. Small Individual (business)	5
4. Informal	-3
5. Unemployed	-3

The informal and unemployed sectors receive a negative value because they do not support economic development and support inflation in a distorted economy.

3. Level of Health (4%).

A higher value is given to those barrios with the greatest health problem (usually due to poor sanitation).The determinant is calculated per 1000 inhabitants and is valued as POSITIVE in setting priorities for works because illness has a negative effect on the economy.

4. Popular participation (10%).
Greater value is given to popular action than to the level of organisation in a community.All community activity that is related to community developments and encouraged and implemented by popular organization receives the same credit.

Issue	Credit
1. Level of Organization	1
2. Community action by own initiative	3
3. Community action by non gov.organization	3
4. Community action initiated by the state	3

5.Dwelling occupation (overcrowding) 4%.
Overcrowding receives a POSITIVE value because it is considered a negative factor which requires assistance.

6. Relationship to Urban Development EDUM .(5%).
The direct reference used by the Urban Development Plan is used.

7. Relationship with the "city centres" (development nodes at the city)(5%).
In order to asses this aspect the indicators of the norm was used,in this case the Index of satisfaction,according to the relationship between the settlement and the Urban Development Plan.The same criteria is used to assess the relationship between the settlement and the City Centres. The value is POSITIVE.

8. Land Use.(5%).
The assessment of land use in each barrio is in terms of net capacity and categorised as residential 2%.circulation 2% and communal areas 2%. The proportions are compared with the norm contained in the preliminar norms of Progressive Urbanization (MINVAH).

9. Densities (5%).
The categories of dwelling/hectare.inhabitants/ha and inhabitants/dwelling are all aspects compared against the MINVAH norms of social housing.

10. Environmental Restrictions (4%).
A reference value of Good.Acceptable or Bad is given according to conditions of habitation for each barrio.Factor which are taken in account are water contammination, floods and the feasibility of connection to service networks at a reasonable cost.

11. Physical Conditions of Existing Networks.
11.a. Road system (4%).
A norm is used as reference value eg 1=good) in order to assess an Index of Satisfaction. A greater value is given to road systems in the worst condition and a lesser value to those in better condition.The value is NEGATIVE .
11.b. Seserage (4%).
Since Managua is well serviced by a primary sewerage system the assessment is mainly in terms of the feasibility of improving or completing the secondary networks.reference is generally made to the efficiency of the existing system described in ml/ha.ml/dw and the numbers of inhabitants either already connected or to be connected to the networks. More specifically:

a. the number of dwelling units already connected to the network in relation to the total number of dwelling units in the settlements ie. the existing situation without regard to the underutilisation of the existing system.
b. the potential of the existing network in relation to its capacity in terms of dwelling units and in relation to the design densities of the settlements.This indicator shows the effective capacity of the service in relation to the maximum housing capacity of the project. Sewerage is an expensive service to install and mantain and it is necessary to plan with accurate indicators particularly in the low-income settlements.The most important physical indicator is the ml/dw which is used to evaluate the technical-economic feasibility of the projects and to asses the locations siutable to be given priority for increased densities on the basis of their ability to be serviced. Those areas without potemntial in their existing networks require alternative solutions.Possible soil infiltration.These are evaluated according to their productivity and also in relation to the costs of extending the system with reference to future servicing.

11.c. Rainwater Drainage (8%).

The efficiency of the net measured in ml/ha,ml/dw and ml/p is used as reference value.The problem is separated in to local disposal of rainwaters and disposal to its final destination.The analysis of local disposal is done by the same method as for sewerage.the larger system of closed and open channels is assessed on the basis of direct and indirect volumes of water received in relation to the capacity of the existing system.

11.d.Drinking water (4%).

The analysis of the drinking water network is also doen by the same method as for sewerage.A specific factor in this case is the daily consumption per capita which is an indicator of the interventions needed in the domestic water networks.

11.e.Topography (3%).

The topographical indicators ("bad" or "better") relate to the characteristics of the topography according to the type of upgrading action that is intended.

Others indicators include depth of water table,regime of surface water (flood areas) soil stability. (geo-technically problematic zones).

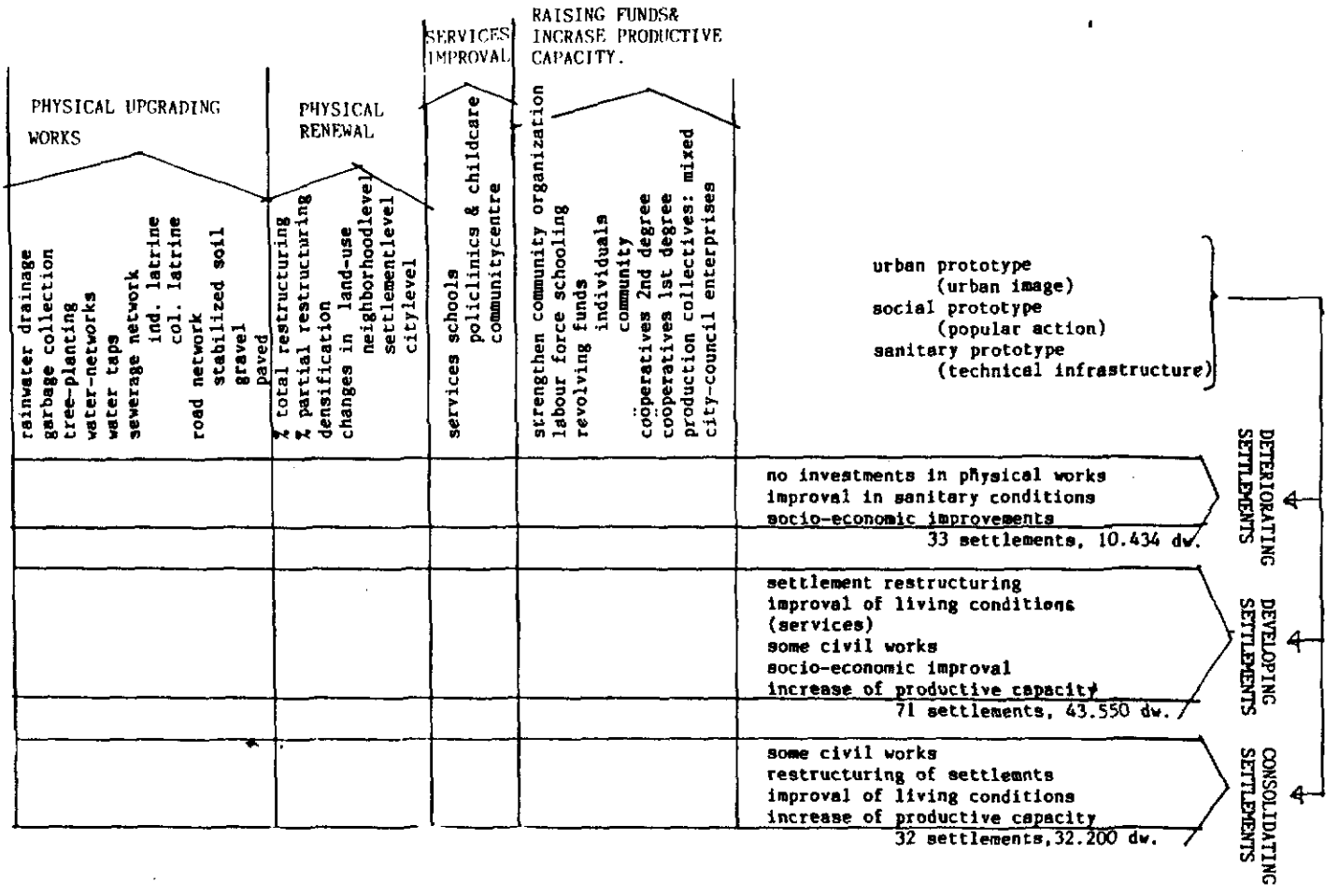
In the case of alternative waste water disposal indicators of water percolation in the soil is also considered.

III.2. ACTIONS PLANS.

The last phase of the PSIB is the formulation of Action Plans.For setting the priorities of interventions,the PSIB makes use of the Evaluation Method,which criterias and assessments are in continuous process of adequation to the changes ocurrying in the city and to the interest of the various Institutions and Popular Organizations involved.

The following list is done in February 87 and was used as Action Plan the ongoing year as far. This list is matter of discussion at the Regional Buro (Delegacion Regional de la Secretaria de la Presidencia) inasmuch it coordinates the annual programmes of the various Regional Institutions.
In making this list,simplified criteria was used for the establishing of priorities.
In the list the barrios are classified in 3 priorities P1,P2 and P.The idea is to attend about 50.000 persons per year in sanitation upgrading.

PROGRAMME OF INTERVENTION IN MANAGUA'S POPULAR SETTLEMENTS, 1986.



PRIORITIZATION OF BARRIOS FOR UP-GRADING INTERVENTION CHART 30

P 1A

B.Prio	Tip.psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 1A	F	Domitila Lugo	VD	691	5653	27	25.22
P 1A	F	Domitila Lugo	C	45	267		
P 1A	F	Santa Rosa	Vd	891	7262	43	20.63
P 1A	F	Santa Rosa	C	237	1296		
P 1A	F	Carlos Sanchez	VD	924	4351	31	29.81
P 1A	F	Jose Dolores Estrada	VD	926	5479	35	26.16
P 1A	F	Jose Dolores Estrada	C	66	461		
P 1A	C	Jose Dolores Estrada	U	30	180	1	60.00
P 1A	F	Waspan	VD	764	5538	35	22.14
P 1A	F	Waspan	A	165	1146	4	39.29
P 1A	F	Camilo Chamorro	VD	1359	8238	53	25.45
P 1A	F	Camilo Chamorro	C	80	437		
P 1A	C	Camilo Chamorro	U	131	786	6	21.13
P 1A	C	Camilo Ch. (Oscar Lino)	U	233	1398	8	30.26
P 1A	E	Jose Benito Escobar	VD	1512	14968	43	35.08
P 1A	F	Bertha Diaz	VD	524	1791	19	27.72
				8.578	59.251	306	

B.Prio	Tip.psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 1B	E	C.Sandino 2/6, Bella Cruz	VD	1711	15194	91	18.89
P 1B	E	C.Sandino3/6, Bella Cruz	VD	2565	22042	101	25.40
P 1B	E	C.Sandino1/6, Bella Cruz	VD	858	7106	44	19.41
				5.134	44.342	236	

B.Prio	Tip.psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 1C	C	Catorce de Septiembre	U	128	768	4	31.22
P 1C	E	Sol de libertad	VF	2502	10821	42	59.43
P 1C	E	Villa Revolucion	VF	739	7837	24	30.41
P 1C	E	Villa Venezuela 81%	VF	2057	17153	71	28.97
P 1C	E	Villa Venezuela	VF	475	3909	36	13.38
				5.901	40.488	177	

B.Prio	Tip.psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 1D	F	Camilo Ortega	VD	797	6820	34	23.72
P 1D	C	Camilo Ortega	U	32	193	2	16.84
P 1D	F	San Judas Norte 80%	VD	3814	21854	50	76.28
P 1D		San Judas Norte 80%	VA	0			
P 1D	A	San Judas Norte	C	102	558		
P 1D	F	San Judas Norte 20%	Va-VD-	1986	12724	49	40.20
P 1D	A	San Judas Norte	C	327	1788		ERR
		Sierra Maestra	VD	1269	11807	50	25.58
				8.327	55.744	185	

B.Prio	Tip.psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 1E	C	Francisco Meza	U	199	1194	9	22.36
P 1E	C	Jorge Dimitrov	U	1040	6240	36	29.21
P 1E	D	San Jose Oriental 50%	VJ	81	3270	15	5.47
P 1E	A	San Jose Oriental	C	89	486		
				1.409	11.190	60	

B.Prio	Tip.psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 1F	F	Arial Darce 66%	VD	872	7896	38	22.95
P 1F	F	Ariel Darce	C	142	776		
P 1F	F	Ariel Darce 33%	VD	506	4193	14	36.14
				1.520	12.865	52	

Note:

P = priority

viv. = (vivienda)= dwelling

Tip.PSIB = PSIB typology of barrios

PRIORITIZATION OF BARRIOS FOR UP-GRADING INTERVENTION

Continuation

B. Prio	Tip. psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 2A	F	Cuba	VB	226	2914	14	16.74
P 2A	F	Cuba	C	236	1290		
P 2A	D	Santa Ana 38%	VD	458	5157	15	30.74
P 2A	D	Santa Ana	VJ	0	0	0	
P 2A	D	Santa Ana	C	166	907		
P 2A	D	Monsenor Lezcano	C	388	2122		
P 2A	D	Javier Cuadras	VJ	405	2342	26	15.70
P 2A	D	Javier Cuadra	C	12	65		
P 2A	D	Santa Ana 50%	VJ	483	5524	18	26.69
P 2A	B	Monsenor Lezcano	A	20	160	1	40.00
P 2A	D	Santa Ana 3%	VJ	14	255	1	11.67
P 2A	D	Santa Ana	C	16	87		
P 2A	D	Santa Ana 9%	VJ	64	158	4	17.78
P 2A	D	Santa Ana	C	29	158		
				2517	21139	78	

B. Prio	Tip. psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 2B	D	Monsenor Lezcano	VJ	1755	19713	39	44.77
P 2B	A	Monsenor Lezcano	C	260	1421		
P 2B	D	Monsenor Lezcano	VJ	712	9357	31	22.89
P 2B	A	Las Torres 6%	A	55	429	1	55.00
P 2B	B	Los Angeles	A	180	1250	4	51.43
P 2B	B	Rigoberto Lopez Perez	A	15	75	1	25.00
P 2B	A	Las Torres 94%	A	839	6733	18	47.13
P 2B	F	El Paraiso	VD	437	4150	18	24.14
P 2B	F	Larreynaga	VD	995	7829	24	41.81
P 2B	F	Larreynaga	C	67	366		
				5315	51323	136	

B. Prio	Tip. psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 2C	D	Altagracia 10%	VD	321	2942	15	21.40
P 2C		Altagracia	VJ	0			
P 2C		Altagracia	C	0	0		
P 2C	D	Altagracia	VJ	527	12071	28	19.03
P 2C	A	Altagracia	C	231	1262		
				1079	16275	43	

B. Prio	Tip. psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 2D	F	Riguero	VD	1328	10299	26	50.69
P 2D	F	Riguero	C	39	213		
				1367	10.512	26	

B. Prio	Tip. psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P 2E	F	Venezuela	VD	1172	9588	32	
P 2E	F			68	372		
				1.240	9.960	32	

PRIORITIZATION OF BARRIOS FOR UP-GRADIN INTERVENTION

Continuation

B.Prio	Tip.psib	BARRIO	TIPO.	NoVIV	POBLACION	HA	Viv./Ha.
P	A	Acahualinca	VA	868	5186	20	44.29
P	A	Acahualinca	C	38	207		
P	A	Acahualinca Norte	A	70	449	2	35.00
P	C	Edgar Lang	U	171	1026	5	32.88
P	I	San Patricio	VL	120	641	30	3.96
P	A	Julio Buitrago	U	165	990	4	41.25
P	D	Javier Cuadras	VJ	100	577	6	16.67
P	A	Julio Buitrago	U	295	1770	12	24.38
P	A	Jonathan Gonzalez	U	204	1224	6	36.43
P	A	Jonathan Gonzalez	A	546	3502	19	29.35
P	R	Santo Dom. y Buen Air	VC	83	446	10	8.65
P	B	Santo Domingo	A	60	416	5	11.76
P	A	Benedicto Valverde	VA	458	4394	5	91.60
P	F	Los Angeles 95%	VD	447	3673	32	13.97
P	D	Rigoberto Lopez Perez	VJ	983	8037	40	24.58
P	A	Rigoberto Lopez Perez	C	278	1520		
P	E	Colonia Managua	VG	125	906	3	41.67
P	B	Camino Sto Domingo	A	8	51	2	4.21
P	F	San Luis Sur	VD	364	2737	27	13.28
P	E	Tenderi	VG	441	3500	9	50.11
P	G	De Junio 10	VG	748	5900	24	31.17
P	G	Maestro Gabriel	VK	330	3256	9	37.50
P	G	Nicarao 85%	VG	567	5186	25	22.50
P	G	Nicarao	C	47	256		
P	F	Adolfo Reyes 66%	VD	279	2719	6	46.50
P	H	Bello Horizonte 25%	VK	524	3449	21	24.72
P	H	Bello Horizonte 75%	VK	1571	10347	50	31.29
P	C	De Mayo 1	U	173	1038	8	22.76
P	G	Nicarao 15%	VG	204	1810	5	40.00
P	F	Adolfo Reyes 33%	VD	139	1315	4	39.71
P	I	Santo Domingo	VM	94	552	32	2.94
P	E	Primero de Mayo	VG	1190	9634	23	52.65
P	C	Camilo Ch. (Q. Pacheco)	U	76	456	3	24.52
P	E	Villa Libertad	VG	1733	12766	26	66.65
				13499	99936	472	

PRIORITIZATION OF BARRIOS FOR UP-GRADING INTERVENTION

Priority	N°of Dwellings	Population	% of tot. populat.	Ha.
1 A	8.578	59.251	6,84 %	306
1 B	5.134	44.342	5,12 %	236
1 C	5.901	40.488	4,67 %	177
1 D	8.327	55.744	6,43 %	185
1 E	1.409	11.190	1,29 %	60
1 F	1.520	12.865	1,48 %	52
2 A	2.517	21.139	2,44 %	78
2 B	5.315	51.323	5,92 %	136
2 C	1.079	16.275	1,88 %	43
2 D	1.367	10.512	1,21 %	26
2 E	1.240	9.960	1,15 %	32
P	13.499	99.936	11,53 %	472
Total	55.886	433.025	49,96 %	1.803
Total MA-NAGUA/85	117.557	866.533	100,00 %	4.828

I N T E G R A L P L A N F O R S L U M U P G R A D I N G

IV. Pilot Plans

PILOT PLAN FOR THE UP-GRADING AND SANITATION OF LOW-INCOME SETTLEMENTS IN MANAGUA

The Integral Sanitation and Up-grading Plan generally has a multidimentional character. It intends to tackle the consequences of poverty at their most sensible points, through integrated development programmes that can generate physical improvements and create conditions for the economic basis of growth within the settlement.

The functions of the Plan are:

1. REVISION of hypothesis concerning different types of low-income settlements and of new modes of intervention for their improvement.

2. EVALUATION of different up-grading and sanitation alternatives ,in relation to the needs of each settlement and taking account of the community organization's experiences.

3. FEED-BACK to the model in order to have an ongoing reformulation of the action plans of local institutions and in order to be able to use it as a methodological system in other countries of the region.

4. DATA BANKS, mainly those concerning forms of community organization, self-help, performance and productivity of the works carried out and follow-up possibilities (re-applicability) in other context.

CHART 31

TYPOLOGY OF BARRIOS AND PILOT PLAN

TYPE OF BARRIO	POPULATION	N° DWELL.	% DWELL.	PILOT BARRIO
Spontan. settl., ruins and cuarterias (illegal old and new)	66.869	10.434	11,7	B-15
Progressive urbaniza.(site-&-services after 1979)	28.081	5.387	4,95	J. Gonzales
Planned popul. barrios (old)	237.449	30.966	28,45	Ciudad Sandino
Spontan. popular barrios	259.587	38.168	35,07	Camilo Ortega Adolfo Reyes
Sub-total			79,64	
Residential	152.362	22.168	20,36	
Total	777.348	108.822	100,00	

SETTLEMENT TYPES, PHYSICAL AND SOCIAL CHARACTERIZATION AND TYPE OF REQUIRED INTERVENTION

CHART 32

Type of settlement	Socio-physical characterization	Required intervention
Spontaneous settl. Slums and Ruins	Settl. developed in inadequate zones-high density- overcrowding -advanced physical dilapidation -lacking public services-marginal sectors(e.g. population displaced by the war)- extreme poverty - mainly adult population-weak social organization susceptible to anti-social actions.	Need resettlement-emergency up-grading programmes (especially health and sanitation)- income improvement and survival programmes.
Progressive developments	New settl. (site-and-services type)- self-help- lay-out designed by the Ministry of Housing (MINVAH)- with collective infrastructure but without sewerage system- dilapidated dwellings-young population- high unemployment and informal employment-population with a high degree of community participation consciousness.	Need provisional improvement of conditions of physical infrastructure and dwellings- Need lesser degree of physical rearrangement- Need income and productive capacity improvement programmes.
Planned low-income settlements	Settl.with legalized properties - presenting different types of lay-out and different degrees of consolidation - many having some type of infrastructure-dwellings in process of consolidation- unemployed adult population having different handicraft skills.	Need some type of physical rearrangement- infrastructure improvement of dwellings- improvement of productive capacity and of employment possibilities.
Spontaneous low-income settlements	In general these settlements present situations of legalizing properties- low density-adult population- community organizations with experience in collective work and improvement actions.	Need physical rearrangement (lay-out/ land use adjustments) basic infrastructure systems- improvement of dwellings and of productive capacity-density adjustments-efficient public unconventional services (that require low maintenance and popular participation).

STAGES OF THE PILOT PLAN

STAGE I Design, election of technologies, construction drawings, preparation / programming of construction works and other executions to be realized in collaboration between govermental and non-govermental local organizations.

STAGE II Stage of consolidation and reinforcement of community organizations and of collective programming of works to be carried out.

STAGE III Stage of construction and of collective production and survival programme initiation based on organization, participation, and self-help.

STAGE IV Stage of the organization and the building of basic civil works. Rearrangement of the settlement and relocation of dwellings that need to be demolished.

STAGE V Stage of construction of basic infrastructure works: sewerage, drinking water, rainwater drainage, pedestrian road pavement (surfacing), public lighting, afforestation of communal areas.

STAGE VI Stage of dwelling improvement linked to collective production or to community enterprises and to popular participation.

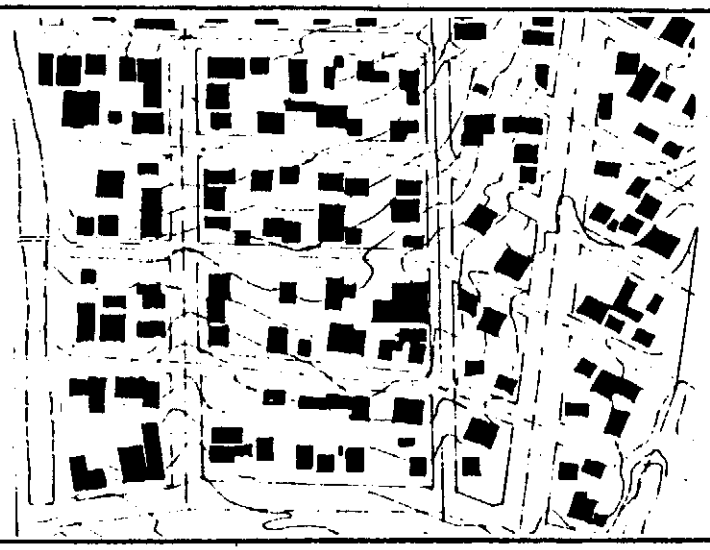
TYPE OF SETTLEMENT, QUANTIFICATION AND PERCENTAGES

CHART 33

Dwelling condition	Type of settlement	Population	Number of dwellings	% of total	Pilot settlement
Dwellings in poor condition	Spontaneous settl., slums and ruins (illegal new and old)	66.869	10.434	11,70	B-15 Acahualinca
Dwellings needing improvem. and/or enlargement	Progressive developments (site-and-services after 1979)	28.081	5.387	4,95	JONATHAN GONZALES
	Planned low-income and old settlements	237.449	30.966	28,45	Ciudad Sandino
	Spontaneous low-income settlements	259.587	38.168	35,07	Camilo Ortega Adolfo Reyes
Sub-total				79,64	
Dwellings that don't need enlargement or repair	Residential quarters	152.362	22.168	20,32	
TOTAL		744.348	108.822	100,00	

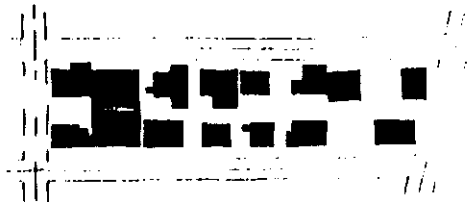
ALTAMIRA

Density : 41 dwell./ha.
Circulation : 4,8 ml/dwell.



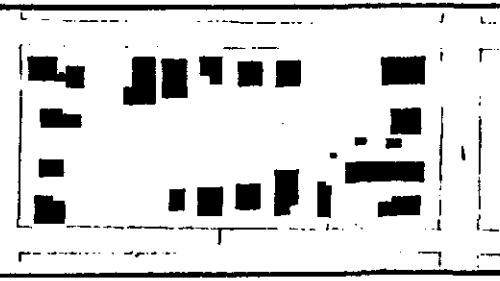
ADOLFO REYES

Density : 38 dwell./ha.
Circulation : 8,5 ml/dwell.



VILLA VENEZUELA

Density : 35 dwell./ha.
Circulation : 11,6 ml/dwell.



GRENADA

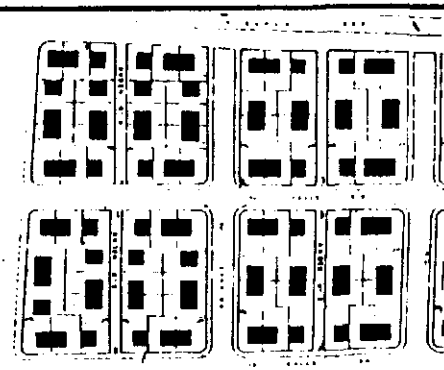
Density : 29 dwell./ha.
Circulation: 10,1 ml/dwell.

CAMILO ORTEGA

Density : 31 dwell./ha.
Circulation : 8,6ml/dwel

MONSENOR LEZCANO

Density : 27,8 dwell./ha.
Circulation : 9,0ml/dwell.



SAN ANTONIO

Density :37 dwell./ha.
Circulation : 7,02ml/dwell.

LAND USE

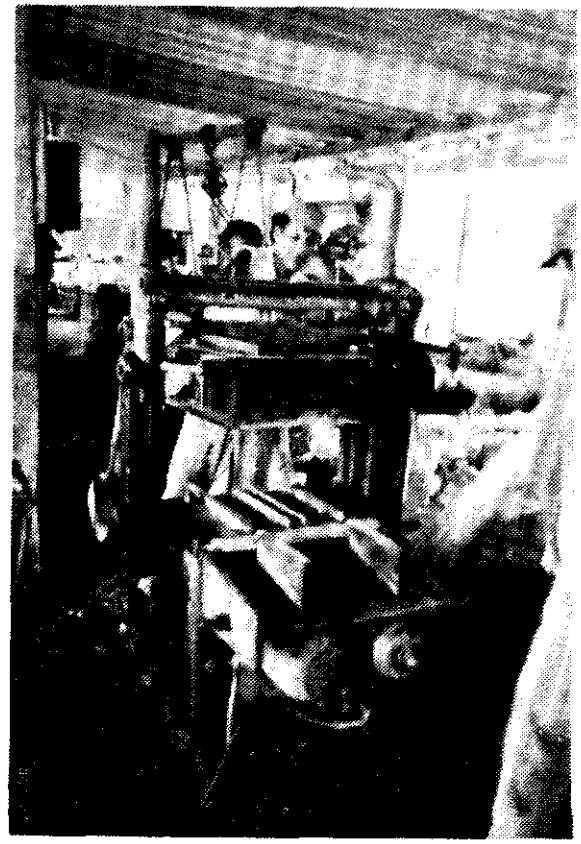
LAY-OUT SYSTEMS IN DIFFERENT BARRIOS OF MANAGUA

COMPARATIVE ANALYSIS

I N T E G R A L P L A N F O R S L U M U P G R A D I N G

Existing conditions in the five Pilot Barrios
Photographic Illustration

1



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3

PHOTO 1. Factory "Carlos Arrollo Pineda"
Metal moulds for the production of pipes.

PHOTO 2. Factory "Carlos A. P."
Concrete block production.

PHOTO 3. Factory "Carlos A. P."
General view. Storage and drying.

4

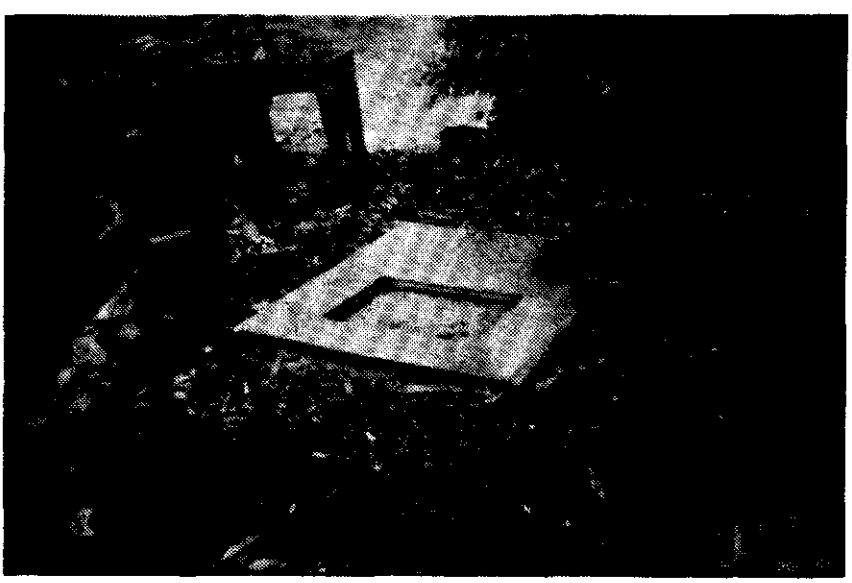

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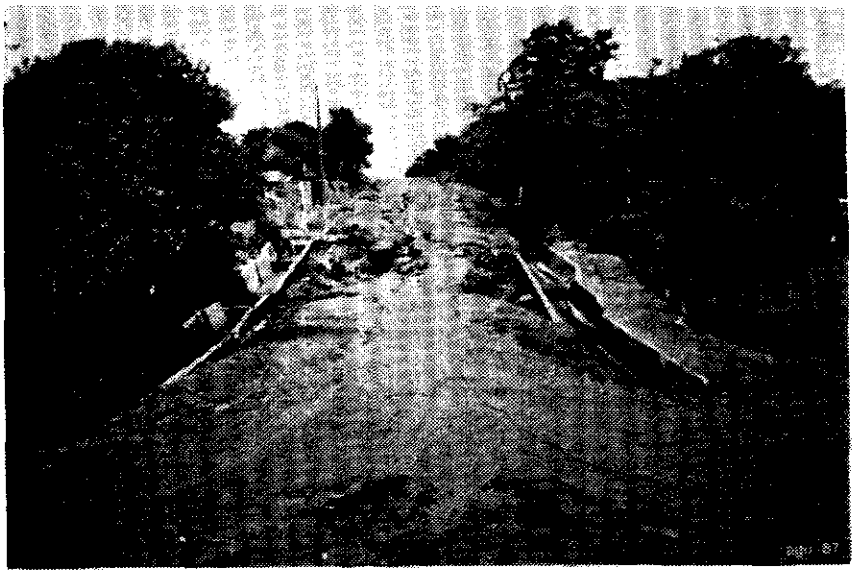
PHOTO 4. Factory "Ribas Salazar"
Casting of multiple washing units (single and double concrete washing units).

PHOTO 5. Factory "Ribas S."
Slab for latrine floor.



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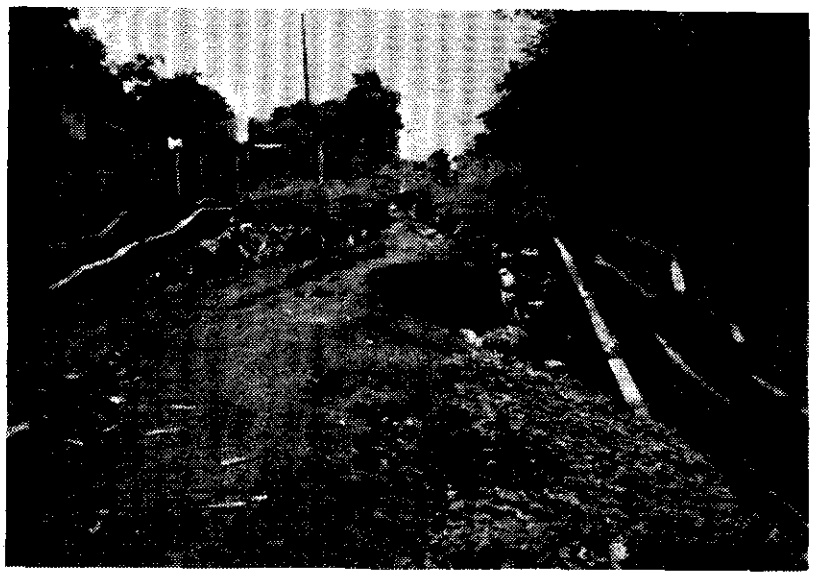

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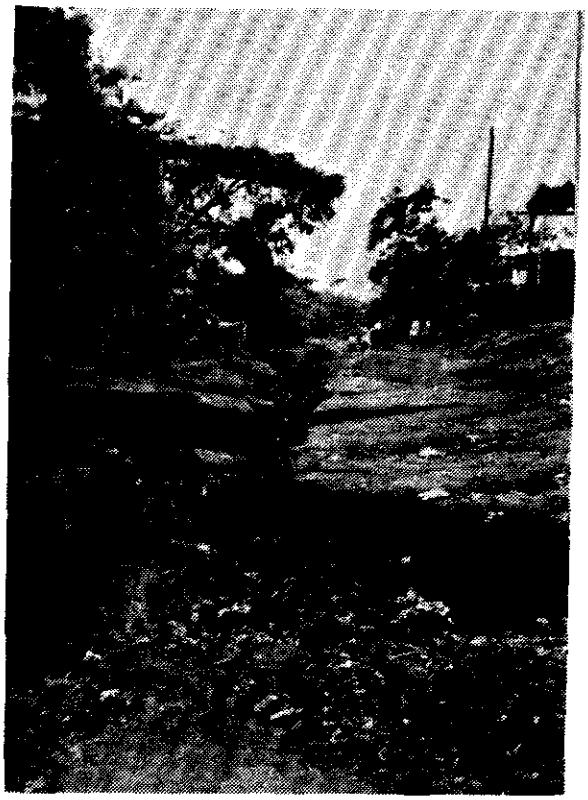
PHOTO 7. Barrio CAMILO ORTEGA. One of the roads belonging to the "basic main road network" that will be (consolidated) reconstructed in the short term. Note the rainwater drainage system opperating through open channels along the street. The "street-bed" has deep erosion furrows which make the ciculation of vehicles almost impossible.

PHOTO 8. Barrio C. ORTEGA. The same road of the last photo after a heavy rain. Note the evolution of the erosion furrows. Rainwaters do not reach the drainage channel because they are on a higer level than that of the street. In such cases erosion will finally destroy the drainage channels.



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11

PHOTO 9. Barrio C. ORTEGA. One of the roads belonging to what would be the "basic main road network". Note the lack of drainage systems and the depth of the erosion furrows and potholes. The consolidation project for this barrio includes, in the emergency phase, the reconstruction of this street. In this stretch concrete street tiles will be laid and open channels will be dug. Because of the deteriorated state of the street, it would be necessary to use machinery for its reconstruction. Note that a water supply pipe (indicated by an arrow) lays bare because of the erosion process.

PHOTO 10 Barrio C. ORTEGA. Typical examples of very rudimentary receptacles used for the storage of water, also a double washing unit. Note the direct disposal of waste water.

PHOTO 11. Barrio C. ORTEGA. Concrete tank for the collection of waste water, close to the boundary between the lot and the public road.

13

14

PHOTOS 13 and 14. Barrio C. ORTEGA. Two aspects of the same street: before and after a heavy rain. Note the enlargement of the erosion furrows. The erosion caused by the rain tends to block the outflow channels thus imparing the efficiency of the drainage system and causing local flooding. Note the great amount of garbage on the street. For this area the consolidation project includes the pavement (concrete street tiles) and the excavation of open drainage channels.

12

15

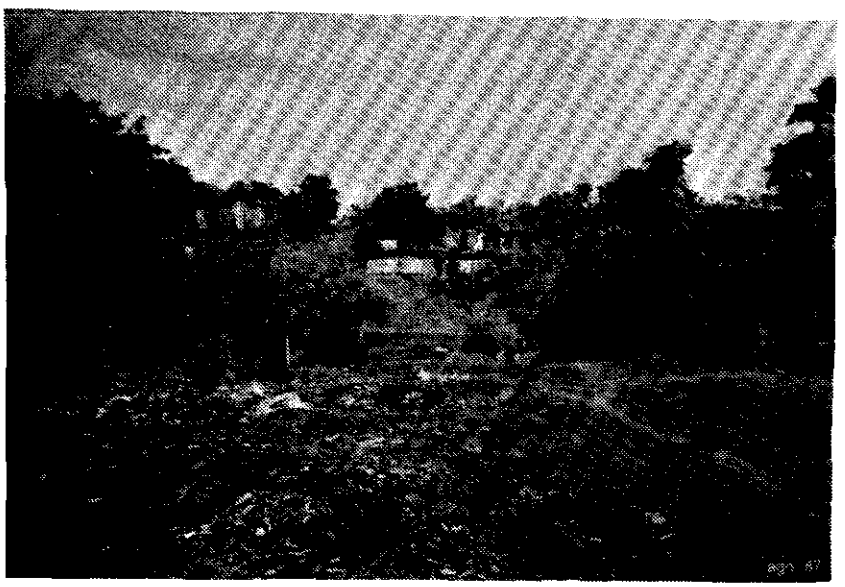
16

PHOTO 12. Barrio C. ORTEGA. View of a passage over an open "ditch" which contains a great amount of accumulate garbage and a pig freely wandering about.

PHOTO 15. Barrio C. ORTEGA. In this situation a dwelling is at high risk of slippage of the 5 mt. sub-vertical slope behind it. In this case the dwelling must be relocated and the slope regraded, or reinforcement works must be carried out.

PHOTO 16. Barrio C. ORTEGA. A pedestrian street without drainage, as shown by the large puddle. In such cases adequate drainage systems must be installed or the street regraded to eliminate the "low point". Note in the background the works for the installation of a drinking water network.

17



18

PHOTO 17. Barrio C. ORTEGA. A street to be reconstructed as a pedestrian way. Note the existing large drainage channel. In this case the consolidation plan proposes that a foot-path be built beside the channel to improve pedestrian circulation during the rain season.

PHOTO 18. Barrio C. ORTEGA. A street belonging to the main road network, near a "ditch". Note the amount of garbage on the street.

19

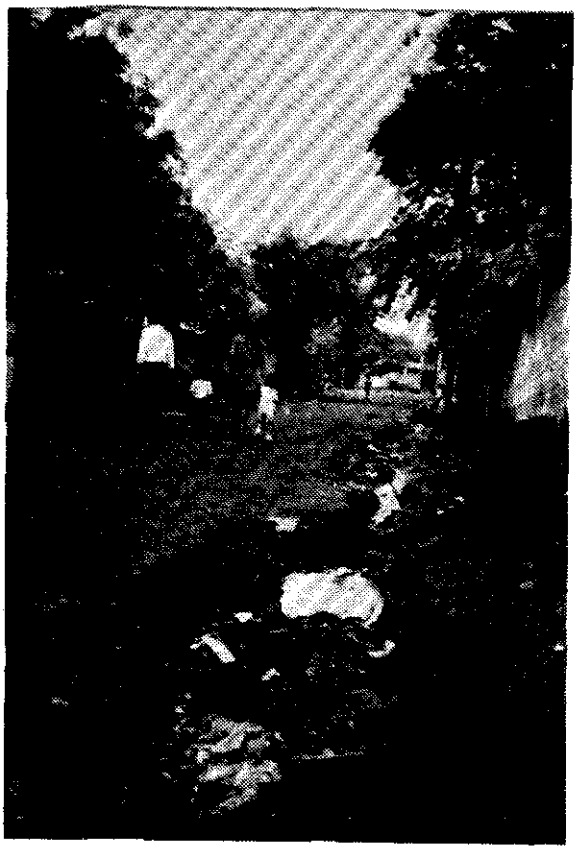


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PHOTO 19. Barrio ADOLFO REYES. Aspect of one of the streets to be reconstructed as a pedestrian way. Note the relatively good preservation of the place. Observe also that the street is rather flat and therefore severe erosion processes do not occur. The reconstruction of this street is planned on the medium/long term, with the use of aided self-help labour.

PHOTO 20. Barrio A. REYES. One of the streets to be reconstructed as a pedestrian way. Note the effects of erosion and the amount of garbage scattered along the drainage channel. This area already has a sewerage system. It is proposed that the road hierarchy will be main roads with a large number of pedestrian streets. In this system garbage will be collected from the main roads only.

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PHOTO 21. Barrio A. REYES. One of the streets chosen to be part of the "main road system". Concrete street tiles will be laid in the medium term. Note the amount of garbage thrown in the drainage channels and on the street.

PHOTO 22. Barrio A. REYES. Aspect of the main street near a ditch. Although the area is relatively flat, there is a concentration of rainwater in this part of the street (see drawing). The absence of drainage system results in water invading the houses on the left side of the photo. Sand bags are used to try to protect the houses from the rainwaters.

PHOTO 23. Barrio A. REYES. Main access road to the barrio. The building, which belongs to a school, is on a lower level than that of the street. When there are heavy rains the water flows from the adjoing streets into the school (see drawing). The consolidation project proposes the disposal of this waters before they reach the school.

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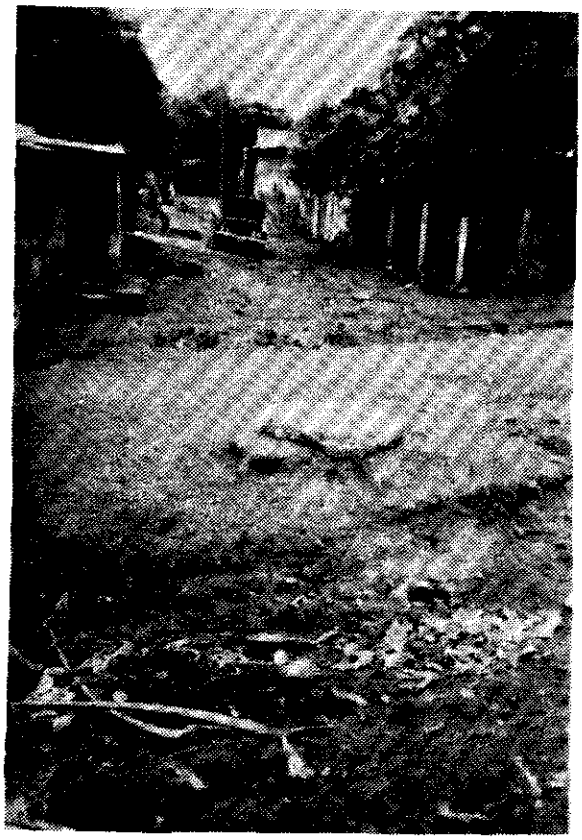

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PHOTO 24. Barrio A.REYES. An adjoing street which contributes to the flooding of the school. As an emergency measure this waters must be collected near the intersection of the streets (foregroud of the photo) and disposed of into the channel that existes on the boundary of the area.

PHOTO 25. Barrio A. REYES. Private collector that has been exposed by the effects of erosion.

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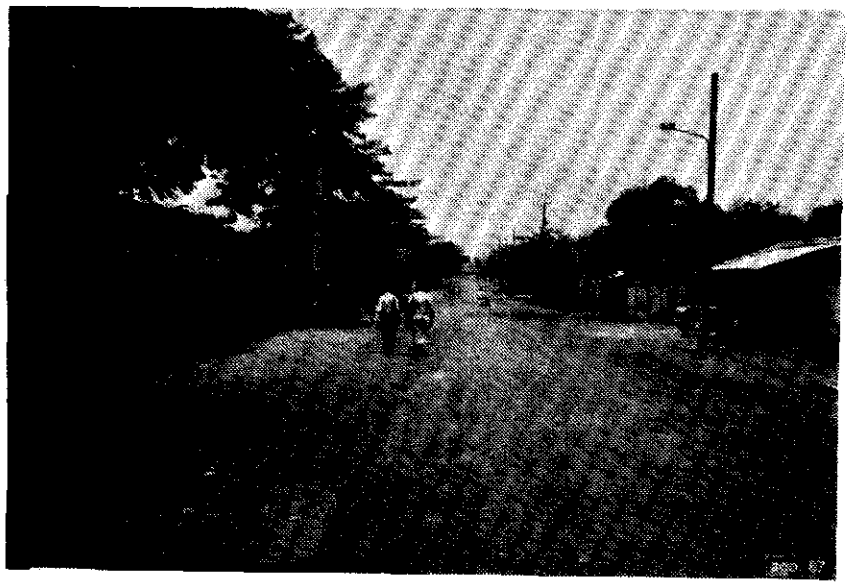

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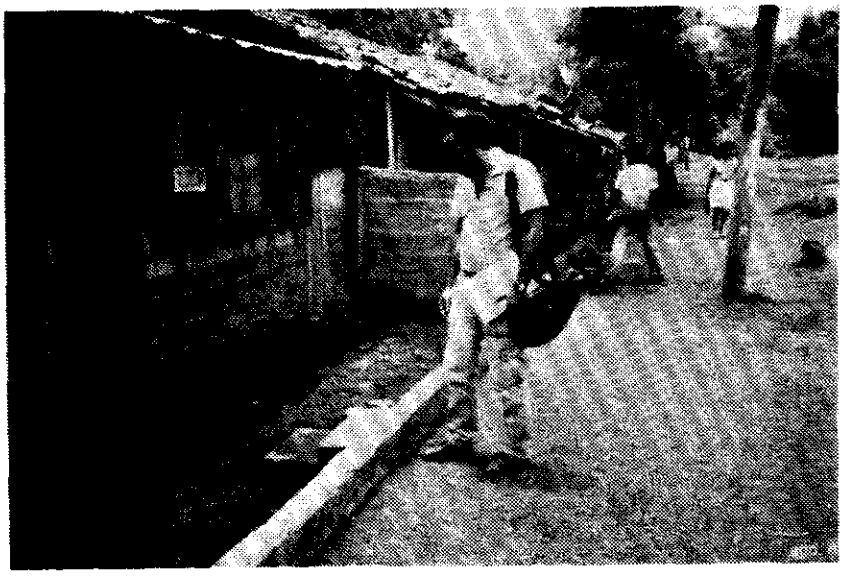
PHOTO 26. Barrio A. REYES. Manhole exposed by the erosion.

PHOTO 27. Barrio A. REYES. Garbage thrown on the streets and the presence of a loose pig.



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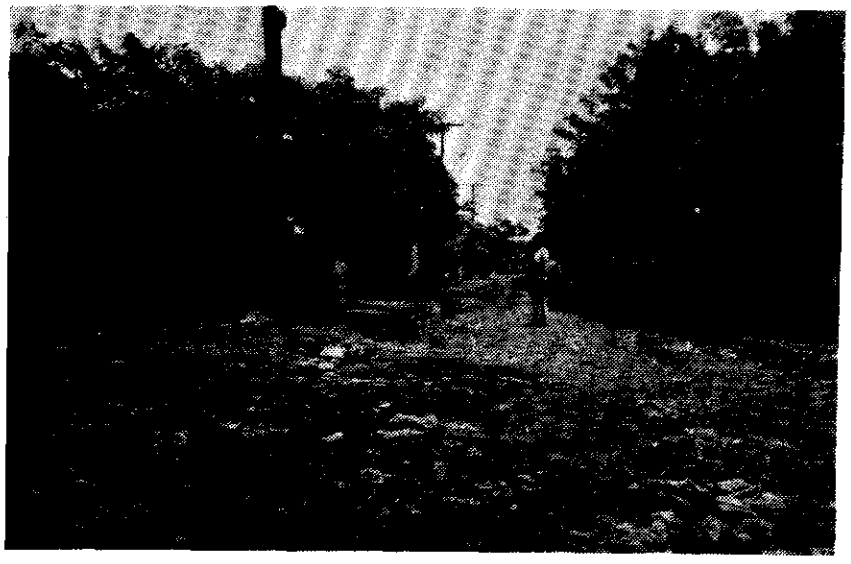

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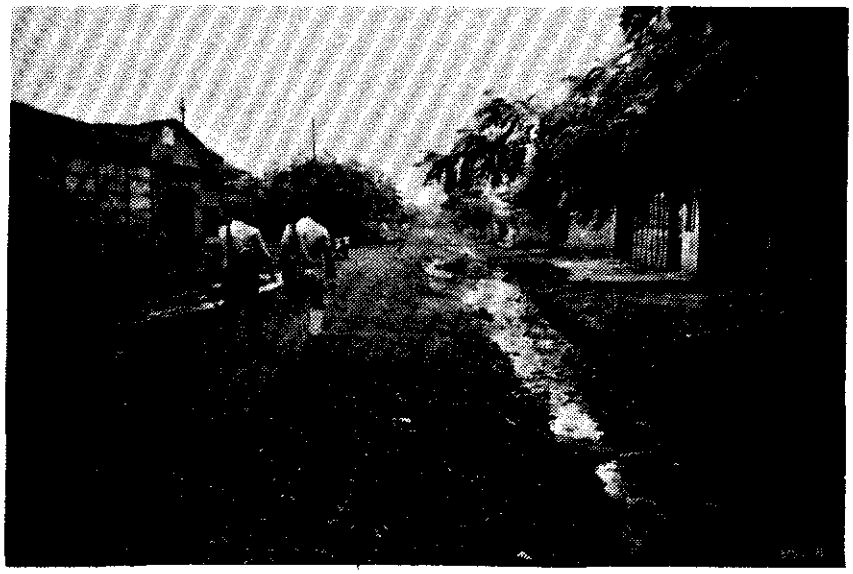
PHOTO 28. CIUDAD SANDINO. Zone 2. Aspect of a main road under the official urbanization proposal. Note the dimensions of the "street-bed", the absence of foot-paths and of any drainage system. The streets are generally flat, close to the "high points" (photo), they are in good shape, without major damage by erosion.

PHOTO 29. CIUDAD SANDINO. Zone 2/3. Note the large number of houses with floor levels lower than that of the street, presenting various degrees of difficulty in disposing the rainwaters into the road system. Note the kerbs placed to protect the houses. In the back-ground one can see signs of erosion on the street-bed. This means that the waters do not drain along the kerbs but along the street. The existence of houses in this conditions makes it difficult to install drainage and sewerage systems.

PHOTO 30. CUIDAD SANDINO. Zone 3. Aspect of one of the streets close to the ditch that runs through the area. Presently, rainwaters are carried exclusively by superficial drainage to the ditches (natural channels) that drain the area. The accumulation of rainwater causes erosion and finally jeopardizes the circulation of vehicles. Note the great amount of garbage on the street.



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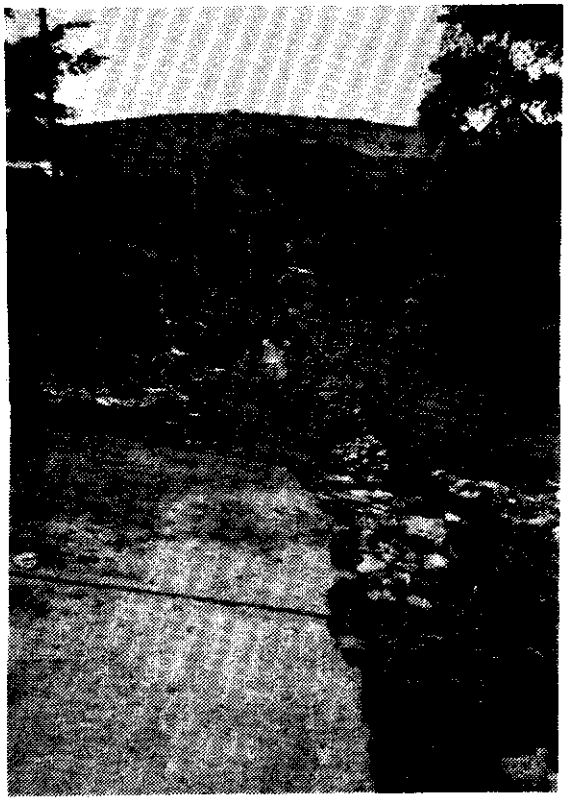

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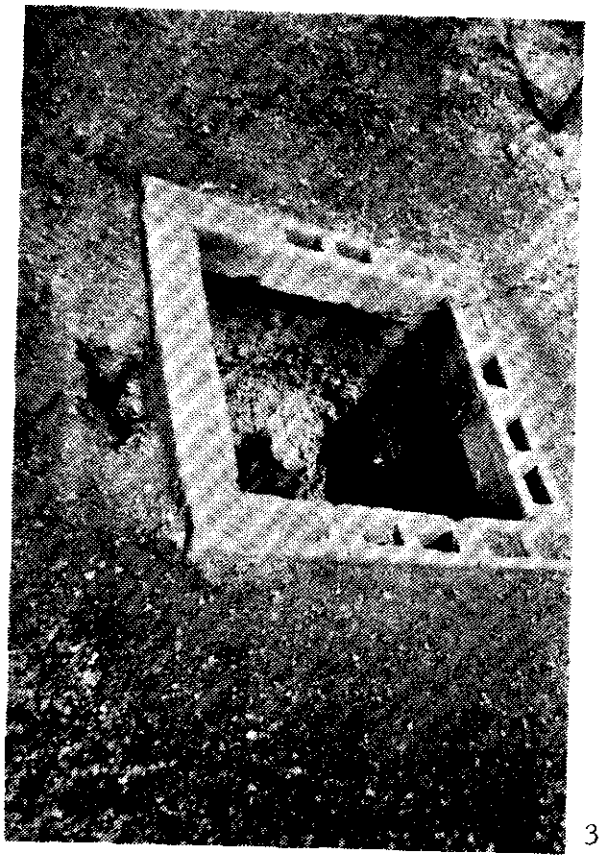
PHOTO 31. CIUDAD SANDINO. Note the absence of any rainwater drainage system. The maintenance of streets is carried out by repeated scraping which causes a deepening of the street-bed in relation to the foot-paths. This can be observed in the foreground (right) of the photo. This practice can result in chronic problems.

PHOTO 32. CIUDAD SANDINO. Street situated between zone 3 and zone 4. Note the damage caused by erosion, that makes the circulation of vehicles very difficult. Note also the low population density of the area.

33



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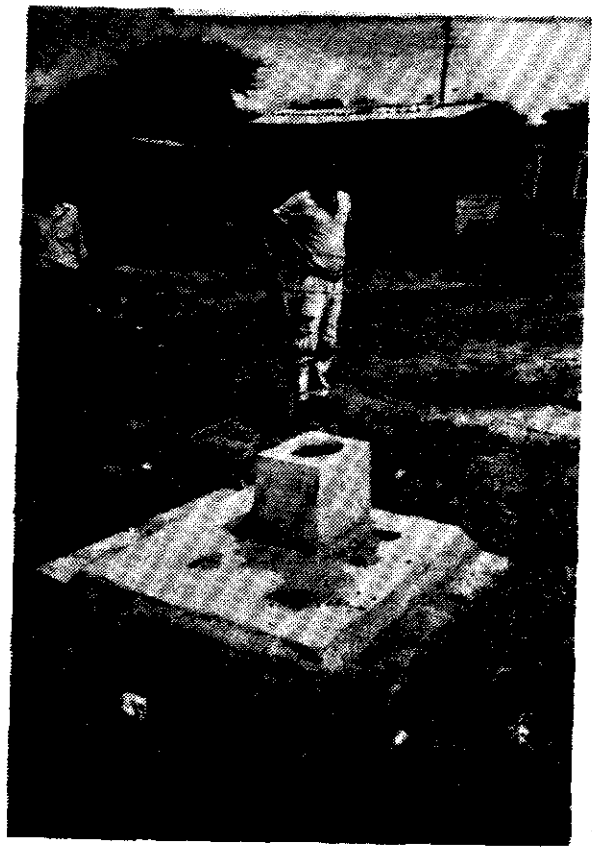

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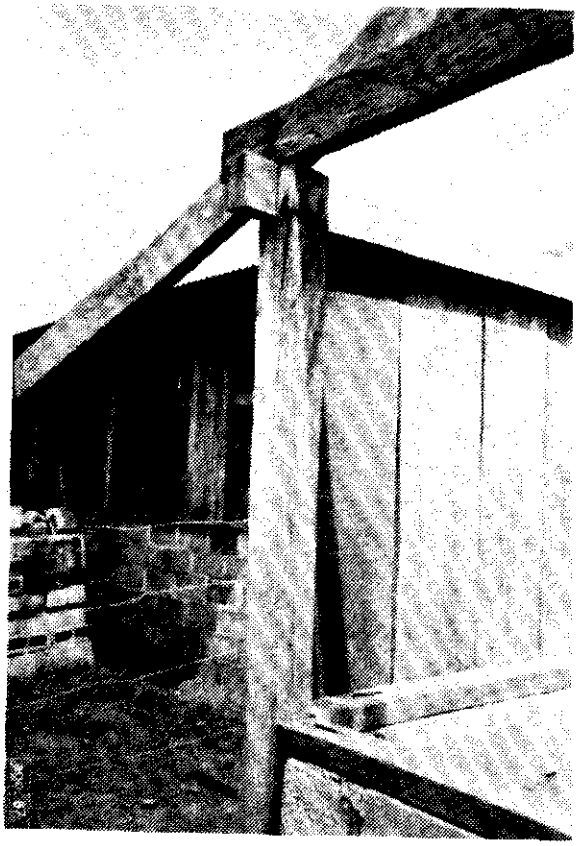
PHOTO 33. CIUDAD SANDINO. Rudimentary installation of water supply through a flexible hose. Note the direct disposal of (non sanitary) waste water and the presence of a loose pig in the drainage channel.

PHOTO 34. CIUDAD SANDINO. Latrine under construction. Observe the small dimensions of the hole and the erosive processes taking place immidiatly under the masonry bolck foundation.

PHOTO 35. CIUDAD SANDINO. Latrine under construction. Single seat placed on pre-fabricated slab.

36



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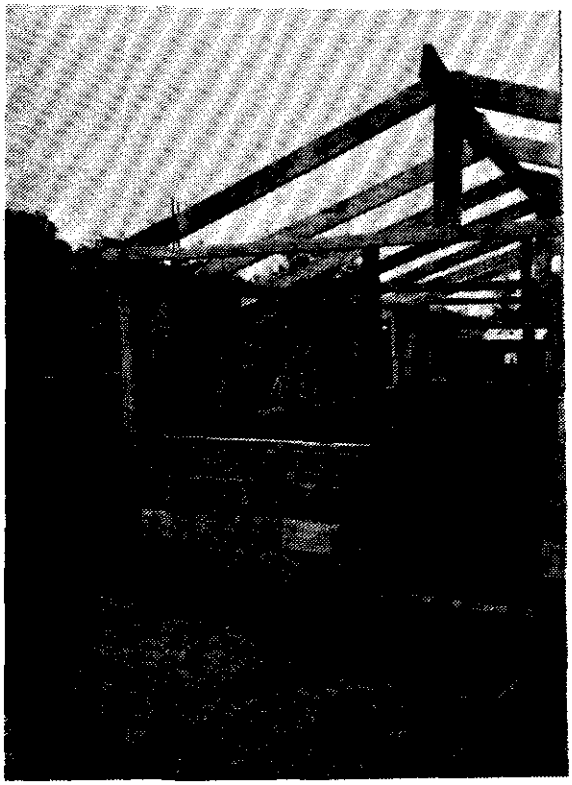

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PHOTO 36. CUIDAD SANDINO. Latrine with double seat. Observe the rudimentary construction.

PHOTO 37. CIUDAD SANDINO. Construction details of a "mini-skirt" type dwelling (mixed system of masonry/wood).

PHOTO 38. CIUDAD SANDINO. Construction details of a mini-skirt type of dwelling.

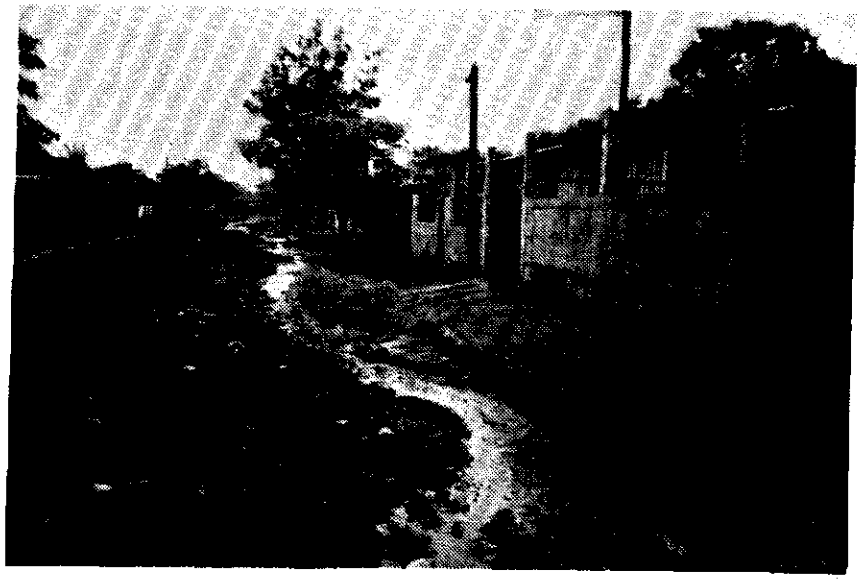

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PHOTO 39. CIUDAD SANDINO. Zone 2. On top of the generalized problems of lack of drainage and of erosion, there are localised problems which are relatively serious, such as the constant overflow of the existing ditch between zone 8 and zone 2. In this way, rainwaters drain freely over the streets from zone 2 to zone 4, where they reach another ditch on the boundary of the area (see drawing 4). The photos 39 and 43 show other aspects of this problem. Note in the left of the photo the accumulation of rainwater and the beginning of erosive processes (observe the dimensions of the street).

PHOTO 42. CIUDAD SANDINO. Zone 4. A street below the collection point described in the last photos. Note the dimensions of the erosion furrows and the partial destruction of the already completed drainage works. Observe the accumulation of garbage.

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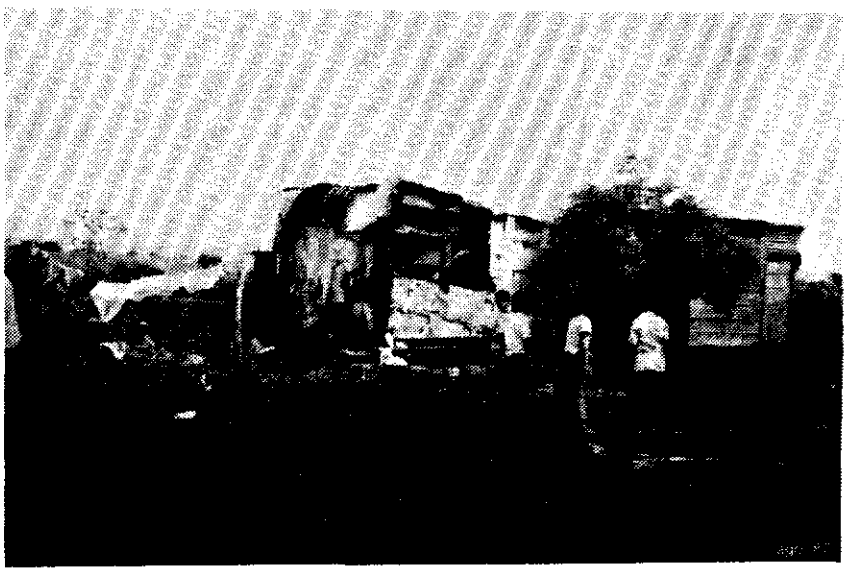

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PHOTO 40. CIUDAD SANDINO. Point of rainwater collection on the boundary between zones 2 and 4 (see drawing 6). Although there is a drainage system from this point to the existing boundary ditch, most of the rainwaters drain onto the streets causing large erosion furrows and overflows.

PHOTO 41. CIUDAD SANDINO. Another aspect of the collection point described in the last photo. Note the lack of barriers to prevent accidental falls. In the background one of the few tiled streets of the area. In the present consolidation project high priority is being given to the main road network. This will include (as far as possible) the paving of those streets which present larger drainage and erosion problems.

PHOTO 43. Barrio B-15 (JOSE BENITO ESCOBAR). Buildings along the East zone. Observe the dilapidated dwellings with exterior cardboard protections.

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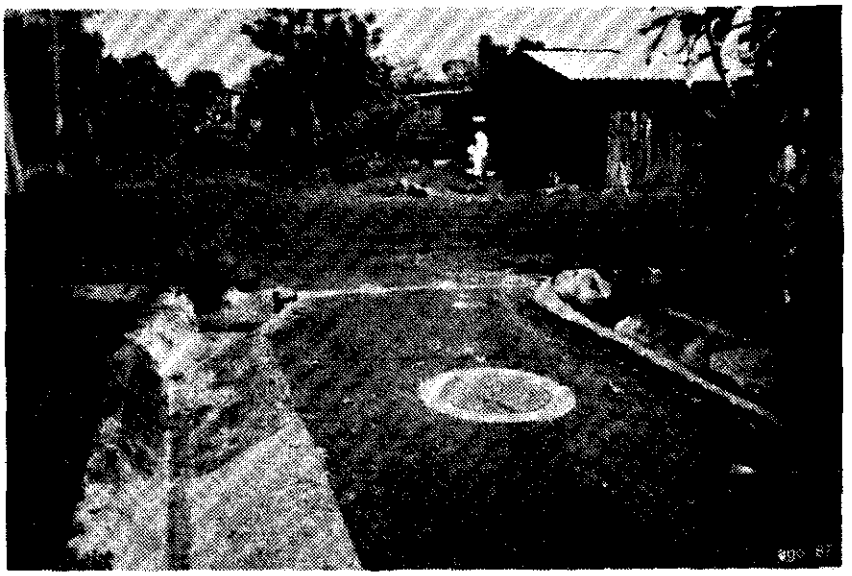
PHOTO 44. Barrio B-15. Buildings along the West zone.

PHOTO 45. Barrio B-15. A street of the oldest area. Note the narrow street, which is well suited to pedestrian way. Obsreve the small drainage channels ("canaletas") which are made on-site. Note the entrances to the houses and the lack of foot-paths.



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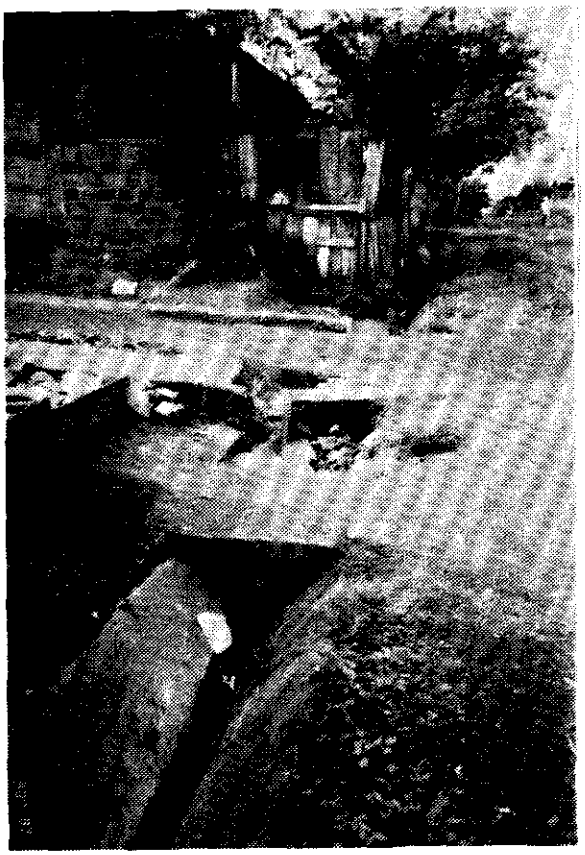

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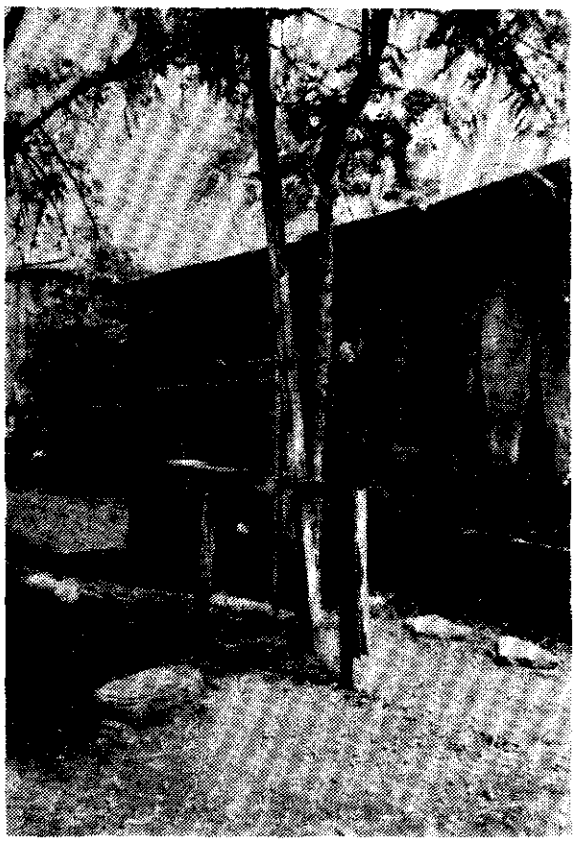

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PHOTO 46. Barrio B-15. In the background can be seen the zone of more recent occupation. Note that the strrets are considerably wider (approx. 12m.). Observe also the existing slope of the street-bed near the "canaletas" which makes it impossible for the rainwater to reach them.

PHOTO 47. Barrio B-15. Open "canaletas" in the intersection of two steets. This is one of the weak points of the open "canaletas" system, because there are generally accumulations of garbage, a decrease of the flow capacity and a need for reinforcement to allow traffic circulation. There is also the problem of continuos maintenance.

PHOTO 48. Barrio B-15. Public watertap on the foot-paths.

49

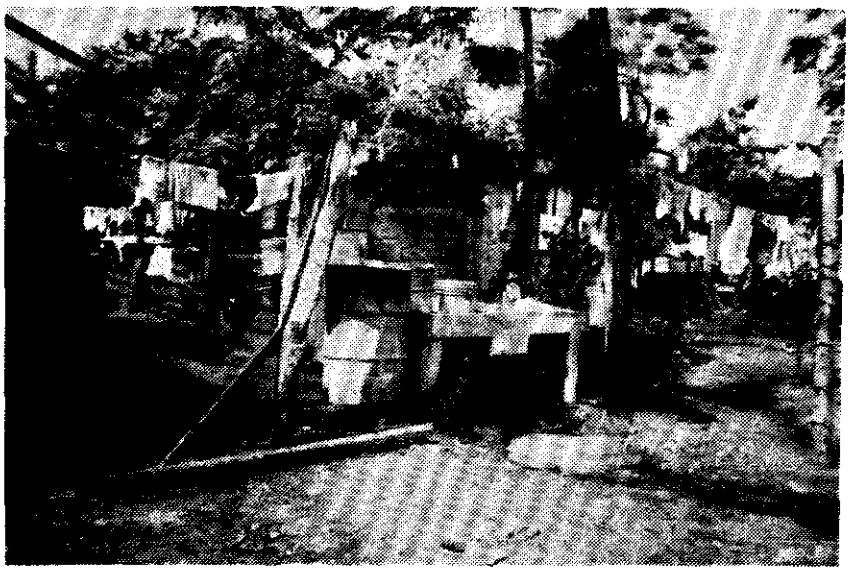

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PHOTO 49. Barrio B-15. Public watertap on the foot-paths.

PHOTO 50. Barrio B-15. Domestic installation with rudimentary water storage.

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PHOTO 51. Barrio B-15. Boundary of the inhabited area, with a strip of cultivated land that reaches the edge of the lake.

PHOTO 52. Barrio B-15. Area of more recent occupation. A street of large dimensions. Note the dilapidated state of the drainage "canaleta". Large volums of water drain onto the street. In this case the camber of the street would have to be changed to provide a slope for runoff to the "canaleta". In some situations, the placing of small artificial humps across the street can help to guide the rainwaters to the "canaletas".

PHOTO 53. Barrio B-15. Small drainage channels which are being destroyed by erosion and do not work because of the relative difference in levels between the street-bed and the edge of the "canaleta".

PHOTO 54. Barrio B-15. Area of more recent occupation. Note the low population density and the lack of any infrastructure.

53

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PHOTO 55. Barrio JONATHAN GONZALES. Aspect of one of the streets proposed to form part of the main road network. Although being of official urbanization priority, it has no pavement or drainage infrastructure. This portion of the street will not be the object of any woks on the short or medium terms. Note the width of the road of approx. 15 m.

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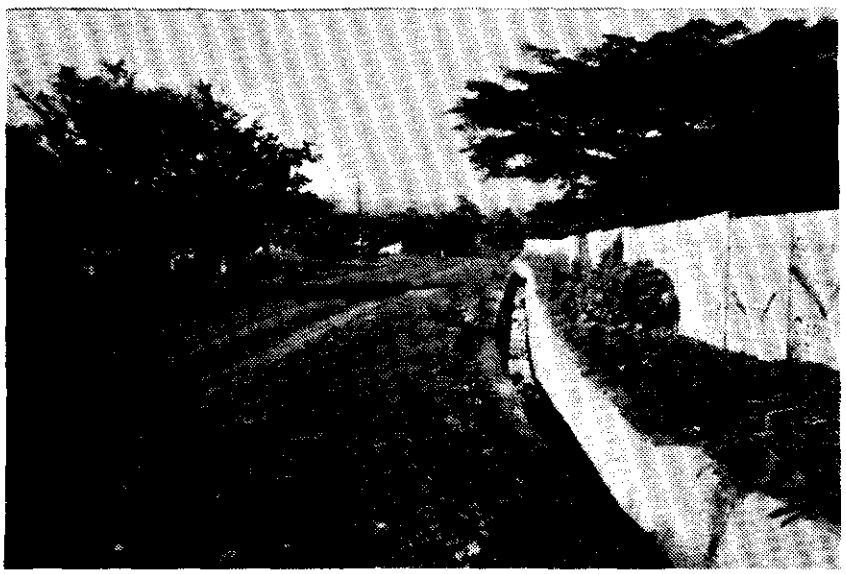

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PHOTO 56. Barrio J. GONZALES. View of part of one of the streets to be reconstructed as a pedestrian way. Note the erosion furrows and the garbage accumulation on the street-bed.

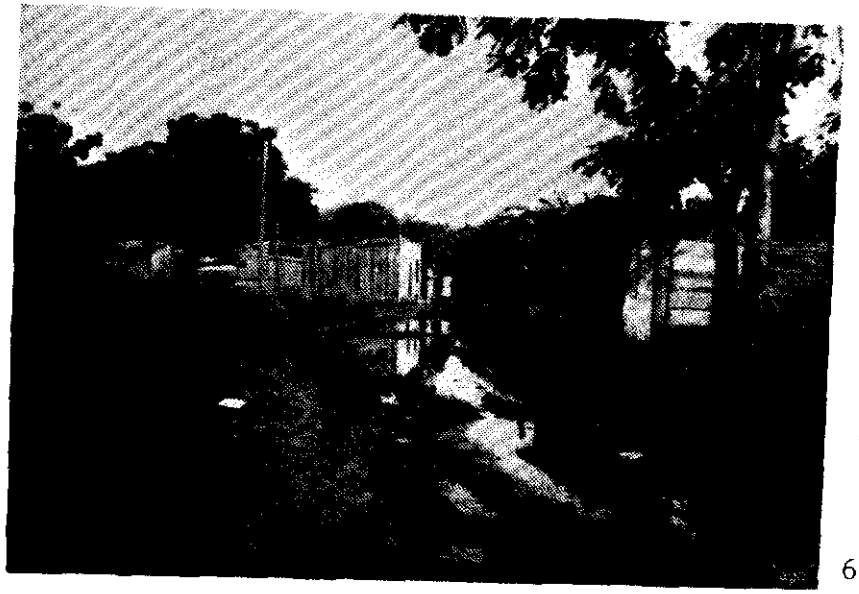

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PHOTO 57. Barrio J. GONZALES. Area near the Av. B. Zeledon. Note the absence of slope, the street width and the low population density. The drainage channel only serves the Hospital area (right side of the photo). Note that rainwater that drains onto the street-bed does not have access to the drainage channel because its edge is higher than that of the street.

PHOTO 59. Barrio J. GONZALES. Area near the Avenue. Here frecuent floods take place. There is insufficient slope to allow the superficial drainage of rainwater. When the barrio is consolidated, this area would have to be treated with priority. Note (in the foreground) that the floor of the houses is on a lower level than that of the street, which causes problems of drainage and floods.

PHOTO 60. Barrio J. GONZALES. Another aspect of the area described in the last photo. Note the accumulation of rainwater and the relatively flat streets.

PHOTO 61. Barrio J. GONZALES. A street located in the "low part" of the barrio, near the Avenue. It is not possible to drain the surface rainwater without an increase on the longitudinal slope of the streets; this can be accomplished through minor infilling. The filling must be generalized in order to allow the drainage of the adjoinig lots to flow towards the road system.

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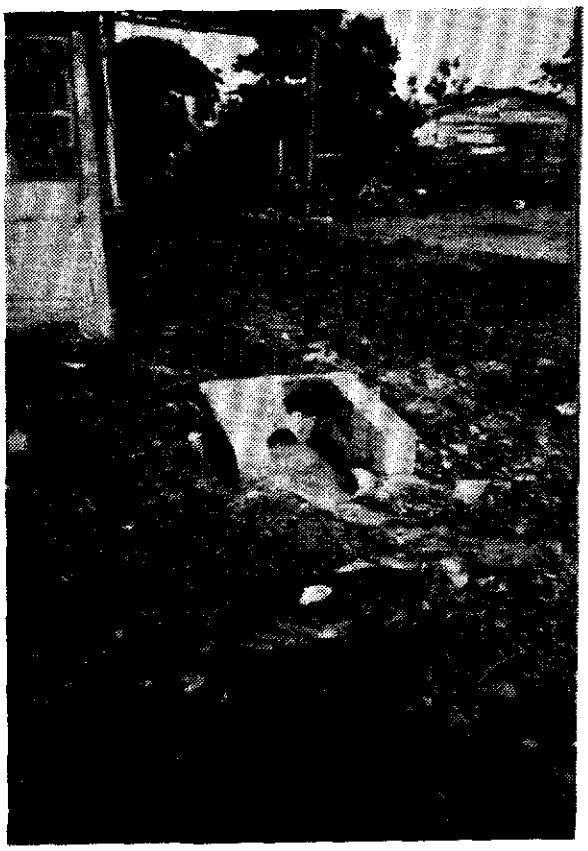

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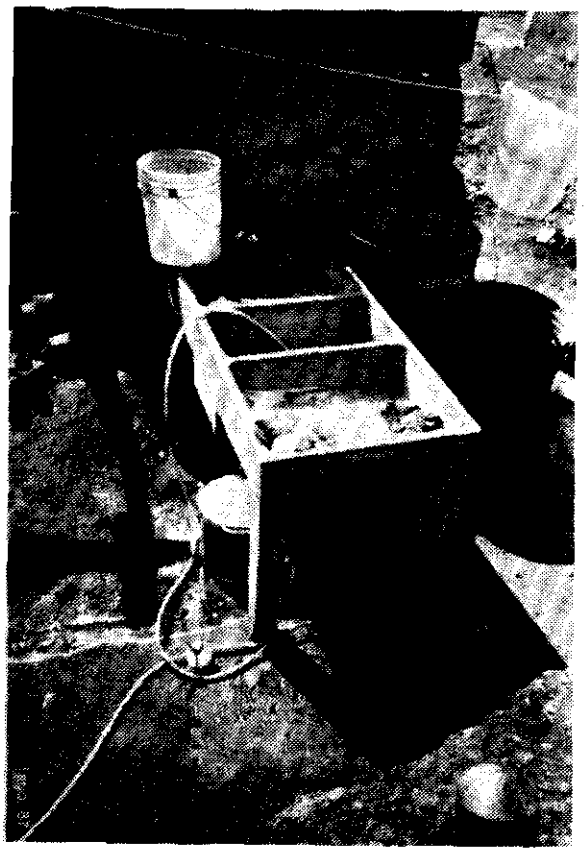

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PHOTO 62. Barrio J. GONZALES. Rudimentary domestic installation with the use of flexible hose.

PHOTO 63. Barrio J. GONZALES. (Non-sanitary) waste water storage at the exit of the domestic installation.

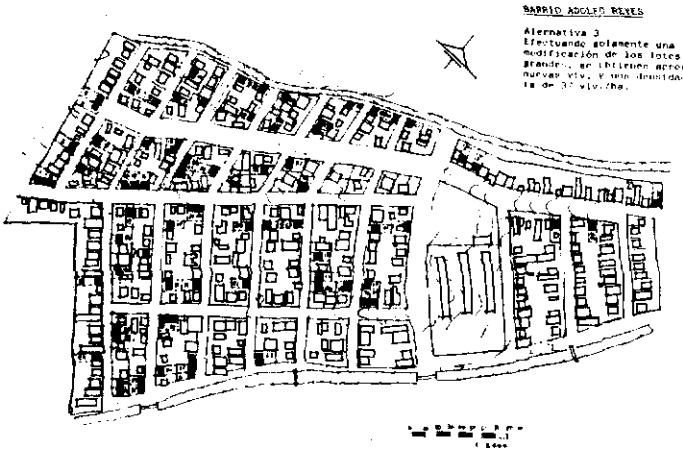
PHOTO 64. Barrio J. GONZALES. View of a double washing unit with the end of the hose submerged in the water tank.

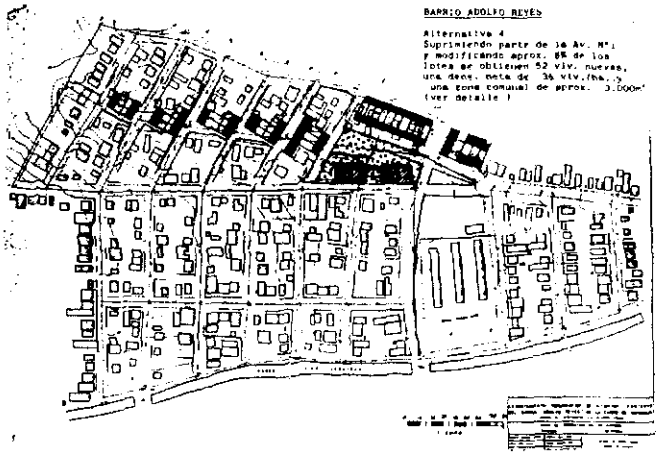
I N T E G R A L P L A N F O R S L U M U P G R A D I N G

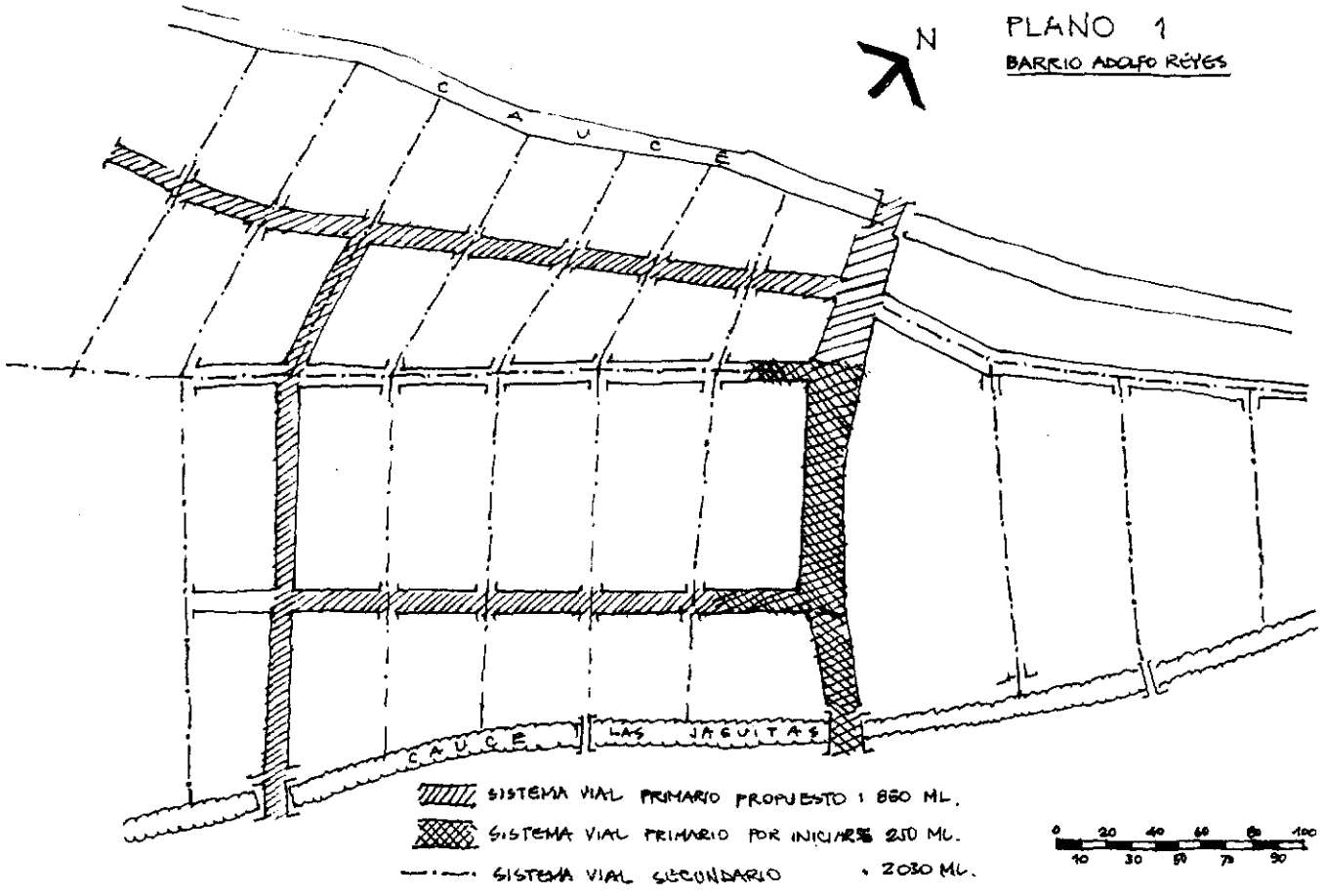
Alternatives of Interventions in Pilot Barrios

Illustrations

Note: The definitive Director Plans are in elaboration .the final results should be printed in April 1988.







BARRIO ADOLFO REYES

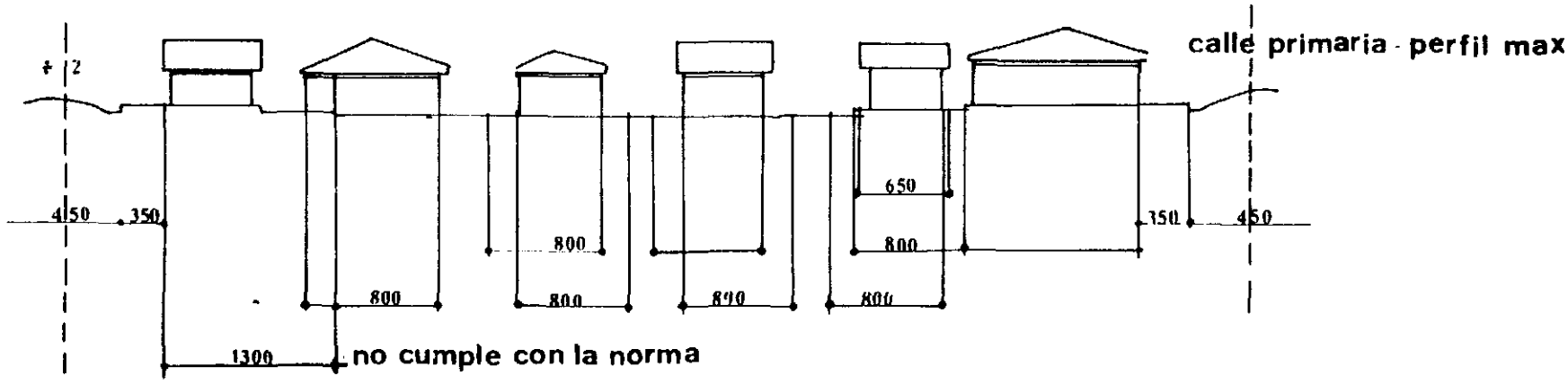
LAND USE ADJUSTMENT ALTERNATIVES

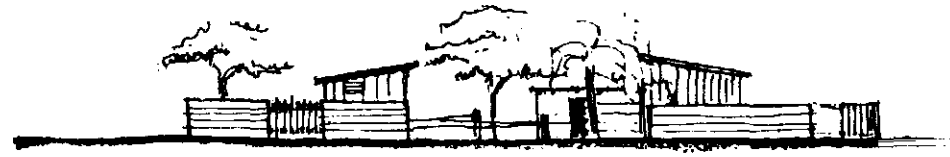
Barrio level

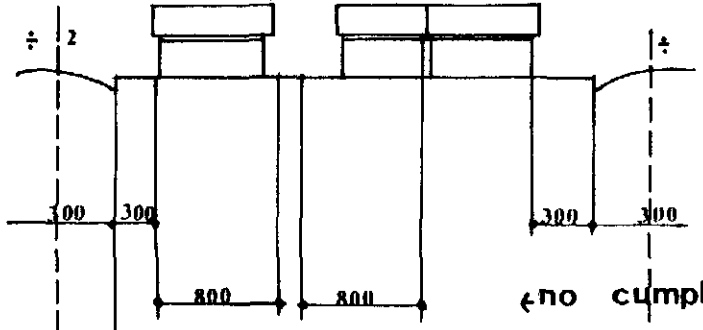
BARRIO:ADOLFO REYES

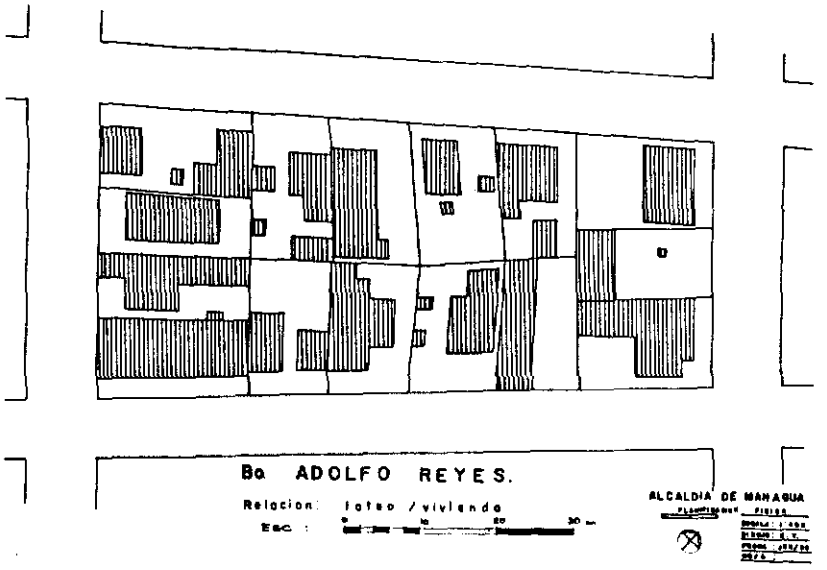
Estudio del cumplimiento de las norma en manzana del barrio A Reyes

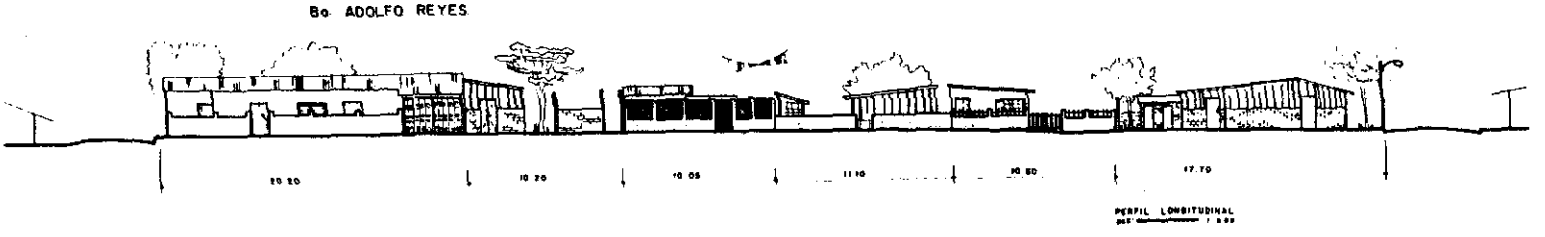
frente y fondo: maximo y minimo
calles: primaria y secundaria

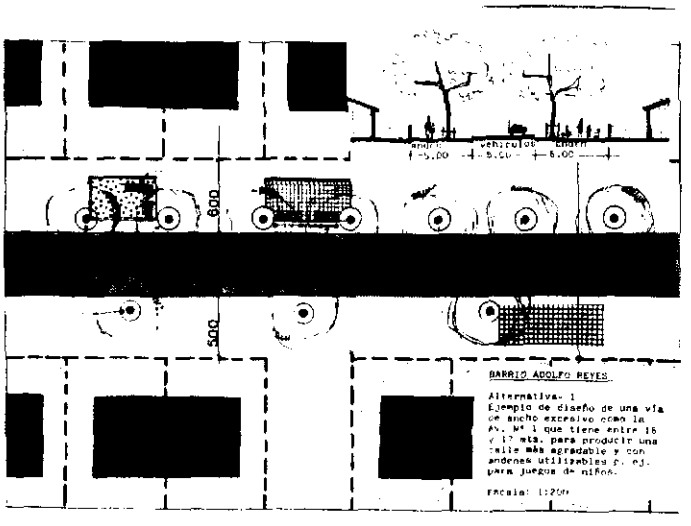


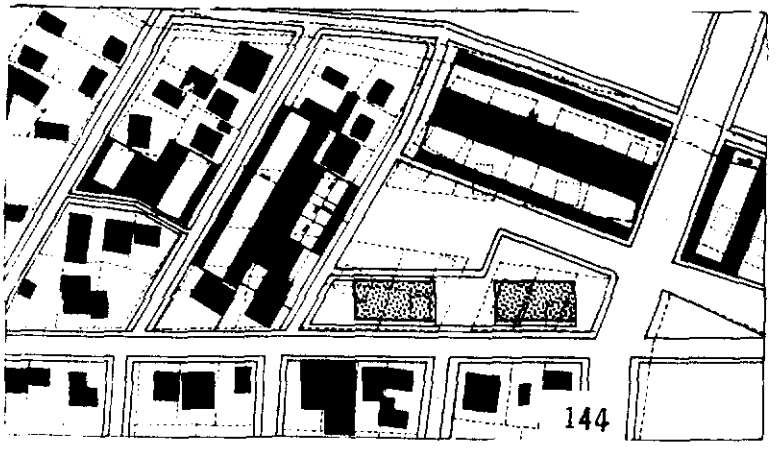








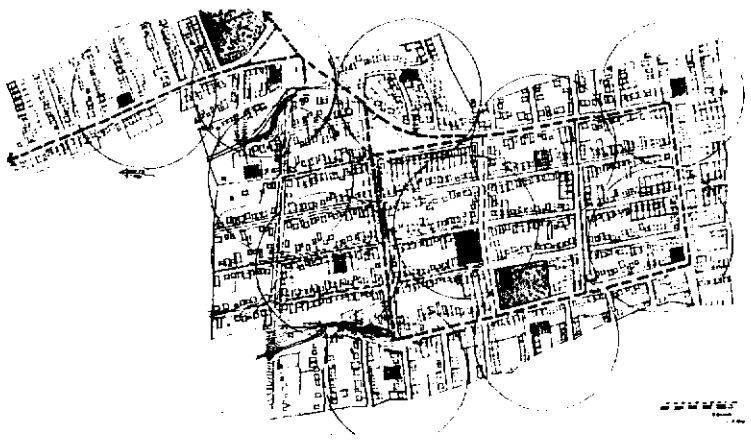


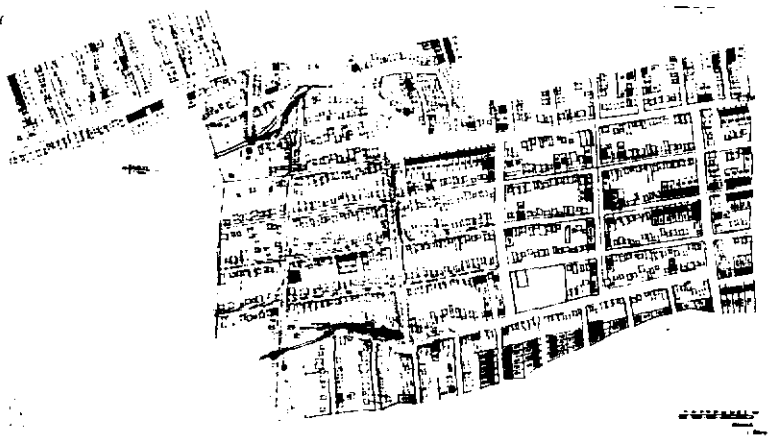


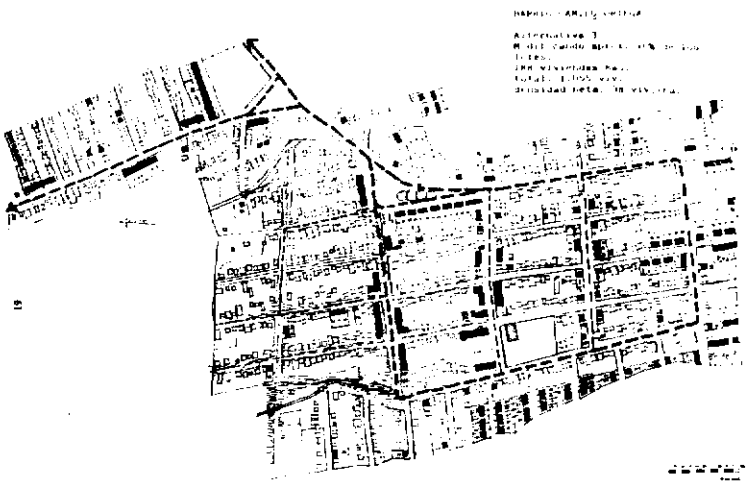
BARRIO ADOLFO REYES

LAND USE ADJUSTMENT ALTERNATIVES

Manzana level







N.

PLANO 3

BARRIO CAMILO ORTEGA.

SISTEMA VIAL PRIMARIO EN CONSTRUCCION : 480 M.L.

SISTEMA VIAL PRIMARIO POR CONSTRUIR : 1866 M.L.

SIST. VIAL SECUNDARIO N/S : 2930 M.L.
E/O : 2640 M.L.

OBRAS CIVILES ESPECIALES

ESCUELA

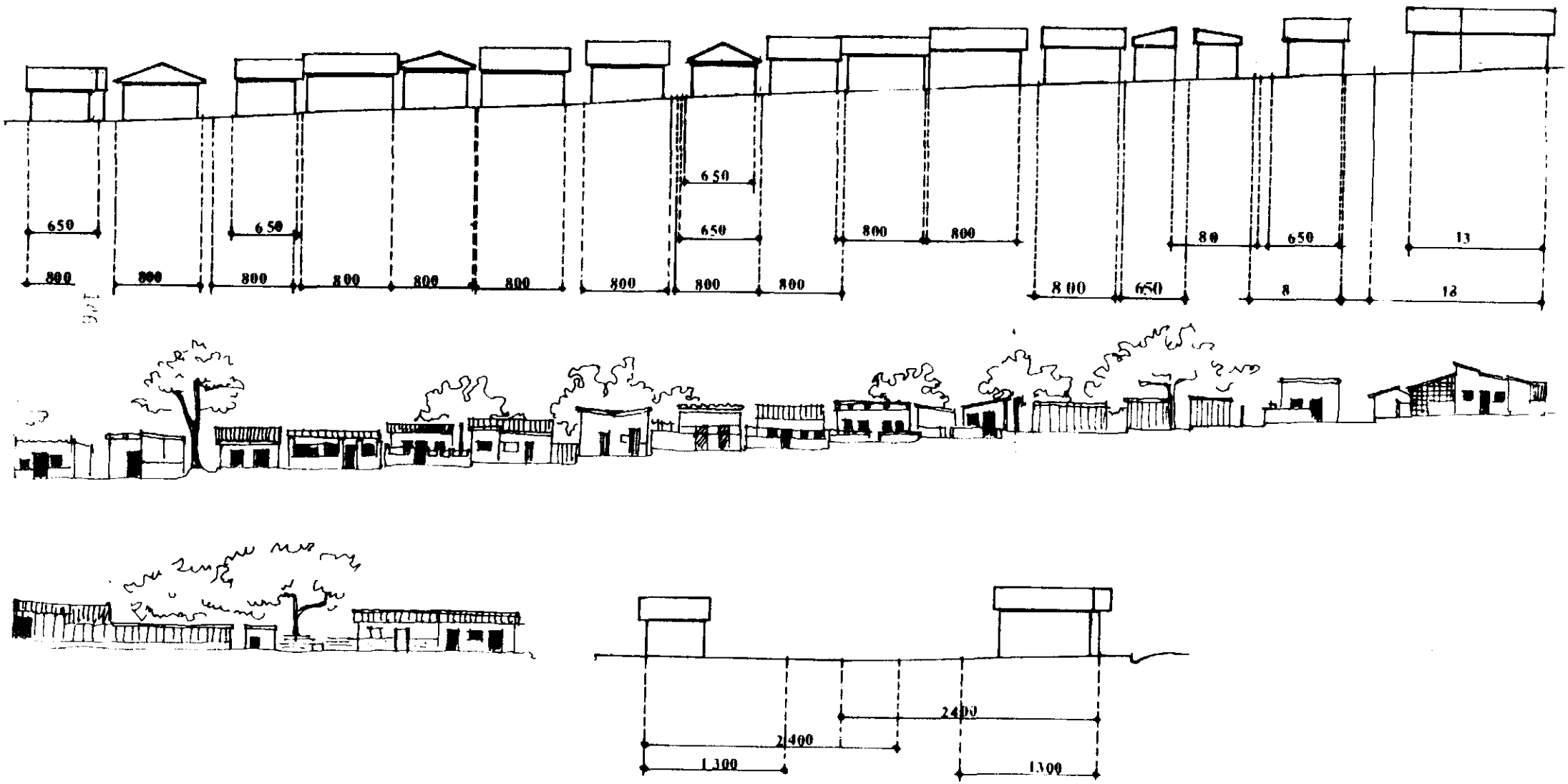
PERFIL TIPICO N/S

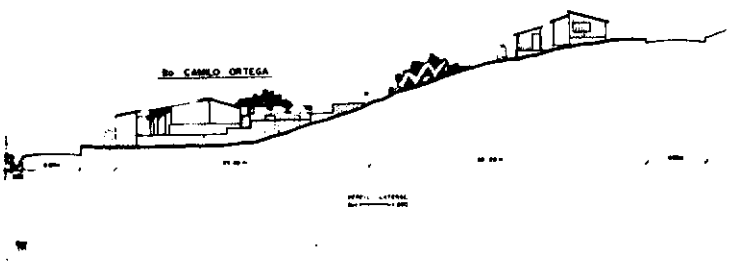
PERFIL TIPICO E/O

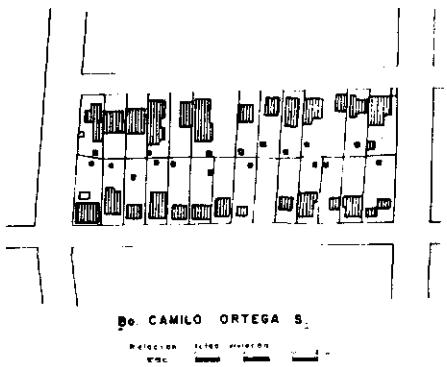
0 40 80 100

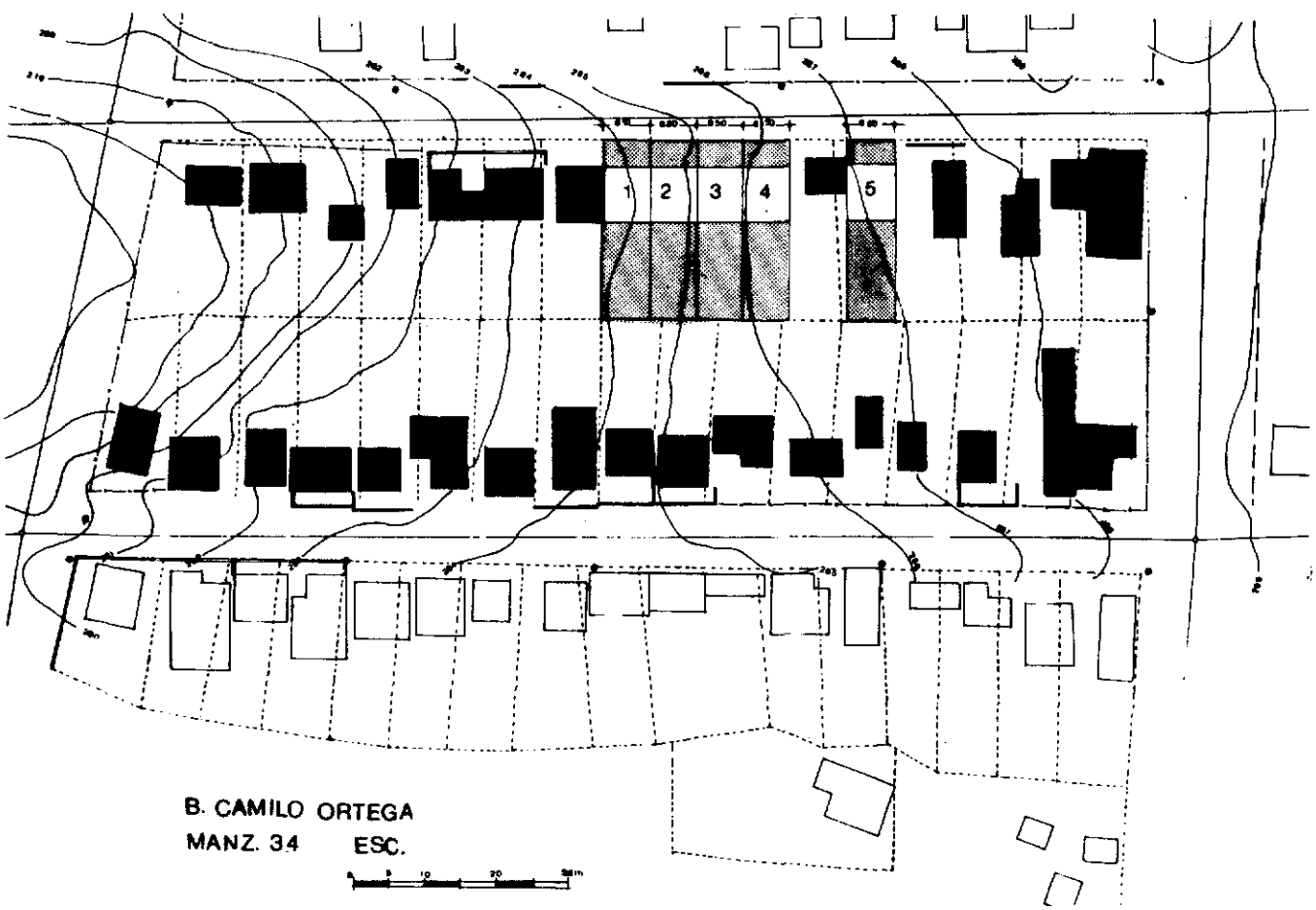
145 BARRIO CAMILO ORTEGA
LAND USE ADJUSTMENT
ALTERNATIVES-Barrio level

BARRIO CAMILO ORTEGA









BARRIO CAMILO ORTEGA

LAND USE ADJUSTMENT ALTERNATIVES -Manzana

Manzana level

ALTERNATIVE "A"

COLLECTION-NETWORK + BIODIGESTION + INFILTRATION EVAPORATION

1. BASIC CHARACTERISTICS

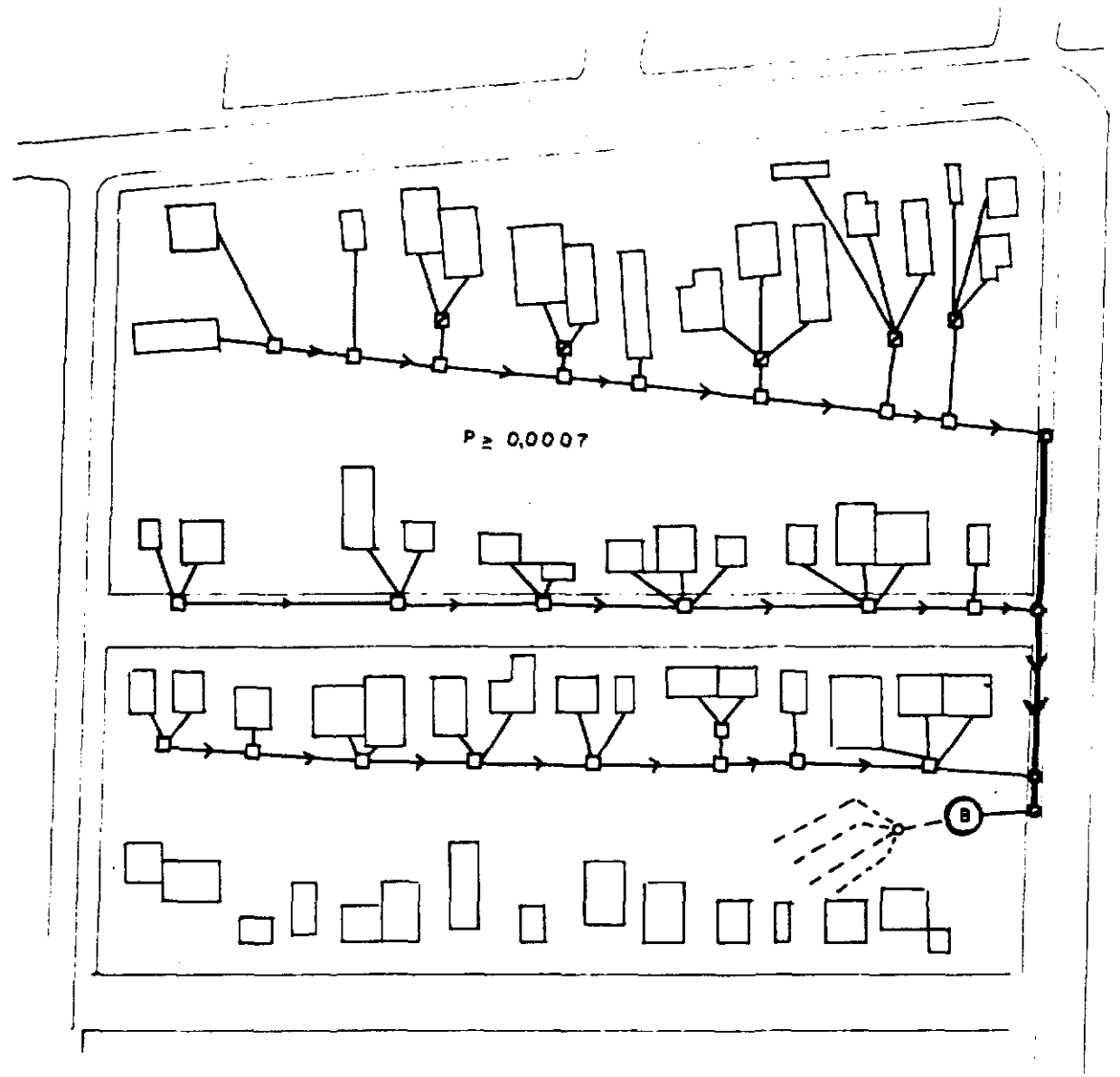
- Secondary collector inside the blocks, with diameter Ø 100 mm, articulated by a system of gathering and transit boxes
- Main Collector along the sidewalks of the streets, Ø 100 mm or Ø 150 mm, depending on the situation.
- Biodigestive Unit, dimensioned for averagely 50 dwellings, working with sewage and solid wastes.
- Infiltration and/or Evaporation Unit, dimensioned for the disposal of the effluents from each Biodigestor.

2. CONSTRUCTIVE CHARACTERISTICS

2.1 Boxes
- see examples sketched in annex

2.2 Biodigestive Units
- construction in enforced mortar

2.3 Infiltration/ Evaporation Unit
- trenches or beds according to scheme



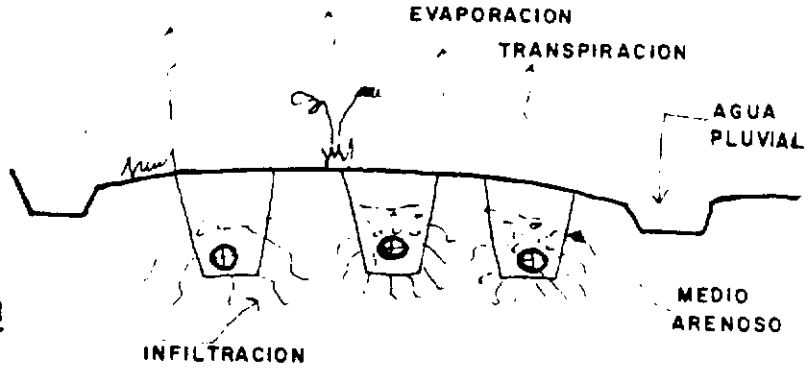
PENDIENTE
PREDOMINANTE

ESQUEMA ALTERNATIVA "A"
ESC: 1:1000

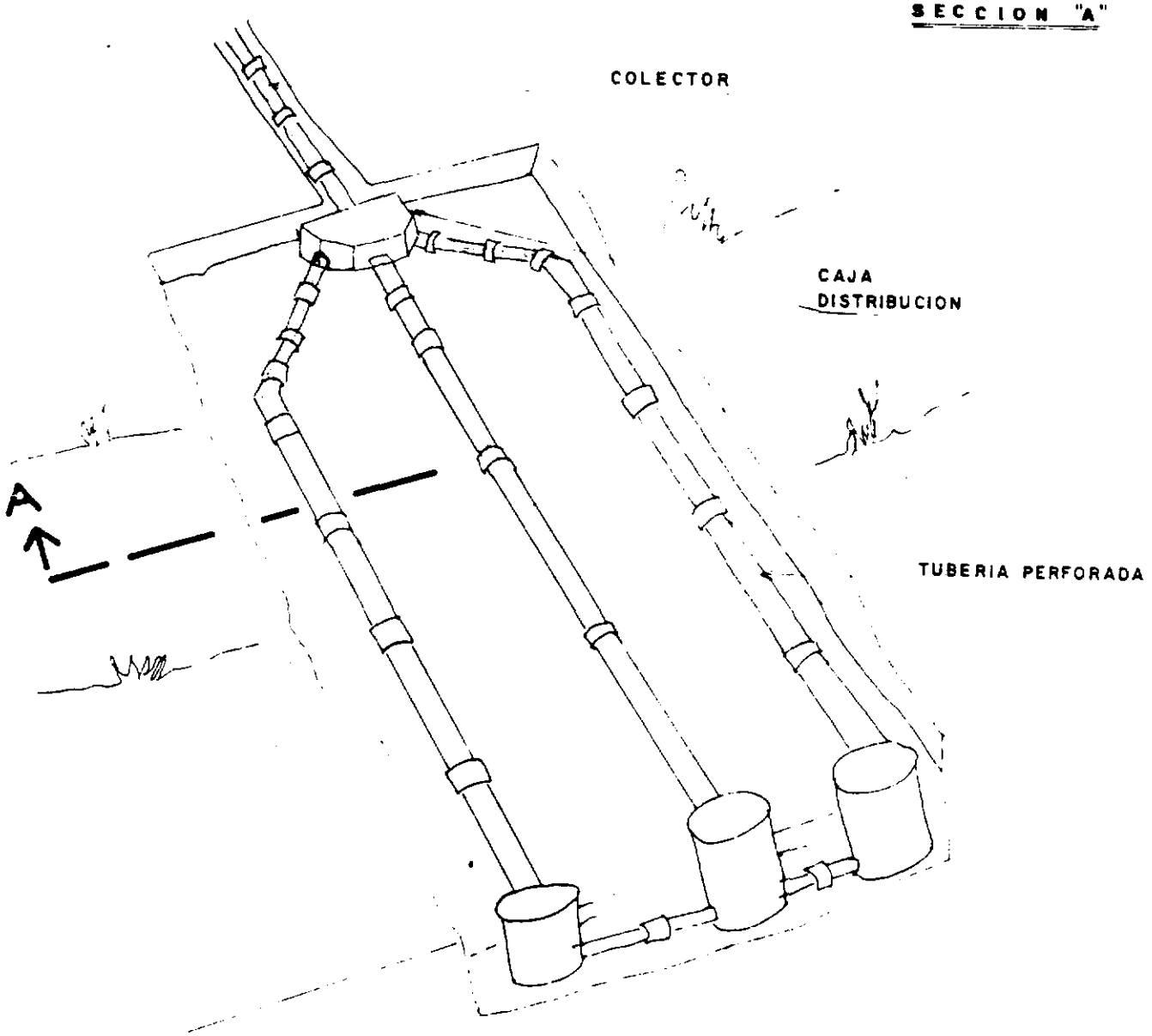
SIMBOLOGIA

- COLECTORA SECUNDARIA
- COLECTORA PRICIPAL
- CAJA DE UNION
- CAJA DE PASAJE
- CAJA DE VISITA
- UNIDAD BIODIGSTORA
- UNIDAD INFILTRACION EVAPORACION

ESQUEMA GENERAL DE RAMALES DE INFILTRACION



SECCION "A"



ISOMETRICO

ALTERNATIVE "B"

IMPROVED LATRINES + JOINED COLLECTION OF GREY-WATERS AND RAIN-WATER

1. BASIC CHARACTERISTICS

- ventilated latrines for the exclusive disposal of human excretes
- water from dish-washing, cloth-washing, etc passes through grease traps and is than thrown into the drainage system.

Sub alternatives:

B-1: grey-waters are conducted through pipelines towards gutters alongside roads

B-2: grey-waters conducted by open channels from the households towards open drainage.

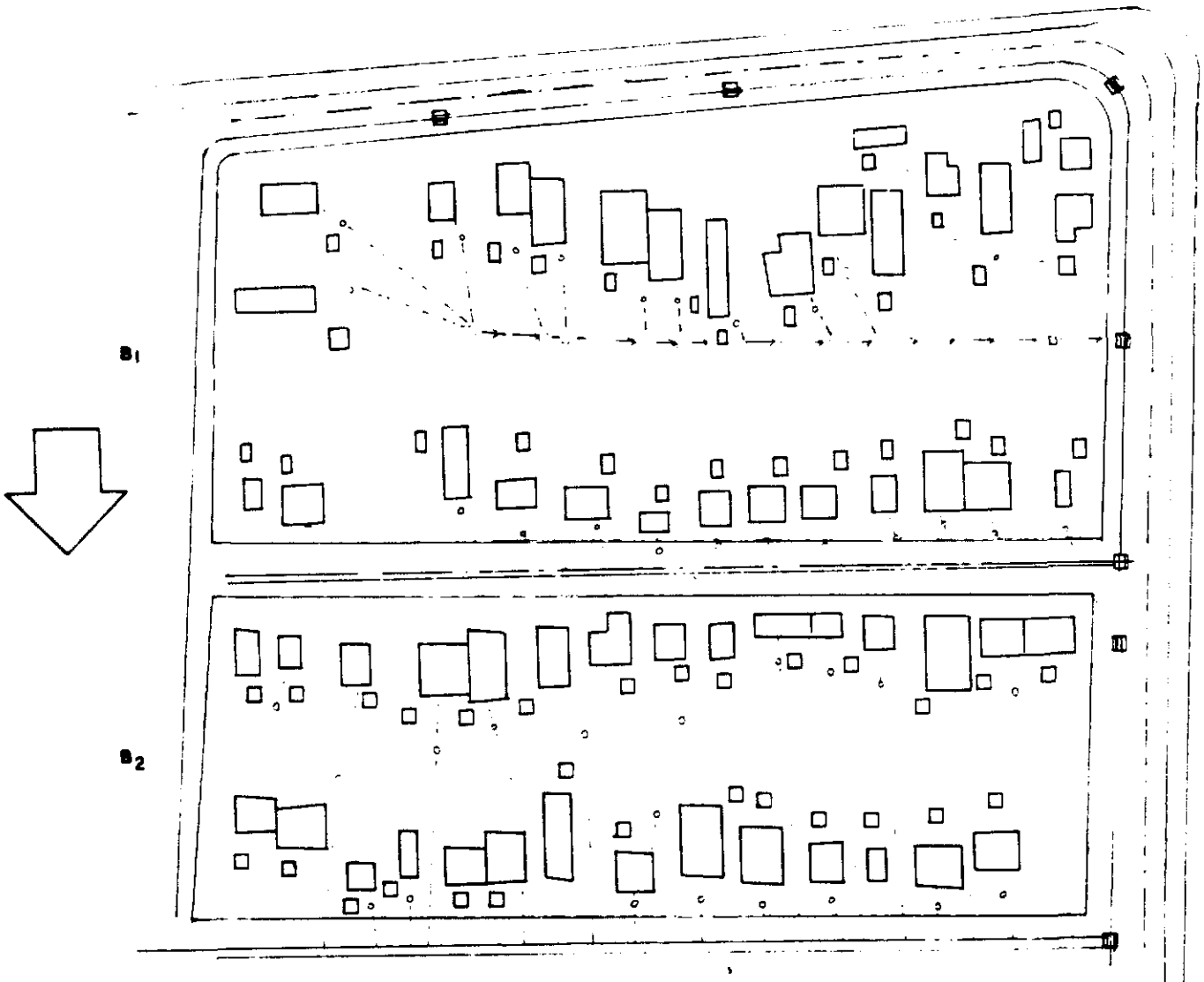
2. CONSTRUCTION CHARACTERISTICS

2.1 Latrines (see scheme)

- sub-alternative 1: single latrines
- sub-alternative 2: double latrines

2.2 Grease traps

- see scheme.



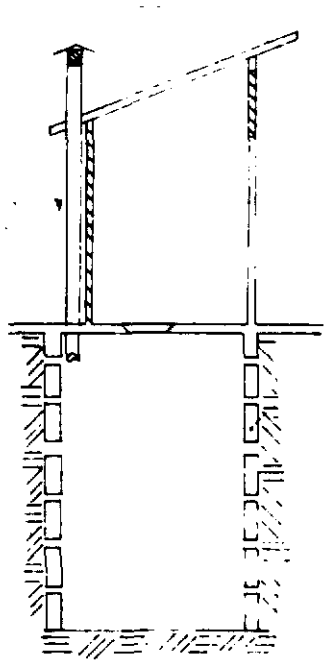
ALTERNATIVA B

ESCALA 1 : 1000

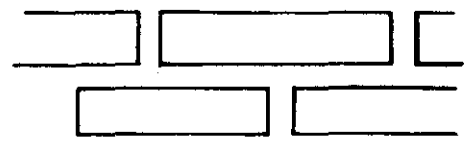
S I M B O L O G I A

- TUBERIA DRENAJE
- TRAGANTES
- TRAMPA DE GRASA
- CANALES AB. DOMICILIO
- RECOLECTORA DE AGUAS SERVIDAS NO FECALES
- LETRINA VENTILADA
- CANALES ABIERTOS DE DRENAJE

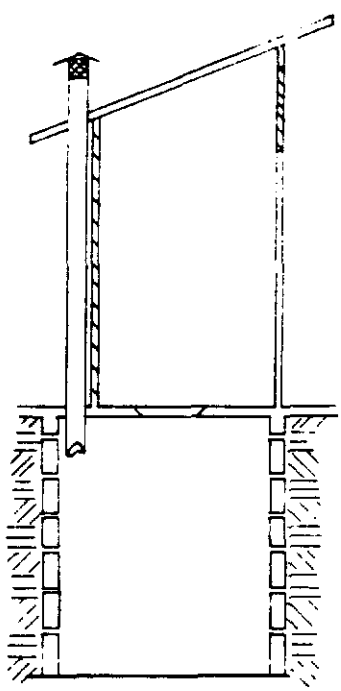
TUBO DE VENTILACION



ALBAÑILERIA ABIERTA
(C/P. CANTERA)
PIEDRAS SEPARADAS

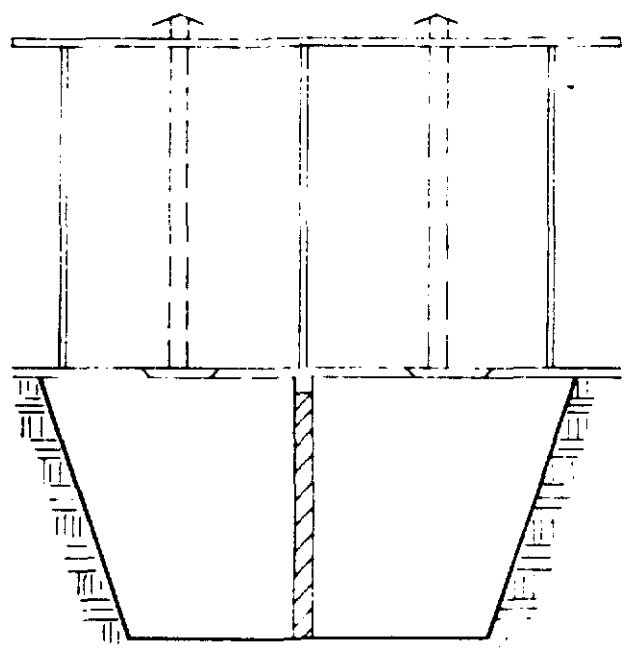


SUB-ALTERNATIVA 1 : FOSA VENTILADA SIMPLE



SECCION TRANSVERSAL

SUB-ALTERNATIVA 2 : FOSA VENTILADA DOBLE, USO ALTERNADO EN PERIODOS DE 1 AÑO



SECCION LONGITUDINAL

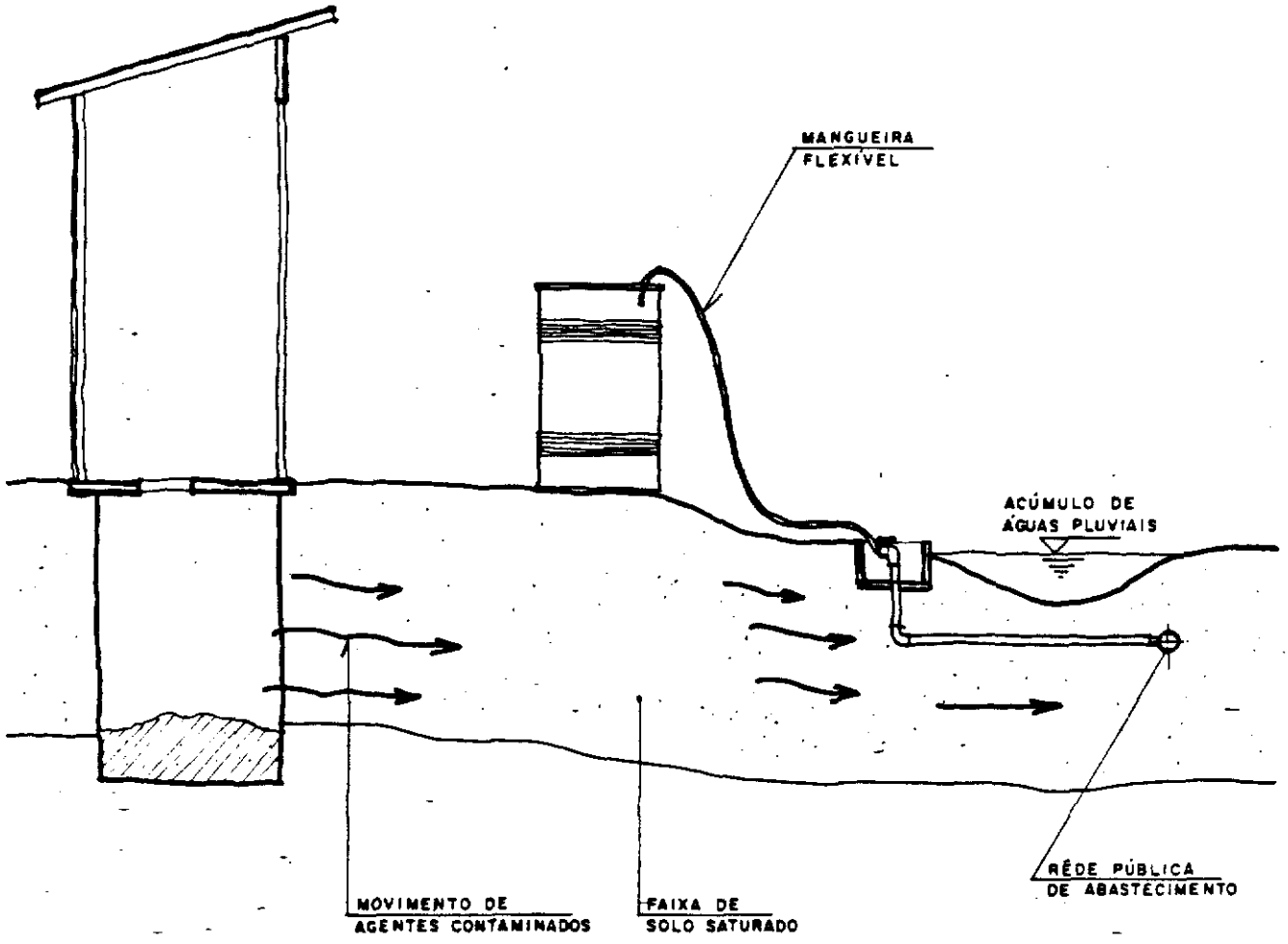
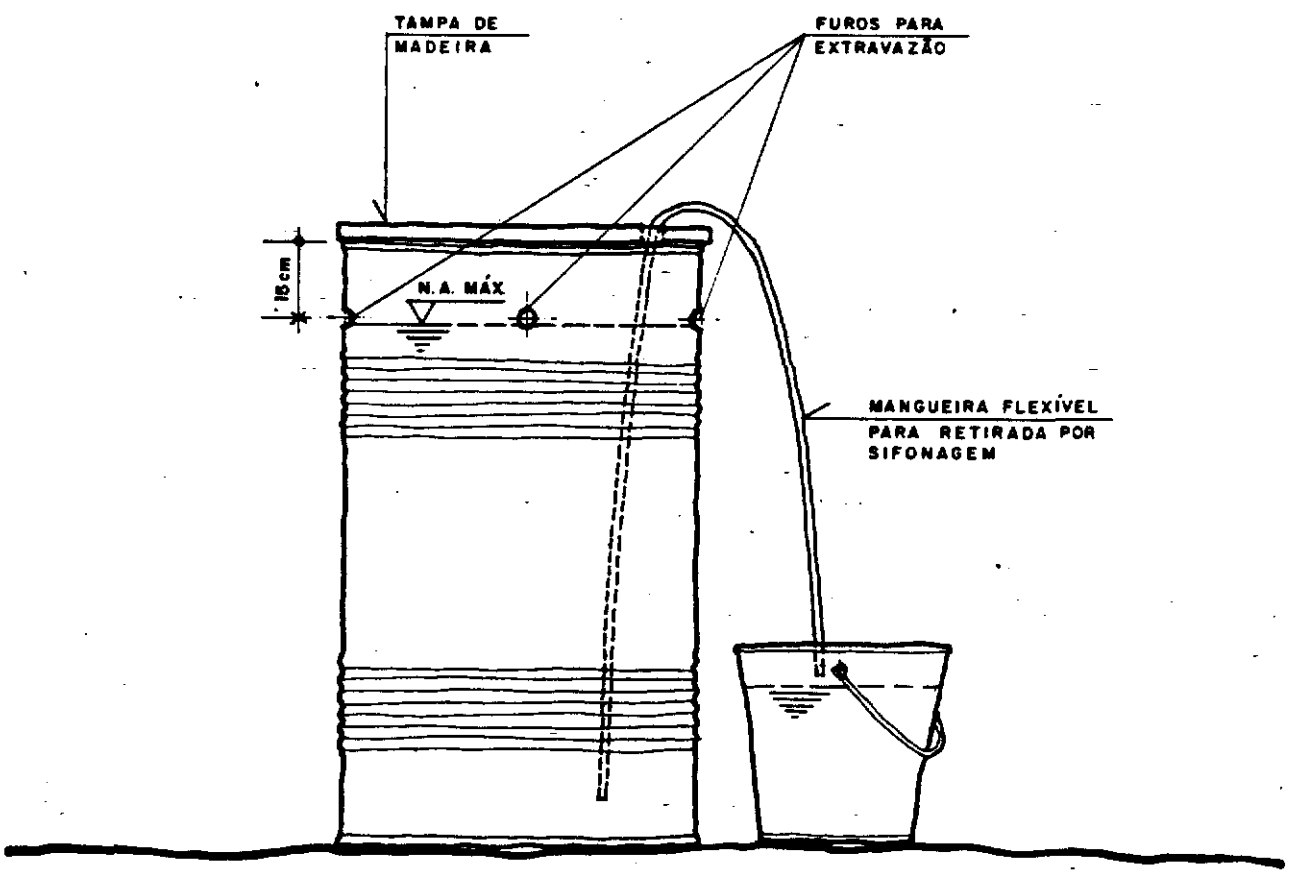


FIG. 1 - ESQUEMA TÍPICO DE CONTAMINAÇÃO DO SISTEMA DE ABASTECIMENTO.



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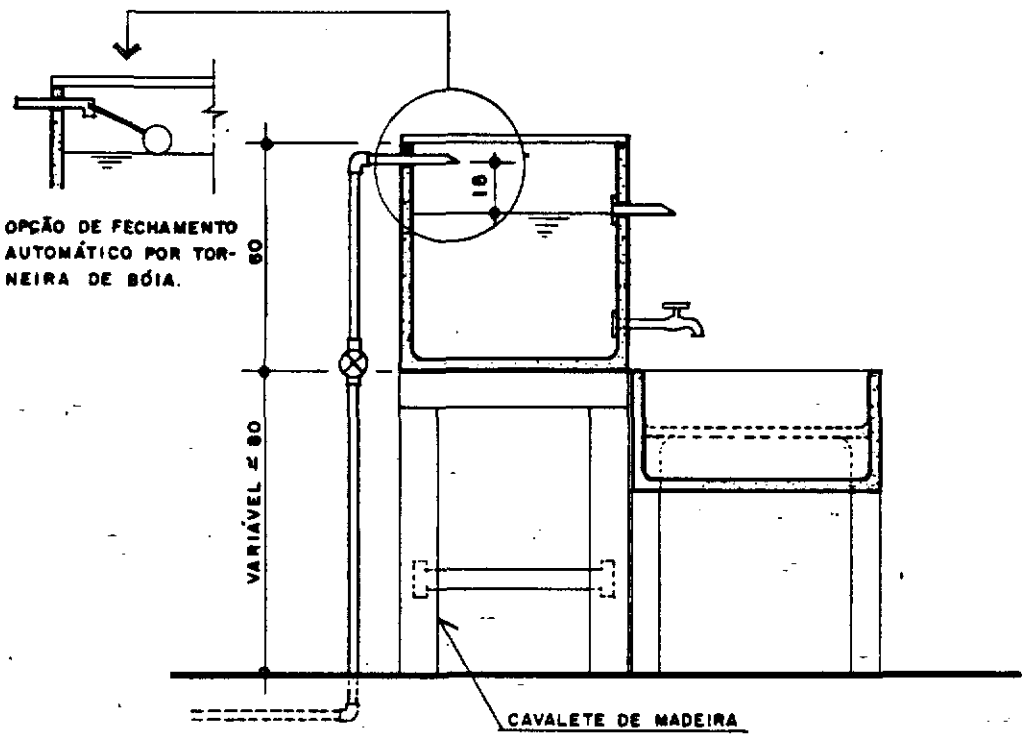
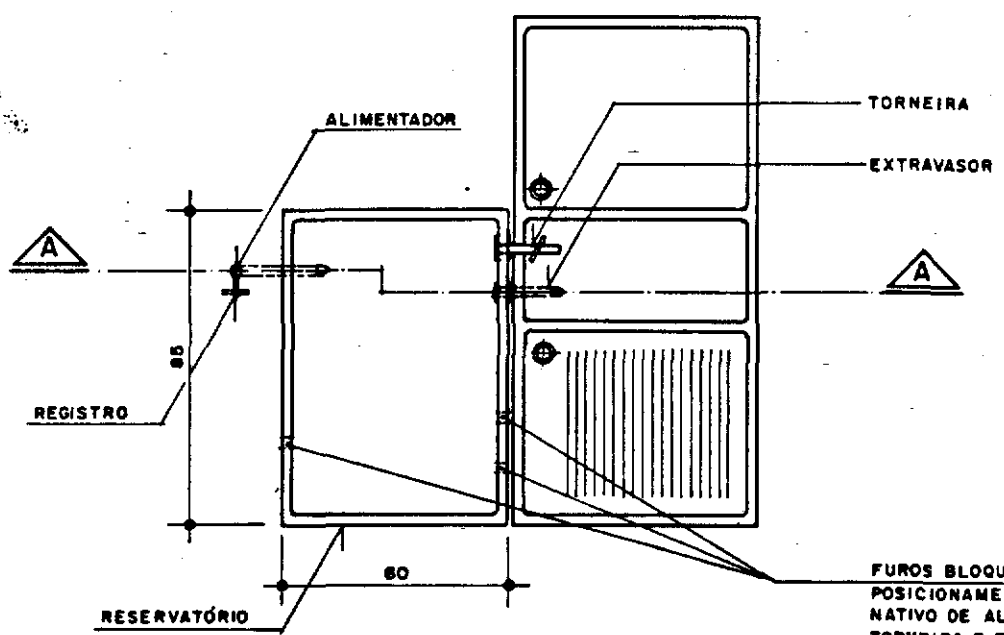
PSIB - PLAN DE SANEAMIENTO INTEGRAL DE BARRIOS		S - 01
MELHORIA NAS CONDIÇÕES DE ARMAZENAMENTO PRECÁRIO		
ESC S/ ESCALA | DES. GILSON | VERIFICADO | APROVADO		DATA AGO / 87



CORTE AA
ESC. 1: 20



PLANTA
ESC. 1: 20

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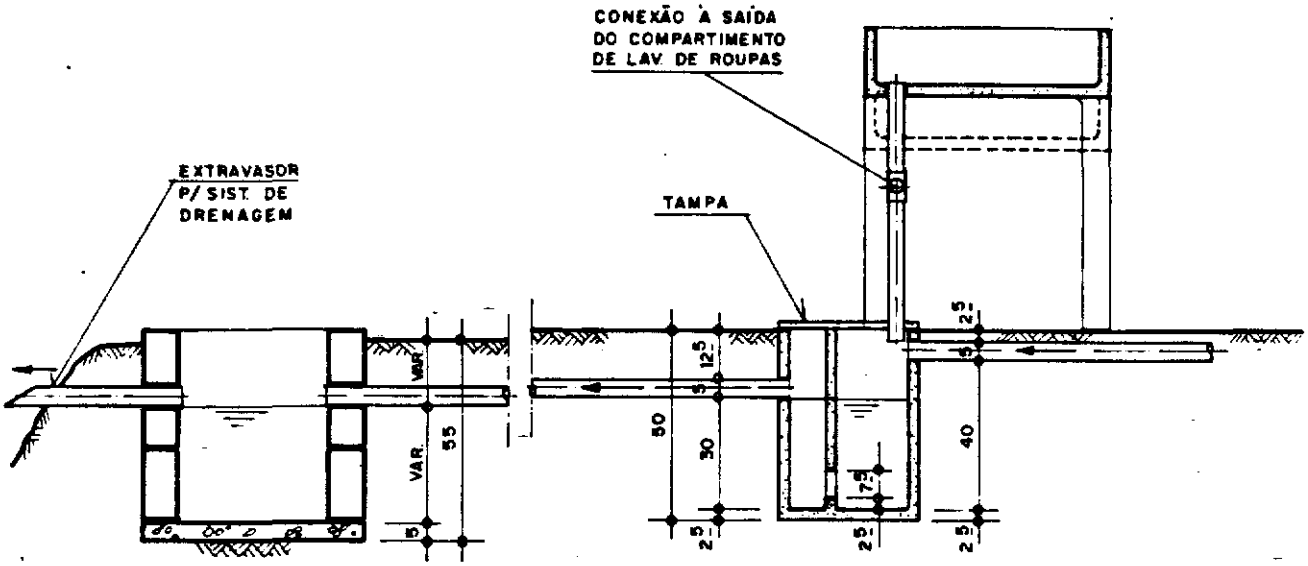
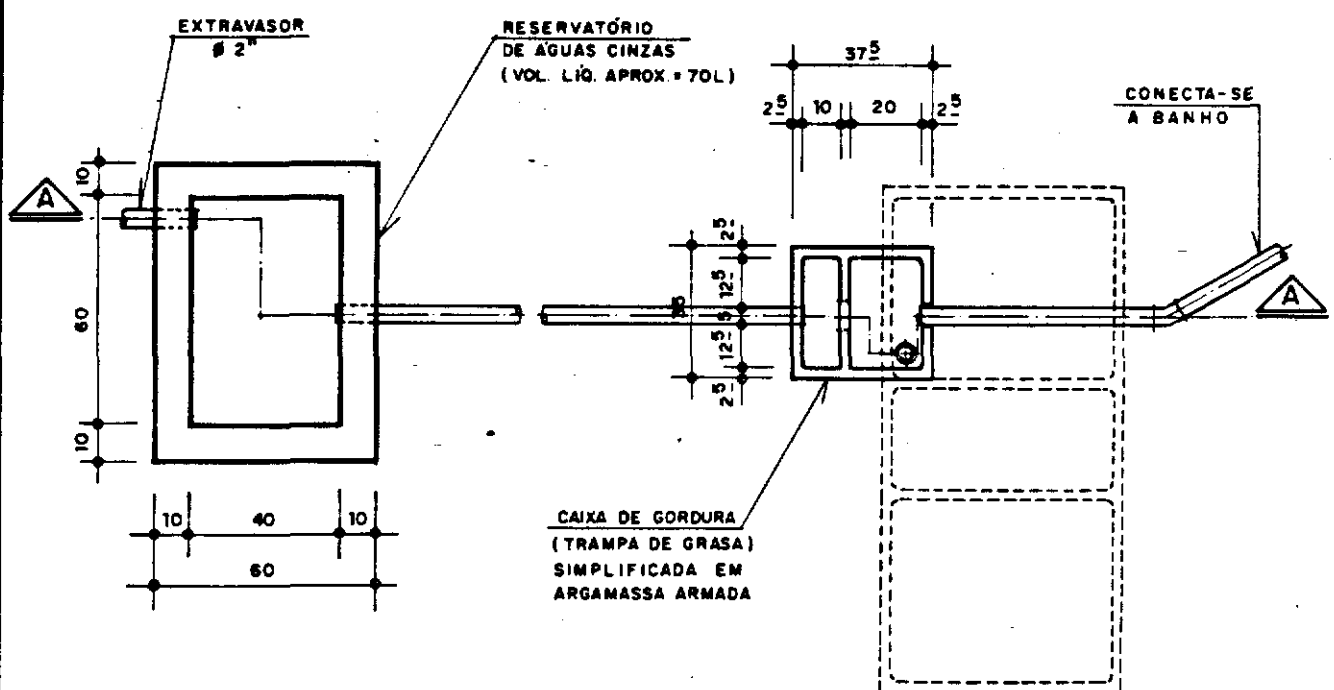
PSI8 - PLAN DE SANEAMIENTO INTEGRAL DE BARRIOS		
SISTEMA DE ARMAZENAMENTO DOMICILIAR DE ÁGUA C/ DESCONEXÃO HÍDRICA		
ESC. 1: 20	DES. GILSON / VERIFICADO / APROVADO	DATA AGO / 87



CORTE AA
ESC. 1 : 20



PLANTA
ESC. 1 : 20

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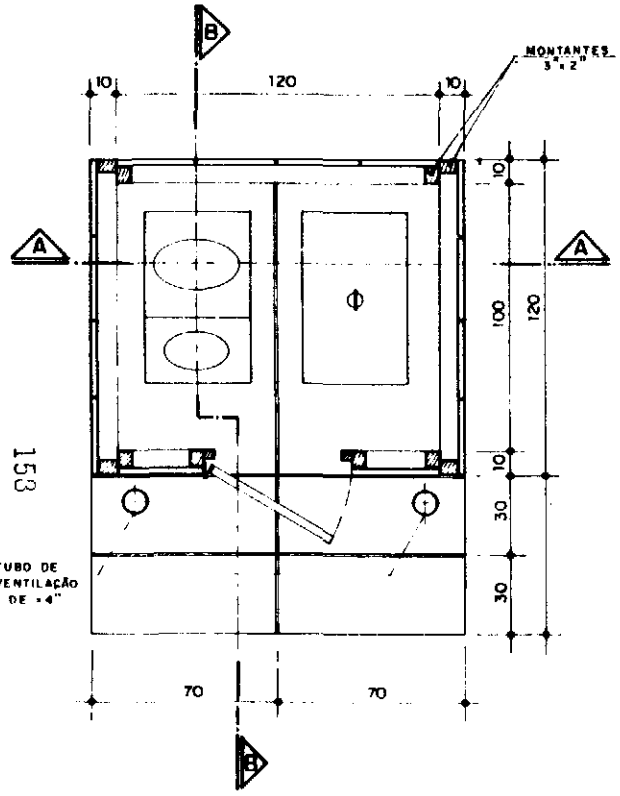
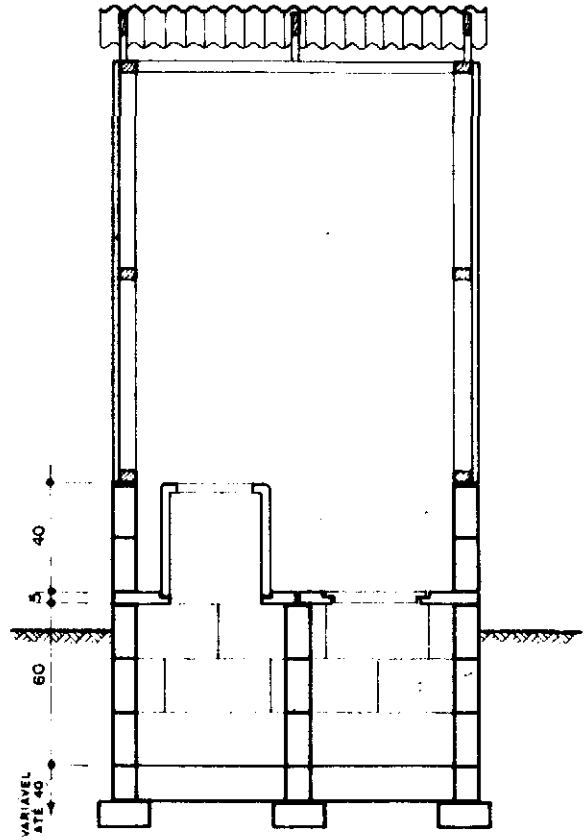
PSIB - PLAN DE SANEAMIENTO INTEGRAL DE BARRIOS		
SISTEMA DOMICILIAR DE DISPOSIÇÃO DE ÁGUAS CINZAS		
ESC. 1 : 20 / DES. GILSON / VERIFICADO / APROVADO		DATA AGO./87



PLANTA
ESC 1 20



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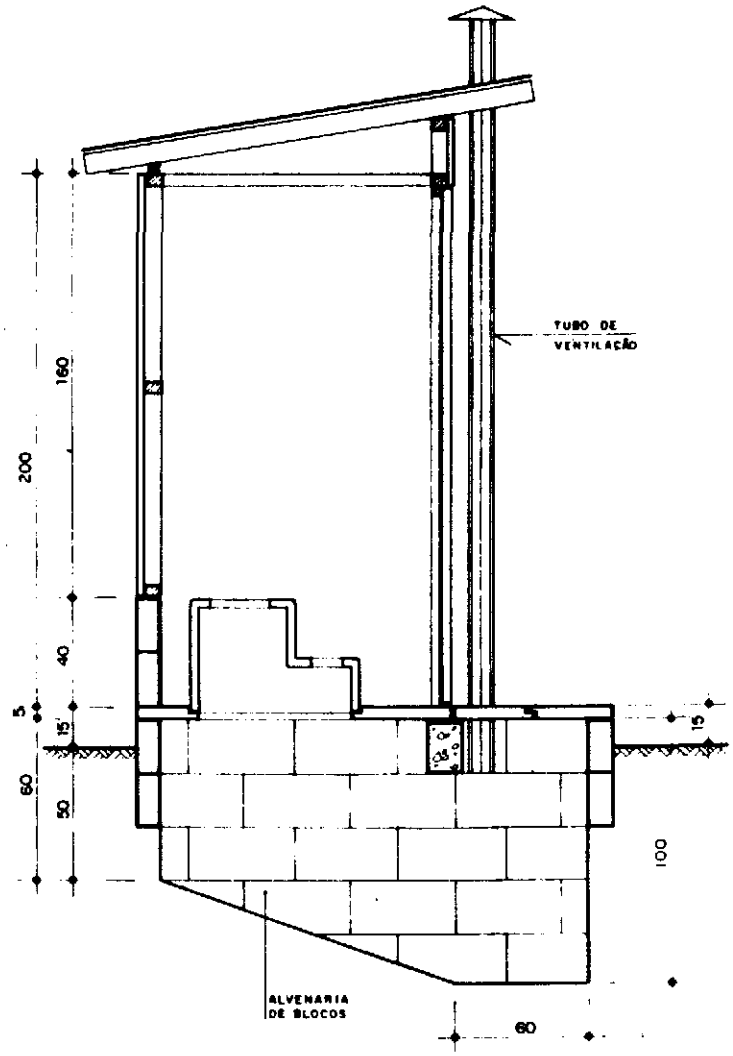

CORTE BB
ESC 1 20

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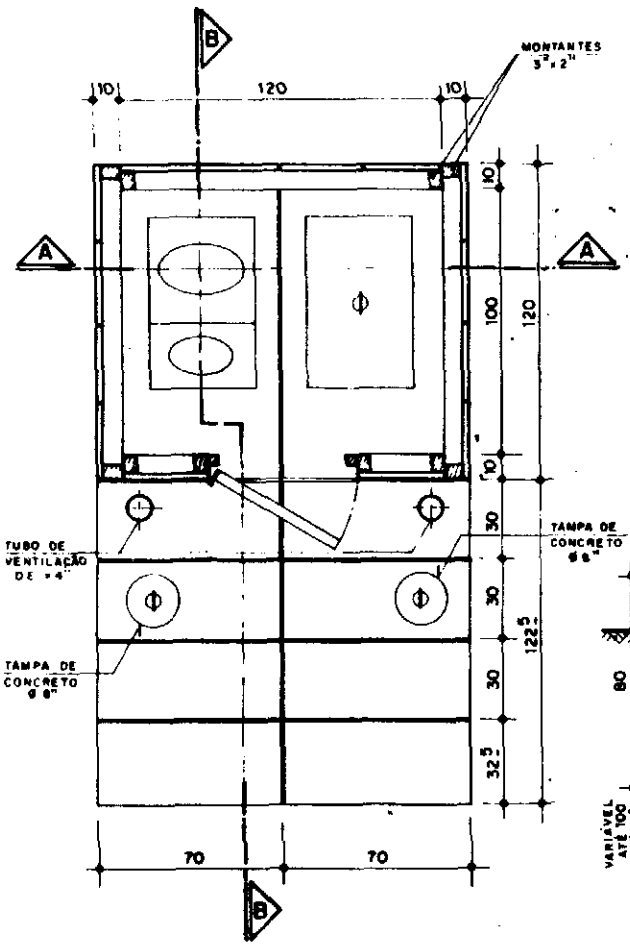
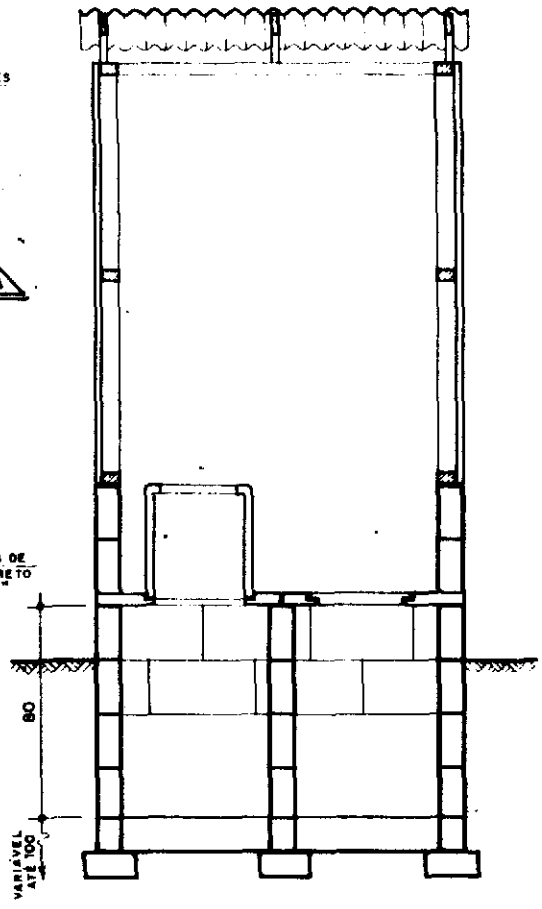
PSIB - PLAN DE SANEAMIENTO INTEGRAL DE BARRIOS				
FOSSA VENTILADA DUPLA				
ESC 1 20	DES GILSON	VERIFICADO	APROVADO	DATA AGO /87



PLANTA
ESC 1 20



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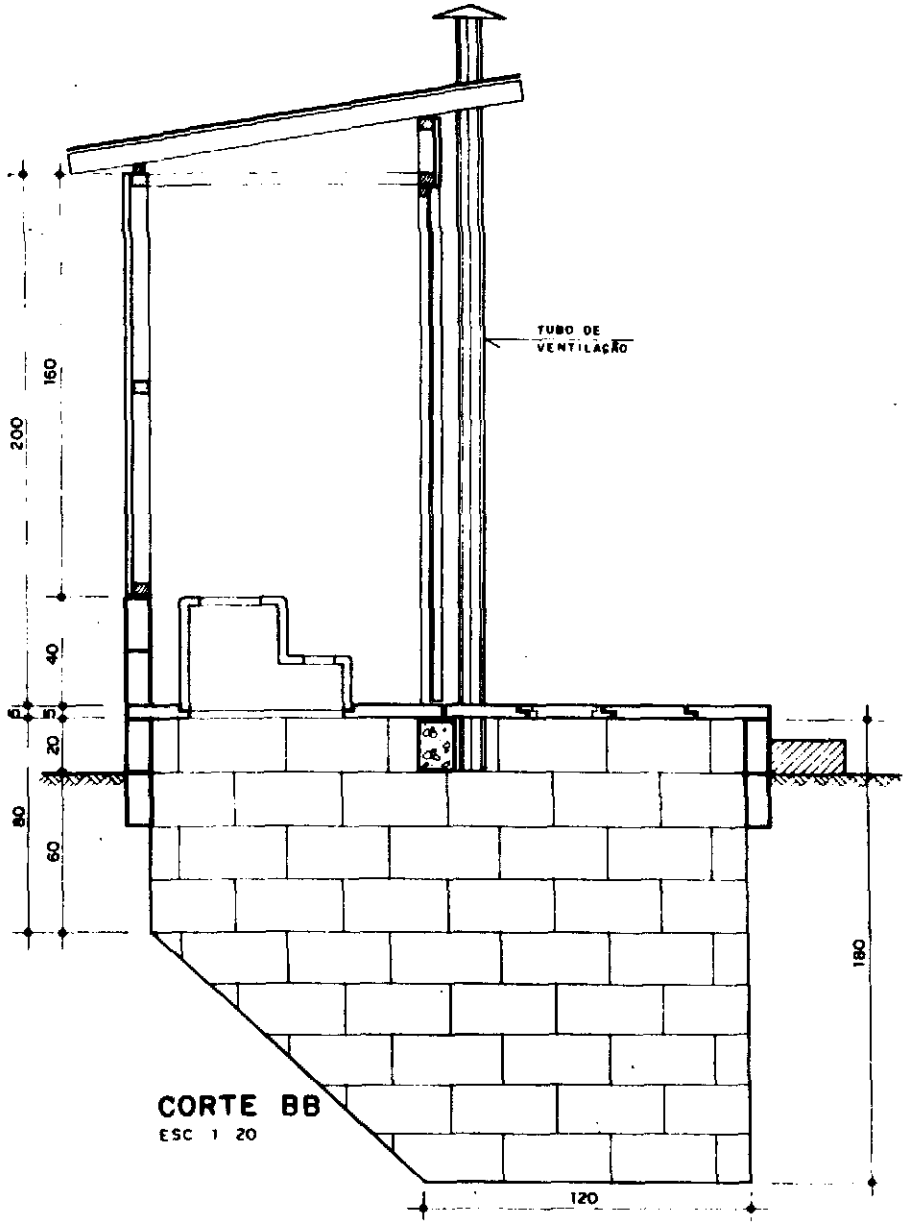

CORTE BB
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IPT DEd - AIS	INSTITUTO DE PESQUISAS TECNOLÓGICAS DO ESTADO DE SÃO PAULO S.A DIVISÃO DE EDIFICAÇÕES - AGRUPAMENTO DE INSTALAÇÕES E SANEAMENTO			FOLHA Nº
PSIB - PLAN DE SANEAMIENTO INTEGRAL DE BARRIOS				S - 05
FOSSA VENTILADA DUPLA C/ COMPOSTAGEM DE RESÍDUOS SÓLIDOS				
ESC 1 : 20	DES. GILSON	VERIFICADO	APROVADO	DATA AGO./87