

## *Chapter 3 Planning Basis*

## CHAPTER 3 PLANNING BASIS

### 3.1 GENERAL

Purpose of a water supply master plan for an urban area is to provide one of infrastructures for the urban development, as well as to improve existing water supply conditions. For the aspect of the provision of the future infrastructure development, the water supply master plan should have planning bases fully compatible to the urban development plans.

The Study tried to follow the existing urban development plans that could provide compatible basic information on planning bases of various infrastructure developments. However, it was found that there is no authorized urban development plan for Tegucigalpa, which could provide basic information sources such as population projection or the future land use plan.

In the water supply master plan, population information, which determines water demands, and spatial expanse of urban areas, which determines water distribution areas, are of the most important information. As there were no available information, the study made own projections for these two factors based on currently available data/information. Then, other planning bases such as unit water demand, water demand by water use, and required intake and production rates were determined.

### 3.2 POPULATION PROJECTION

#### 3.2.1 BASE DATA

Due to lack of adequate resident registration system in Honduras, the only reliable and authorized population data source is the National Census of Population and Household conducted by the General Directorate of Statistics and Census (DGEC). The latest published census was conducted in 1988, and now DGEC is preparing new census to be issued in 2001. For the purpose of field survey design for this new census, DGEC has prepared so called pre-census 2000, which lists up number of the existing households in each neighborhood. We adhere to employ the pre-census 2000 as a basis of the existing population estimation, even though neither it contains population data nor it is authorized by DGEC. The reasons are as follows.

The pre-census 2000 shows that the number of neighborhoods has been drastically increased by nearly 60 %, from 365 in the year 1988 to about 580 in the year 2000.

Hurricane Mitch in 1998 had severe impacts on several neighborhoods. Thus, it is necessary to use information after Hurricane Mitch.

The population projection based on the pre-census 2000 requires an average household size. The Study applied the result of the Permanent Multiple Purpose Questionnaire Survey of Families (EPHPM) conducted by DGEC for determination of average household size.

#### 3.2.2 PRESENT POPULATION

The pre-census 2000 lists up not only inhabited neighborhoods but also ongoing residential development sites which are currently not inhabited. For example, 86 houses in Colonia Casandra are listed indeed there is no inhabitant. After the screening of such uninhabited neighborhoods, a number of the existing household is estimated at 188,341 households.

Table 3.1 shows average household sizes during 1997 to 1999 according to EPHPM.

**Table 3.1 Average Household Size from 1997 to 1999**

Year	June 1997	March 1998	March 1999
Average HH Size (persons/HH)	5.12	5.09	4.95

Source: The Permanent Multiple Purpose Questionnaire Survey of Families (EPHPM), DGEC, June 1997, March 1998, and March 1999

As shown in the table, the average household size is slightly decreasing. In the estimation of the present population, 4.95 persons/household in March 1999 was adopted while it might be larger, or on the safer side from the planning viewpoint.

Then, the existing population of each neighborhood is calculated by multiplying number of households by 4.95 persons/household. The total urban population of Tegucigalpa in 2000 is estimated at 932,288.

### 3.2.3 PROJECTION OF TOTAL POPULATION

#### (1) Previous Population Projections

Table 3.2 shows population projections after the issuance of the Census 1988. Table 3.2 implies how little reliable information exists concerning the population of Tegucigalpa. Many of them assumed certain growth rate without solid justification. Only the United Nations Population Fund (FNUAP) applied a demographic model based on age and sex group. This FNUAP projection seems the most detailed population study among the above projections, however, the projected population seems significantly underestimated. The reason might be a lack of migration information as explained in their report.

**Table 3.2 Previous Projections of Urban Population in Tegucigalpa**

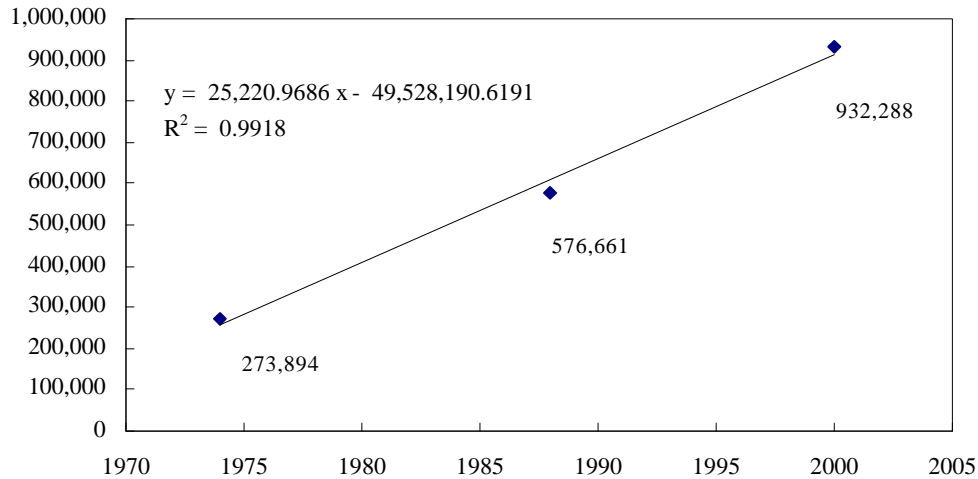
Name of Study	Issuer	Year	Projected population	
			In 2000	In 2015
Actualization of Master Plan for Sanitary Sewerage in Tegucigalpa	SANAA	1992	1,047,300	1,548,500
RAPID IV(La Honduras de Hoy y La Honduras del Manana), High Version	USAID, SECPLAN, etc.	1995	1,200,000	2,250,000
RAPID IV(La Honduras de Hoy y La Honduras del Manana), Low Version	USAID, SECPLAN, etc.	1995	1,100,000	1,750,000
Tegucigalpa Urban Transport Study	JICA	1996	769,764	1,046,385
Honduras Population Projection - HON/94/P02	FNUAP, SECPLAN, DGEC	1996	*835,294	Not available

\*) :The total population of Tegucigalpa including the rural population.

Source: Tegucigalpa Urban Transport Study (JICA,1996), Actualization of Master Plan for Sanitary Sewerage in Tegucigalpa (SANAA,1992), Honduras Population Projection-HON/94/P02 (FNUAP, SECPLAN and DGEC,1996)

#### (2) Projected Total Urban Population

In Honduras the reliability of census data is a matter of argument. It is reported that the omission rate of the Census 1974 might have reached 10 %, nevertheless its quality is superior to previous censuses. Post evaluation of the Census 1988 estimated 4.57 % of omission rate. Therefore, it is concluded that the previous censuses before 1974 are not reliable from the statistical viewpoint. Hence, the total population was projected based on the census 1974, the census 1988, and the present population estimated in the Study, as shown in Figure 3.1.



**Figure 3.1 Trend of Total Urban Population in Tegucigalpa**

Applying a linear extrapolation, total urban population was estimated as shown in *Table 3.3*. The total urban population in 2015 is estimated at 1,376,822.

**Table 3.3 Projection of Total Urban Population in Tegucigalpa**

Year	2000	2005	2010	2015
Projected population	932,288	1,080,466	1,228,644	1,376,822

### 3.2.4 POPULATION PROJECTION FOR EACH NEIGHBORHOOD

#### (1) General

The fact that a number of neighborhoods has been increased around 60% from 1988 to 2000 indicates a further increase of neighborhoods in future. However, we can predict neither the location nor the population distribution for such neighborhoods. For such neighborhoods what we can do is to estimate the population growth as a whole, without specifying the exact location. Considering it, we categorized projected population into following groups.

- Population in the existing inhabited neighborhoods
- Population in the planned neighborhoods/the existing neighborhoods with expansion plan
- Population in the neighborhoods to be settled in future

*Table 3.4* summarizes the concept of annual population growth of each group.

**Table 3.4 Concept of Annual Population Growth**

Group	2000-2005	2006-2015
Existing neighborhoods without expansion plan	Constant (Total-16,886 = 12,750 persons/year)	Constant (Total – 16,886 = 12,750 persons/year)
Existing neighborhoods with extension plan/ Planned neighborhoods	Estimation based on planned lot number ( $x$ persons/year )	
Future neighborhoods	16,886 – $x$ persons/year	Constant (16,886 persons/year)
<b>Total</b>	<b>Constant (29,636 persons/year)</b>	

## (2) Annual Growth in Whole City

Since the Study assumes linear population growth for the whole city, the annual population growth of the whole city is given as follows.

$$\begin{aligned}\text{Annual population growth} &= (\text{Population in 2015} - \text{Population in 2000}) / 15 \text{ years} \\ &= 29,636 \text{ [persons/year]}\end{aligned}$$

## (3) Annual Growth in Outside Existing Neighborhoods

Comparison of the Census 1988 and the estimated existing population in 2000 shows that population increase in the newly constructed neighborhoods after the census was 16,886 persons/year, with assuming linear growth pattern.

## (4) Annual Growth in Planned Neighborhoods and Extension of Neighborhoods

The pre-census 2000 contains ongoing residential development sites which are currently not inhabited. Furthermore, SANAA made a list of service contract of water supply and/or sewerage with private developers, which contains the numbers of contracted lots. Based on the list and the pre-census 2000, the planned urbanization and planned extension of the existing neighborhoods were identified as shown in *Table 3.5*.

**Table 3.5 Planned Neighborhood and Planned Extension of Neighborhood**

Name of Neighborhood	Number of Houses in 2000	Number of Planned Lot
Col. Israel Sur	122	250
Zona Llanos del Potrero	33	181
Brisas de Jacaleapa	-	243
Col. Plan de Los Laureles	-	240
Col. Res. Las Hadas III Etapa	-	324
Juana C. Rivera	-	32
Lomas de Rio Grande	-	60
Milpa Quemada	-	780
Proyecto Banco Atlantida	-	31
Proyecto Linda Vista Centro	-	19
Residencial Agua Dulce	-	158
Residencial Cienega	-	1,000
Residencial La Estancia	-	200
Residencial La Granja	-	65
Residencial Las Uvas	-	1,000
Residencial Los Encuentros	-	2,000
Residencial Monte Pinos	-	33
Residencial Toncontin	-	100
Senor Jose Maria Agurcia	-	210
Urbanizacion Osmond Maduro	-	128
Aldea La Joya	323	437
Col. La Cascada	41	361
Col. Res. Lomas de Miraflores Sur	68	271
Col. Vista Hermosa del Norte	177	197
Col. Armando Calidonio	52	145
Col. Jesus Aguilar Paz	9	102
Col. La Vega	2	80
Total	827	8,647

Source: Pre-census 2000, DGEC, and SANAA, 2000

It should be noted that Ciudad Mateo is excluded from the present study because it is located at the upstream basin of Los Laureles dam which is the protected zone for water source, and in fact no urbanization permission has been issued for Ciudad Mateo by the Municipality Office. Also Aldea S.O.S is excluded because it is an institute for orphans without domestic water use.

All neighborhoods listed in *Table 3.5* are assumed to be fully inhabited until 2005. Then, during the year 2000 to 2005 an annual population growth in each of such residential is given in the following equation.

$$\text{Annual population growth [persons/year]} = (H_p - H_0) / 5 \text{ [years]} \times 4.95 \text{ [persons/household]}$$

where,  $H_p$  : Number of planned lots

$H_0$  : Number of houses in 2000

After the year 2006 the same growth rate as the existing neighborhoods is applied.

### (5) Annual Growth in Future Neighborhoods

Annual population growth in future neighborhoods which will be formed in future is given as follows.

During 2000 to 2005:  $16,886 - x$

After 2006: 16,886

where,  $x$  : Annual population growth in the planned neighborhoods and planned extension of the existing neighborhoods

### (6) Annual Growth in Existing Neighborhoods

The annual population growth of the existing neighborhoods is given as follows.

$$\text{Annual population growth} = 29,636 - 16,886 = 12,750 \text{ [persons/year]}$$

The annual population growth of existing neighborhoods is equally distributed to each neighborhood. After the year 2006 the planned urbanization and the existing neighborhoods with expansion plan are regarded as the existing neighborhoods.

### (7) Result of Population Projection for Each Neighborhood

The result of population projection for each neighborhood is shown in *Table 3.6*.

The present social class of each neighborhood classified by SANAA is also shown in *Table 3.6*. In the table, the class W indicates a neighborhood where water is supplied by well, and the class L indicates a neighborhood without water supply service by SANAA. It is noted that the classes L(A), L(C), and L(P) will become the class A, the class C, and the class P respectively, when piped water supply will be realized. Remaining class L will become the class T with piped water supply.

## 3.3 URBAN AREA

During 1990s the Municipality Office of Tegucigalpa had an intention to extend the limit of urbanization from present 201.5 km<sup>2</sup> to 325 km<sup>2</sup> within 20 years, as shown in *Figure 3.2*. On this matter the Municipality Office and SANAA had a series of discussions in 1996 and 1997. According to SANAA's technical-administrative reports No.117 and No.125, the major conclusions were as follows.

SANAA's proposal to restrict urbanization in the existing boundary was generally accepted, taking into account of sustainable development of the city, high risk zones for disaster, and basin protection of water sources.

Minor expansion such 2 to 4 km towards north and new urbanization of southeastern part of the city were acceptable.

Protected zones like El Hatillo and La Laguna del Pedregal should be kept.

Upstream basin of Los Laureles dam should be treated as protected zone.

**Table 3.6 Result of Population Projection (1/4)**

Code	Name of Neighborhood	Class	2000	2005	2010	2015	Code	Name of Neighborhood	Class	2000	2005	2010	2015
N1	Bo. Abajo	B	1,431	1,529	1,623	1,716	N80	Bo. San Juan de Dios	T	465	497	528	558
N2	Bo. Belen	B	5,064	5,412	5,744	6,076	N81	Bo. San Pablo	T	5,297	5,660	6,008	6,355
N3	Bo. Bella Vista	T	5,767	6,163	6,541	6,919	N82	Bo. San Rafael	C	624	667	707	748
N4	Bo. Bolivar	T	559	598	634	671	N83	Bo. Santa Eduvigis	T	2,416	2,582	2,740	2,898
N5	Bo. Brisas del Norte	W	1,906	2,037	2,162	2,287	N84	Bo. Saucique	T	510	545	578	612
N6	Bo. Buena Vista	B	436	466	494	523	N85	Bo. Sipile	T	4,227	4,518	4,795	5,072
N7	Bo. Buenos Aires	M	3,302	3,528	3,745	3,961	N86	Bo. Tiloarque Sector I,II	M	530	566	601	635
N8	Bo. Camaguara	T	1,257	1,344	1,426	1,509	N87	Bo. Villa Adela	B	2,366	2,529	2,684	2,839
N9	Bo. Casamata	B	1,401	1,497	1,589	1,681	N88	Bo. Viera	B	916	979	1,039	1,099
N10	Bo. Centro de Comayaguela	T	2,782	2,973	3,155	3,338	N89	Bo. Zaragoza	B	406	434	460	487
N11	Bo. Centro de Tegucigalpa	C	347	370	393	416	N90	Col. Alameda	S	728	778	825	873
N12	Bo. Concepcion	B	2,455	2,624	2,785	2,946	N91	Col. El Alamo	P	1,505	1,608	1,707	1,806
N13	Bo. El Bosque	B	12,999	13,891	14,744	15,596	N92	Col. Alemania No.1	T	1,228	1,312	1,392	1,473
N14	Bo. El Calvario	B	876	936	994	1,051	N93	Col. Alemania No.2	T	619	661	702	742
N15	Bo. El Carrizal	T	282	302	320	339	N94	Col. Altos de Cartero	T	426	455	483	511
N16	Bo. El Coco	T	678	725	769	814	N95	Col. Altos de Divanna	T	980	1,047	1,112	1,176
N17	Bo. El Chile	C	3,450	3,687	3,913	4,140	N96	Col. Altos de Primavera	T	431	460	488	517
N18	Bo. El Eden	T	802	857	910	962	N97	Col. Altos de las Vegas	L(T)	129	138	146	154
N19	Bo. El Eden No.2	T	1,327	1,418	1,505	1,592	N98	Col. Altos de Loarque	T	2,114	2,259	2,397	2,536
N20	Bo. El Guanacaste	B	2,114	2,259	2,397	2,536	N99	Col. Altos de Miramontes	A	1,643	1,756	1,864	1,972
N21	Bo. El Jazmin	C	124	132	140	148	N100	Col. Altos de San Francisco	T	3,104	3,317	3,520	3,724
N22	Bo. El Manchen	C	4,430	4,735	5,025	5,316	N101	Col. Altos de San Jose	P	584	624	663	701
N23	Bo. El Obelisco	B	149	159	168	178	N102	Col. Altos de Tiloarque	M	2,237	2,391	2,538	2,685
N24	Bo. El Olvido	C	470	503	533	564	N103	Col. Altos del Milagro	T	376	402	427	451
N25	Bo. El Pastel	T	1,153	1,233	1,308	1,384	N104	Col. America	A	2,257	2,412	2,560	2,708
N26	Bo. El Pedregalito	T	3,980	4,253	4,514	4,775	N105	Col. Argentina	A	198	212	225	238
N27	Bo. El Picachito	T	1,238	1,322	1,404	1,485	N106	Col. Aurora No.1	T	2,341	2,502	2,656	2,809
N28	Bo. El Reparto	T	9,583	10,241	10,870	11,498	N107	Col. Ayestas	T	7,603	8,125	8,624	9,123
N29	Bo. El Rincon	T	1,510	1,613	1,712	1,811	N108	Col. Bella Oriente	M	2,049	2,190	2,324	2,459
N30	Bo. El Vacilon	T	149	159	168	178	N109	Col. Bendeck	B	663	709	752	796
N31	Bo. El Zancudo	T	1,445	1,545	1,639	1,734	N110	Col. Bolivar	P	322	344	365	386
N32	Bo. Guacerique	C	465	497	528	558	N111	Col. Brasilia	L	356	381	404	428
N33	Bo. Guadalupe	B	4,282	4,576	4,857	5,137	N112	Col. Brisas de Olancho	T	2,396	2,560	2,717	2,875
N34	Bo. Jardines de las Mercedes	T	1,539	1,645	1,746	1,847	N113	Col. Brisas de Suyapa	T	1,213	1,296	1,376	1,455
N35	Col.(Bo.) La Alhambra	M	69	74	79	83	N114	Col. (Bo.) Brisas del Picacho	T	817	873	926	980
N36	Bo. La Bolsa	C	337	360	382	404	N115	Col. Brisas del Valle	T	1,802	1,926	2,044	2,162
N37	Bo. La Burrera	T	1,391	1,486	1,578	1,669	N116	Col. Buenas Nuevas	T	990	1,058	1,123	1,188
N38	Bo. La Cabaña	C	3,222	3,444	3,655	3,866	N117	Col. Campo Cielo	T	4,351	4,650	4,935	5,221
N39	Bo. La Concordia	C	317	339	359	380	N118	Col. Canada	T	1,723	1,841	1,954	2,067
N40	Bo. La Cuesta No. 1	W	1,752	1,873	1,988	2,102	N119	Col. 14 de Febrero	T	723	772	820	867
N41	Bo. La Chivera	T	653	698	741	784	N120	Col. 14 de Marzo	T	5,306	5,671	6,019	6,367
N42	Bo. La Esperanza	T	673	719	764	808	N121	Col. Centroamericana I,II Etapa	P	2,124	2,269	2,409	2,548
N43	Bo. La Estrella	T	817	873	926	980	N122	Col. Centro America Oeste	P	12,291	13,135	13,941	14,747
N44	Bo. La Fuente	B	802	857	910	962	N123	Col. Cerro Grande Zona III	P	1,554	1,661	1,763	1,865
N45	Bo. La Granja	A	941	1,005	1,067	1,128	N124	Col. Ciudad Nueva	L(A)	678	725	769	814
N46	Bo. La Hoya	C	609	651	691	731	N125	Col. Cristobal Diaz	T	391	418	444	469
N47	Bo. La Joya # 1	P	40	42	45	48	N126	Col. Divanna	T	3,158	3,375	3,582	3,789
N48	Bo. La Leona	C	1,693	1,809	1,920	2,031	N127	Col. El Carrizal No.1-B	T	2,460	2,629	2,790	2,952
N49	Bo. La Loma	T	64	69	73	77	N128	Col. El Carrizal No.2	T	2,044	2,185	2,319	2,453
N50	Bo. La Merced	C	5	5	6	6	N129	Col. El Castaño	A	124	132	140	148
N51	Bo. La Moncada	C	193	206	219	232	N130	Col. El Castano Sur	S	985	1,053	1,117	1,182
N52	Bo. La Pagoda	T	1,064	1,137	1,207	1,277	N131	Col. El Cerrito	T	569	608	646	683
N53	Bo. La Pedrera No.1	B	223	238	253	267	N132	Col. El Country	B	698	746	792	837
N54	Bo. La Pedrera No.2	B	50	53	56	59	N133	Col. El Dorado	M	178	190	202	214
N55	Bo. La Plazuela	C	723	772	820	867	N134	Col. El Hatillo	A	1,624	1,735	1,842	1,948
N56	Bo. La Ronda	C	1,049	1,121	1,190	1,259	N135	Col. El Hato o San Ignacio	A	886	947	1,005	1,063
N57	Bo. La Soledad	T	1,762	1,883	1,999	2,114	N136	Col. El Hogar	M	2,178	2,328	2,470	2,613
N58	Bo. Las Colinas	T	455	487	517	546	N137	Col. Manantial	L	480	513	545	576
N59	Bo. Las Crucitas No.1	T	5,876	6,279	6,664	7,050	N138	Col. El Pederal	T	896	957	1,016	1,075
N60	Bo. Las Crucitas No.2	T	599	640	679	719	N139	Col. El Porvenir	T	2,228	2,380	2,527	2,673
N61	Bo. Las Delicias	C	941	1,005	1,067	1,128	N140	Col. El Prado	A	817	873	926	980
N62	Bo. Las Palomas	B	347	370	393	416	N141	Col. El Progreso No. 1	T	772	825	876	927
N63	Bo. Lempira	B	2,559	2,735	2,903	3,071	N142	Col. El Progreso No. 2	T	376	402	427	451
N64	Bo. Los Dolores	C	391	418	444	469	N143	Col. El Retiro	T	2,119	2,264	2,403	2,542
N65	Bo. Los Encuentros (Col.Kuwait)	T	114	122	129	137	N144	Col. El Rosario	T	2,470	2,640	2,802	2,964
N66	Bo. Los Girasoles	P	193	206	219	232	N145	Col. El Sitio	P	4,693	5,015	5,323	5,630
N67	Bo. Los Profesores	T	817	873	926	980	N146	Col. El Socorro	B	149	159	168	178
N68	Bo. Mirafior	T	342	365	387	410	N147	Col. El Triangulo	S	218	233	247	261
N69	Bo. Miramesi	T	554	592	629	665	N148	Col. El Zarzal o Betania	T	2,252	2,407	2,555	2,702
N70	Bo. Morazan	B	5,306	5,671	6,019	6,367	N149	Col. Elvel	A	535	571	606	641
N71	Bo. Perpetuo Socorro	B	4,341	4,639	4,924	5,209	N150	Col. Espiritu Santo	L(T)	554	592	629	665
N72	Bo. Planes de la Loma	L	84	90	95	101	N151	Col. Estados Unidos	T	2,218	2,370	2,515	2,661
N73	Bo. Pueblo Nuevo	B	1,436	1,534	1,628	1,722	N152	Col. Faldas del Pedregal	T	1,663	1,777	1,886	1,996
N74	Bo. Purta Caliente	P	733	783	831	879	N153	Col. FEHCOVIL	P	421	450	477	505
N75	Bo. Salida a Valle de Angeles	M	45	48	51	53	N154	Col. La Flor No.1	T	4,544	4,856	5,154	5,452
N76	Bo. Salida del Sur	B	144	153	163	172	N155	Col. La Flor No.2	T	1,718	1,836	1,948	2,061
N77	Bo. San Cristobal	T	896	957	1,016	1,075	N156	Col. Flor del Campo, Zonas 1-3	T	15,187	16,230	17,225	18,221
N78	Bo. San Felipe	C	381	407	432	457	N157	Col. Florencia Norte	S	1,089	1,164	1,235	1,307
N79	Bo. San Jorge	T	104	111	118	125	N158	Col. Florencia Sur	S	554	592	629	665

**Table 3.6 Result of Population Projection (2/4)**

Code	Name of Neighborhood	Class	2000	2005	2010	2015	Code	Name of Neighborhood	Class	2000	2005	2010	2015
N159	Col. Flores de Oriente	T	2,614	2,793	2,964	3,136	N238	Col. Marichal	A	361	386	410	434
N160	Col. Francisco Murillo Soto	T	515	550	584	618	N239	Col. Matamoros	S	545	582	618	653
N161	Col. Fuerzas Armadas	T	624	667	707	748	N240	Col. Mayangle	M	896	957	1,016	1,075
N162	Col. Godoy	A	846	905	960	1,016	N241	Col. Melgar Castro	W	327	349	371	392
N163	Col. Gracias a Dios	T	1,782	1,904	2,021	2,138	N242	Col. Mirador de Loarque	M	158	169	180	190
N164	Col. Guamillito	T	604	645	685	725	N243	Col. Mirador de San Isidro	T	936	1,000	1,061	1,123
N165	Col. Guillen	T	4,688	5,010	5,317	5,624	N244	Col. Miraflores	M	6,811	7,279	7,726	8,172
N166	Col. Hato de Enmedio, 1-10, 6A	P	18,726	20,012	21,240	22,468	N245	Col. Miraflores Sur	M	1,455	1,555	1,651	1,746
N167	Col. Henry Merriam	P	718	767	814	861	N246	Col. Miramontes	A	1,322	1,412	1,499	1,586
N168	Col. Hollywood	T	64	69	73	77	N247	Col. Modelo	S	767	820	870	921
N169	Col. Humuya	A	1,020	1,090	1,157	1,223	N248	Col. Modesto Rodas Alvarado	T	1,604	1,714	1,819	1,924
N170	Col. Inestroza	M	99	106	112	119	N249	Col. Modesto Rodas Alvarado	T	1,322	1,412	1,499	1,586
N171	Col. La Independencia	T	4,648	4,967	5,272	5,577	N250	Col. Monsenor Fiallos	M	2,688	2,872	3,049	3,225
N172	Col. Interamericana	M	520	555	590	624	N251	Col. Montelimar	T	589	630	668	707
N173	Col. Izaguirre	B	3,376	3,608	3,829	4,051	N252	Col. Monterrey	T	5,301	5,666	6,013	6,361
N174	Col. Israel Norte	T	2,059	2,201	2,336	2,471	N253	Col. Monterrey Norte	T	663	709	752	796
N175	Col. Jacaranda	M	109	116	124	131	N254	Col. Montes de Sinai	T	1,945	2,079	2,207	2,334
N176	Col. Jardines de Loarque	M	2,594	2,772	2,942	3,112	N255	Col. Nueva Era (I,II,III Etapas)	B	1,485	1,587	1,684	1,782
N177	Col. Jardines de San Jose	P	292	312	331	350	N256	Col. Nueva Era	T	500	534	567	600
N178	Col. Jardines de Toncontin	T	2,079	2,222	2,358	2,494	N257	Col. Nueva Esperanza (I-II)	T	3,886	4,153	4,407	4,662
N179	Col. Jardines del Carrizal	W	653	698	741	784	N258	Col. Nueva Providencia	W	505	540	573	606
N180	Col. Jose Simon Azcona	T	609	651	691	731	N259	Col. Nueva Santa Rosa	T	2,762	2,952	3,133	3,314
N181	Col. Kennedy (Zona 1,2,3,4,5,6)	P	22,770	24,334	25,827	27,320	N260	Col. Nueva Suyapa	T	6,227	6,655	7,063	7,471
N182	Col. La Campana	A	990	1,058	1,123	1,188	N261	Col. Nuevas Delicias	T	356	381	404	428
N183	Col. La Cantera (parte F)	T	945	1,010	1,072	1,134	N262	Col. Nuevo Loarque	M	678	725	769	814
N184	Col. Residencial La Cañada	M	119	127	135	143	N263	Col. Nuevos Horizontes	W	1,693	1,809	1,920	2,031
N185	Col. La Era No.1	T	2,624	2,804	2,976	3,148	N264	Col. Obrera	T	4,673	4,994	5,300	5,607
N186	Col. La Era No.2	T	1,807	1,931	2,049	2,168	N265	Col. 11 de Junio o Suazo Cordova	T	1,851	1,978	2,100	2,221
N187	Col. La Esperanza	B	3,614	3,862	4,099	4,336	N266	Col. Oscar A. Flores	T	3,074	3,285	3,487	3,688
N188	Col. La Fraternidad	T	1,049	1,121	1,190	1,259	N267	Col. Palermo	A	431	460	488	517
N189	Col. La Fuente	M	886	947	1,005	1,063	N268	Col. Palmaira	A	1,500	1,603	1,701	1,800
N190	Col. La Haya	T	2,089	2,232	2,369	2,506	N269	Col. Payaqui	A	317	339	359	380
N191	Col. La Joya (Sector 1,2,3)	P	4,212	4,502	4,778	5,054	N270	Col. Payregal de San Jose	P	5,589	5,972	6,339	6,705
N192	Col. La Laguna	T	1,010	1,079	1,145	1,212	N271	Col. Perez	P	188	201	213	226
N193	Col. La Pena	T	8,361	8,935	9,483	10,031	N272	Col. Pilito Jose A. Ulloa	L	1,901	2,031	2,156	2,281
N194	Col. La Popular	P	1,445	1,545	1,639	1,734	N273	Col. Planes de los Pinos	T	1,386	1,481	1,572	1,663
N195	Col. La Pradera	T	4,203	4,491	4,767	5,042	N274	Col. Policarpo Paz Garcia	T	3,143	3,359	3,565	3,771
N196	Col. La Primavera	A	1,277	1,365	1,449	1,532	N275	Col. 1 de Enero	T	574	614	651	689
N197	Col. La Providencia	T	812	868	921	974	N276	Col. Quezada	A	604	645	685	725
N198	Col. La Reforma	A	520	555	590	624	N277	Col. 15 de Septiembre	A	1,945	2,079	2,207	2,334
N199	Col. La Rosa	T	2,257	2,412	2,560	2,708	N278	Col. Res. Altos de las Colinas	M	520	555	590	624
N200	Col. La Sosa	T	4,995	5,338	5,665	5,993	N279	Col. Res. Centroamerica Este	M	1,337	1,428	1,516	1,604
N201	Col. La Trinidad No.1	T	3,752	4,010	4,256	4,502	N280	Col. Residencial Granada	P	1,401	1,497	1,589	1,681
N202	Col. La Trinidad No.2	T	950	1,016	1,078	1,140	N281	Col. Res. Guaymuras	P	1,272	1,360	1,443	1,526
N203	Col. La Union	T	752	804	853	903	N282	Col. Res. Las Colinas	M	3,935	4,206	4,464	4,722
N204	Col. Lara	A	678	725	769	814	N283	Col. Res. La Joya	S	475	508	539	570
N205	Col. Las Brisas	T	2,366	2,529	2,684	2,839	N284	Col. Res. Lomas de Jacaleapa	P	1,812	1,936	2,055	2,174
N206	Col. Las Mercedes	T	7,544	8,062	8,557	9,051	N285	Col. Res. Los Pinares	A	599	640	679	719
N207	Col. Las Minitas	S	426	455	483	511	N286	Col. San Jose de los Llanos I,II,III,IV	P	3,713	3,967	4,211	4,454
N208	Col. Las Palmas	T	5,371	5,740	6,092	6,444	N287	Col. Res. Villa Delmy	T	292	312	331	350
N209	Col. Las Pavas	T	1,292	1,381	1,465	1,550	N288	Col. Villa Espanola	P	431	460	488	517
N210	Col. Las Torres	T	6,029	6,443	6,839	7,234	N289	Col. Republica de Venezuela	P	2,539	2,714	2,880	3,047
N211	Col. Las Vegas del Carrizal	W	35	37	39	42	N290	Col. Rio Grande Norte	M	1,406	1,502	1,595	1,687
N212	Col. Las Vegas del Country	T	1,406	1,502	1,595	1,687	N291	Col. Rio Grande Sur	M	1,267	1,354	1,437	1,520
N213	Col. Lincoln	W	1,025	1,095	1,162	1,229	N292	Col. Rivas	T	495	529	561	594
N214	Col. Linda Vista o Planes del Guajarro	S	366	391	415	439	N293	Col. Roberto Suazo Cordova	T	1,247	1,333	1,415	1,497
N215	Col. Linton	T	455	487	517	546	N294	Col. Sagastume No.2 (Rodimiro Zelaya)	T	1,406	1,502	1,595	1,687
N216	Col. Loma La Minita	B	916	979	1,039	1,099	N295	Col. Rodriguez	B	6,064	6,480	6,878	7,275
N217	Col. Loma Linda Norte	A	1,129	1,206	1,280	1,354	N296	Col. Rosa Linda	L	1,203	1,285	1,364	1,443
N218	Col. Loma Linda Sur	S	921	984	1,044	1,105	N297	Col. Ruben Dario	A	554	592	629	665
N219	Col. Lomas de Tiloque I, II	P	2,435	2,603	2,762	2,922	N298	Col. Sabana Grande	T	896	957	1,016	1,075
N220	Col. Lomas del Cortijo	T	1,139	1,217	1,291	1,366	N299	Col. Sagastume	T	2,267	2,423	2,571	2,720
N221	Col. Lomas del Country	T	614	656	696	736	N300	Col. San Angel	P	4,247	4,539	4,817	5,096
N222	Col. Lomas del Guajarro	S	1,119	1,196	1,269	1,342	N301	Col. San Buenaventura	T	2,752	2,941	3,122	3,302
N223	Col. Lomas del Guajarro Sur	S	2,153	2,301	2,442	2,584	N302	Col. San Carlos	P	312	333	354	374
N224	Col. Lomas del Mayab o Los Profesionales	S	1,104	1,180	1,252	1,324	N303	Col. San Francisco	T	6,346	6,782	7,198	7,614
N225	Col. Lomas del Norte	L	3,841	4,105	4,357	4,609	N304	Col. San Jose	P	594	635	674	713
N226	Col. Los Almendros	A	272	291	309	327	N305	Col. San Jose de la Pena	P	3,341	3,571	3,790	4,009
N227	Col. Los Angeles	S	644	688	730	772	N306	Col. San Jose de la Vega I, II	P	3,683	3,936	4,177	4,419
N228	Col. Los Centenos	W	1,163	1,243	1,319	1,396	N307	Col. San Juan del Norte No.1	L	223	238	253	267
N229	Col. Res. Los Girasoles I,II,III, IV	P	1,634	1,746	1,853	1,960	N308	Col. San Juan del Norte No.2	L	1,579	1,687	1,791	1,895
N230	Col. Los Olmos	T	297	317	337	356	N309	Col. San Luis	M	708	756	803	849
N231	Col. Los Periodistas	A	193	206	219	232	N310	Col. San Lorenzo	W	396	423	449	475
N232	Col. Los Pinos	T	9,494	10,146	10,769	11,391	N311	Col. San Martin	D	1,505	1,608	1,707	1,806
N233	Col. Los Proceres	T	381	407	432	457	N312	Col. San Miguel	P	10,628	11,358	12,054	12,751
N234	Col. Res. Los Robles	M	3,901	4,168	4,424	4,680	N313	Col. Santa Anita o Quebrachal	T	332	354	376	398
N235	Col. Los Zorcales Sector I,II	T	1,460	1,561	1,656	1,752	N314	Col. Santa Barbara	M	218	233	247	261
N236	Col. Res. Luis Landa	M	569	608	646	683	N315	Col. Santa Cecilia No.1	T	3,015	3,222	3,419	3,617
N237	Col. Maradiaga	A	500	534	567	600	N316	Col. Santa Fe	P	3,005	3,211	3,408	3,605



**Table 3.6 Result of Population Projection (3/4)**

Code	Name of Neighborhood	Class	2000	2005	2010	2015	Code	Name of Neighborhood	Class	2000	2005	2010	2015
N317	Col. Santa Isabel o Palmas Oeste	P	1,049	1,121	1,190	1,259	N396	Bo. La Soledad No.2	T	233	249	264	279
N318	Col. Santa Isabel No.1	T	218	233	247	261	N397	Bo. Los Higueros	T	50	53	56	59
N319	Col. Santo Domingo I-II Etapa	M	559	598	634	671	N398	Bo. San Isidro	T	307	328	348	368
N320	Col. Satellite	M	2,633	2,814	2,987	3,160	N399	Bo. Villa Los Ciruelos	T	158	169	180	190
N321	Col. Sempe	T	1,040	1,111	1,179	1,247	N400	Col. Universidad Este	P	371	397	421	445
N322	Col. Smith No.1	W	1,297	1,386	1,471	1,556	N401	Col. 1 de Diciembre	T	4,376	4,676	4,963	5,250
N323	Col. Smith No.2	W	678	725	769	814	N402	Col. 17 de Septiembre	T	1,079	1,153	1,224	1,295
N324	Col. Soto	D	208	222	236	249	N403	Col. 17 de Septiembre #2	T	569	608	646	683
N325	Col. Tepeyac	S	1,322	1,412	1,499	1,586	N404	Col. 19 de Septiembre	T	1,792	1,915	2,032	2,150
N326	Col. Torocagua	P	7,143	7,633	8,102	8,570	N405	Col. 23 de Junio	T	1,901	2,031	2,156	2,281
N327	Col. 13 de Julio	T	901	963	1,022	1,081	N406	Col. Altamira	P	208	222	236	249
N328	Col. 30 de Noviembre	P	2,510	2,682	2,847	3,011	N407	Col. Altos de Eden	T	153	164	174	184
N329	Col. Tres Caminos	A	1,515	1,619	1,718	1,817	N408	Col. Altos de Elvel	A	64	69	73	77
N330	Col. 12 de Mayo	T	11,949	12,770	13,554	14,337	N409	Col. Altos de Jardines de Loarque	T	317	339	359	380
N331	Col. Universidad Norte (I,II)	M	1,143	1,222	1,297	1,372	N410	Col. Altos de la Cabaña	B	941	1,005	1,067	1,128
N332	Col. 28 de Marzo	T	3,648	3,899	4,138	4,377	N411	Col. Altos de La Joya	P	149	159	168	178
N333	Col. 21 de Febrero	T	7,494	8,009	8,500	8,992	N412	Col. Altos de la Laguna	L	218	233	247	261
N334	Col. 21 de Octubre	P	3,653	3,904	4,144	4,383	N413	Col. Altos de las Tapias	L	3,445	3,682	3,908	4,134
N335	Col. Prof. Victor F. Ardon	P	1,653	1,767	1,875	1,984	N414	Col. Altos de los Laureles	T	1,173	1,254	1,331	1,408
N336	Col. Vieja Santa Rosa	T	441	471	500	529	N415	Col. Altos de Miramesi	T	401	428	455	481
N337	Col. Viera	A	441	471	500	529	N416	Col. Altos de San Isidro	P	584	624	663	701
N338	Col. Villa Cristina (I,II,III Etapas)	L	5,589	5,972	6,339	6,705	N417	Col. Altos de Toncontin	L	549	587	623	659
N339	Col. Villa Delmy	P	767	820	870	921	N418	Col. Altos del Paraiso (S-I,II,III)	L	5,529	5,909	6,271	6,634
N340	Col. Villafranca	L	4,128	4,412	4,683	4,953	N419	Col. Altos del Paraiso (S-IV)	L	277	296	314	333
N341	Col. Villa Los Laureles o Flor Campo II	T	3,039	3,248	3,447	3,647	N420	Col. Altos del Pedregalito	T	856	915	971	1,027
N342	Col. Villa Nueva Norte	T	13,043	13,939	14,794	15,650	N421	Col. Arcieri	T	1,223	1,307	1,387	1,467
N343	Col. Villa Nueva Sur	T	17,147	18,324	19,449	20,573	N422	Col. Arcieri No.2	T	203	217	230	244
N344	Col. Villa Union	T	6,089	6,507	6,906	7,305	N423	Col. Arturo Quezada	P	7,371	7,877	8,360	8,843
N345	Col. Vista Hermosa (Kennedy)	B	84	90	95	101	N424	Col. Aurora No.2	M	252	270	286	303
N346	Col. Vista Hermosa	L(T)	673	719	764	808	N425	Col. Avenida La Paz	L(C)	89	95	101	107
N347	Col. Villa San Caralampio	T	10	11	11	12	N426	Col. Bella Vista Norte	L(P)	757	809	859	909
N348	Col. Zapote Centro	P	2,351	2,513	2,667	2,821	N427	Col. Bernardo Dazzi	P	673	719	764	808
N349	Col. Zapote Norte	P	1,658	1,772	1,881	1,990	N428	Col. Bethel (Dios Proveera)	P	282	280	298	315
N350	Col. Zunlacal	T	50	53	56	59	N429	Col. Brisas de la Laguna	L	411	439	466	493
N351	Aldea La Soledad	L	277	296	314	333	N430	Col. Brisas de Oriente	L	545	582	618	653
N352	Aldea La Travesia	T	11,306	12,082	12,824	13,565	N431	Col. Brisas del Cortijo	T	361	386	410	434
N353	Aldea Suyapa	T	4,138	4,422	4,694	4,965	N432	Col. Buena Vista	L(T)	614	656	696	736
N354	Cerro Juan A. Lainez	T	401	428	455	481	N433	Col. Campana Arriba	A	54	58	62	65
N355	Zona de la Clinica Periferica del IHSS No.2	P	124	132	140	148	N434	Col. Canaan	T	3,772	4,031	4,278	4,526
N356	Zona Puente de Loarque	B	287	307	326	344	N435	Col. Cantarero Lopez	L	4,272	4,565	4,845	5,126
N357	Col. Israel Sur	P	604	1,238	1,313	1,389	N436	Col. Carrizal No.1-A	T	2,282	2,439	2,588	2,738
N358	Zona LLanos del Potrero	M	163	896	951	1,006	N437	Col. Casavola	A	163	175	185	196
N359	Brisas de Jacaleapa	P	-	1,203	1,277	1,350	N438	Col. Cerro Grande Zona II	P	9,360	10,003	10,617	11,231
N360	Col. Plan de Los Laureles	L(T)	-	1,188	1,261	1,334	N439	Col. Cerro Grande Zona IV	M	4,262	4,555	4,834	5,114
N361	Col. Res. Las Hadas III Etapa	M	-	1,604	1,702	1,801	N440	Col. Ciudad Lempira	M	1,931	2,063	2,190	2,316
N362	Juana C. Rivera	P	-	158	168	178	N441	Col. Cooperativa Las Mercedes	P	183	196	208	220
N363	Lomas de Rio Grande	B	-	297	315	333	N442	Col. Covespul	M	530	566	601	635
N364	Milpa Quemada	M	-	3,861	4,098	4,335	N443	Col. David Betancourt	L(P)	624	667	707	748
N365	Proyecto Banco Atlantida	M	-	153	163	172	N444	Col. El Contador	P	144	153	163	172
N366	Proyecto Linda Vista Centro	P	-	94	100	106	N445	Col. El Estiquirin	T	15	16	17	18
N367	Residencial Agua Dulce	M	-	782	830	878	N446	Col. El Japon	T	1,332	1,423	1,510	1,598
N368	Residencial Cienega	M	-	4,950	5,254	5,557	N447	Col. El Trapiche	A	74	79	84	89
N369	Residencial La Estancia	B	-	990	1,051	1,111	N448	Col. Erendida	P	356	381	404	428
N370	Residencial La Granja	M	-	322	341	361	N449	Col. F. Calderon	T	144	153	163	172
N371	Residencial Las Uvas	M	-	4,950	5,254	5,557	N450	Col. Fatima	T	1,574	1,682	1,785	1,889
N372	Residencial Los Encuentros	P	-	9,900	10,507	11,115	N451	Col. Francisco Morazan	T	1,168	1,248	1,325	1,402
N373	Residencial Monte Pinos	B	-	163	173	183	N452	Col. Fuerzas Unidas	L	1,337	1,428	1,516	1,604
N374	Residencial Toncontin	M	-	495	525	556	N453	Col. Generacion 2000	L(P)	129	138	146	154
N375	Señor Jose Maria Agurcia	P	-	1,040	1,103	1,167	N454	Col. Hermanos Reyna	W	267	286	303	321
N376	Urbanizacion Osmond Maduro	P	-	634	672	711	N455	Col. I.P.M.	P	658	704	747	790
N377	Aldea La Joya	B	1,599	2,163	2,296	2,429	N456	Col. Iberia	T	2,822	3,015	3,200	3,385
N378	Col. La Cascada	M	203	1,787	1,897	2,006	N457	Col. Independiente (El Portillo)	T	114	122	129	137
N379	Col. Res. Lomas de Miraflores Sur	M	337	1,341	1,424	1,506	N458	Col. Jardines de Miraflores	M	683	730	775	820
N380	Col. Vista Hermosa del Norte	W	876	975	1,035	1,095	N459	Col. Jardines del Norte	W	252	270	286	303
N381	Col. Armando Calidonio	P	257	718	762	806	N460	Col. Jose Arturo Duarte (Sect. I - IV)	L	3,628	3,878	4,115	4,353
N382	Col. Jesus Aguilar Paz	M	45	505	536	567	N461	Col. Juan Lindo	T	342	365	387	410
N383	Col. La Vega	L(P)	10	396	420	445	N462	Col. La Campana o Maya Centro	A	50	53	56	59
N384	Albergue Cruz Roja (Santa Rosa)	L(P)	-	1,233	1,308	1,384	N463	Col. La Libertad	T	455	487	517	546
N385	Albergue El Trebol No. 1	L(P)	-	2,252	2,390	2,529	N464	Col. La Nueva Capital	L	7,836	8,374	8,888	9,402
N386	Col. Casandra	P	-	426	452	478	N465	Col. La Vegas 172	P	337	360	382	404
N387	Col. La Leonessa del Rincon	P	-	153	163	172	N466	Col. Las Vegas 12	P	64	69	73	77
N388	Col. Res. Fecestilih Sector I y II	L(P)	-	59	63	67	N467	Col. Las Vegas de la Flor del Campo	T	762	815	865	915
N389	Aldea La Cañada	L	1,203	1,285	1,364	1,443	N468	Col. Las Vegas del Rio	P	470	503	533	564
N390	Bo. Altos del Bosque o 13 de Febrero	T	460	492	522	552	N469	Col. Las Vegas Fecestilih	L(P)	292	312	331	350
N391	Bo. Cofradia	T	361	386	410	434	N470	Col. Loarque Sur I y II Etapas	M	1,178	1,259	1,336	1,414
N392	Bo. El Socorro	T	1,262	1,349	1,432	1,514	N471	Col. Lomas del Loarque	P	54	58	62	65
N393	Bo. Jacaleapa	T	149	159	168	178	N472	Col. Luis Andres Zuniga	T	342	365	387	410
N394	Bo. Jardines de Casamata	P	401	428	455	481	N473	Col. Luis Cordova o Caprisa	T	252	270	286	303
N395	Bo. La Isla	T	109	116	124	131	N474	Col. Macro Albergue el Molino No.1	L(P)	1,351	1,444	1,533	1,621

**Table 3.6 Result of Population Projection (4/4)**

Code	Name of Neighborhood	Class	2000	2005	2010	2015	Code	Name of Neighborhood	Class	2000	2005	2010	2015				
N475	Col. Macro Alberge el Molino No.2	L(P)	891	952	1,011	1,069	N554	El Suyatillo	L(P)	35	37	39	42				
N476	Col. Maria Cristina	P	337	360	382	404	N555	Faldas Residencial Centroamerica Este	T	59	63	67	71				
N477	Col. Mary de Flores	L	980	1,047	1,112	1,176	N556	Loma Sur	L(P)	163	175	185	196				
N478	Col. Montes de Bendicion	L	1,688	1,804	1,915	2,025	N557	Lomas de San Jose (II etapa)	P	416	444	472	499				
N479	Col. Nueva Danli	L	2,985	3,190	3,386	3,581	N558	Lomas Del Naovo (Etapas I,II,III)	L(P)	252	270	286	303				
N480	Col. Nueva Eden	T	579	619	657	695	N559	Los Alpes Arriba (B-16)	P	35	37	39	42				
N481	Col. Nueva España	L	1,282	1,370	1,454	1,538	N560	Los Alpes I	P	401	428	455	481				
N482	Col. Nueva Orocuina	T	1,153	1,233	1,308	1,384	N561	Los Alpes II	P	59	63	67	71				
N483	Col. Nuevo Amanecer	T	629	672	713	754	N562	Lofitacion Altos de las Lomas I.P.M.	S	109	116	124	131				
N484	Col. Oscar Castro Tejeda	T	495	529	561	594	N563	Paseo los Laureles	T	89	95	101	107				
N485	Col. Paracaltagua	M	114	122	129	137	N564	Quebrada el Ocote	L(P)	10	11	11	12				
N486	Col. Planes de Suyapa	L(T)	69	74	79	83	N565	Res. Los Zorzales	T	104	111	118	125				
N487	Col. Predios del Recreo	T	2,203	2,354	2,498	2,643	N566	Res. Villas Palmeras de San Ignacio	M	69	74	79	83				
N488	Col. Prof. Eugenio Matute Canizales	P	554	592	629	665	N567	Residencial Altos del Trapiche	P	594	635	674	713				
N489	Col. Pueblo Nuevo	T	520	555	590	624	N568	Residencial Buena Vista	P	89	95	101	107				
N490	Loarque	P	579	619	657	695	N569	Residencial Condominios Viera	P	436	466	494	523				
N491	Col. Rafael Leonardo Callejas	T	2,361	2,523	2,678	2,833	N570	Residencial Francisco Morazan	P	5,410	5,782	6,137	6,492				
N492	Col. Ramon Amaya Amador No.1	T	134	143	152	160	N571	Residencial La Hacienda	A	238	254	269	285				
N493	Col. Ramon Amaya Amador No.2	T	3,821	4,084	4,334	4,585	N572	Residencial Lomas de San Jose	L(T)	812	868	921	974				
N494	Col. Reparto Mandofer	T	99	106	112	119	N573	Residencial Prados Universitarios	P	4,727	5,052	5,362	5,672				
N495	Col. Res. Aeropuerto	M	149	159	168	178	N574	Santa Clara	T	59	63	67	71				
N496	Col. Res. Aleman	P	4,638	4,957	5,261	5,565	N575	Urbanizacion La Cumbre	S	149	159	168	178				
N497	Col. Res. Alta Vista	L(T)	248	264	281	297	N576	Urbanizacion Loma Verde	S	114	122	129	137				
N498	Col. Res. Atlantis	P	139	148	157	166	N577	Villa Colonial Altos de Miramontes	A	153	164	174	184				
N499	Col. Res. Centroamerica Este (Anexo Sur)	P	480	513	545	576	N578	Zona Industrial Caprisa	T	20	21	22	24				
N500	Col. Res. Centroamerica Este IV	M	1,094	1,169	1,241	1,313	N579	Zona Miraflores Sur	M	25	26	28	30				
N501	Col. Res. El Jardin	T	188	201	213	226	Future Colonias (location unidentifiable)						-	41,598	126,029	210,459	
N502	Col. Res. Honduras	P	3,980	4,253	4,514	4,775	Total Urban Population						932,288	1,080,466	1,228,644	1,378,822	
N503	Col. Res. Lara Norte	M	198	212	225	238	Note:										
N504	Col. Res. Las Granjitas	P	327	349	371	392	S: Superior										
N505	Col. Res. Las Hadas	A	1,193	1,275	1,353	1,431	A: High										
N506	Col. Res. Las Vegas	P	525	561	595	630	M: Medium										
N507	Col. Res. Loma Alta	A	84	90	95	101	C: Central										
N508	Col. Res. Lomas de Toncontin I-III	M	3,876	4,142	4,396	4,650	B: Low										
N509	Col. Res. Los Calpules Etapas I, II	P	3,554	3,798	4,031	4,264	P: Planned urbanization										
N510	Col. Res. Los Mangos	P	74	79	84	89	T: Developing community										
N511	Col. Res. Los Molinos	P	510	545	578	612	W: Supplied by well										
N512	Col. Res. Luimisa	M	94	101	107	113	L: Supplied by tank lorry										
N513	Col. Res. Montecarlo	A	208	222	236	249	L(A): Supplied by tank lorry, with same unit demand of the class A										
N514	Col. Res. Plaza	M	6,559	7,009	7,439	7,869	L(C): Supplied by tank lorry, with same unit demand of the class C										
N515	Col. Res. Puerta del Sol	A	10	11	11	12	L(P): Supplied by tank lorry, with same unit demand of the class P										
N516	Col. Res. Rio Alto	L(P)	144	153	163	172	L(T): Supplied by tank lorry, with same unit demand of the class T										
N517	Col. Res. Ruben Antunez C.	P	5	5	6	6											
N518	Col. Res. Santa Maria	T	1,584	1,693	1,797	1,901											
N519	Col. Res. Villa Suyapa, I,II,III	P	2,802	2,994	3,178	3,362											
N520	Col. Res. Villa Universitaria	M	856	915	971	1,027											
N521	Col. Residencial Gloria a Dios	P	139	148	157	166											
N522	Col. Residencial La Cañada	M	4,099	4,380	4,649	4,918											
N523	Col. Residencial Las Vegas	P	104	111	118	125											
N524	Col. Residencial Maya	M	1,035	1,106	1,173	1,241											
N525	Col. Residencial Maya Centro	T	203	217	230	244											
N526	Col. Residencial Monte Verde	M	272	291	309	327											
N527	Col. Rivera de La Vega	P	1,005	1,074	1,140	1,206											
N528	Col. Roble Alto I-II Etapas	M	416	444	472	499											
N529	Col. Roma o Codideprol	P	307	328	348	368											
N530	Col. San Jose de la Montaña	T	1,337	1,428	1,516	1,604											
N531	Col. San Jose de Loarque	P	1,015	1,084	1,151	1,218											
N532	Col. San Juan Bosco	W	485	518	550	582											
N533	Col. San Rafael (Near Elve)	M	45	48	51	53											
N534	Col. Santa Ana	T	762	815	865	915											
N535	Col. Santa Cecilia No.2	T	178	190	202	214											
N536	Col. Santa Isabel No.3	L	441	471	500	529											
N537	Col. Superacion	L	342	365	387	410											
N538	Col. Suyapita	P	678	725	769	814											
N539	Col. Tiloarque Norte	P	94	101	107	113											
N540	Col. Union y Fuerza	L(T)	455	487	517	546											
N541	Col. Valencia	M	396	423	449	475											
N542	Col. Venecia	T	1,376	1,471	1,561	1,651											
N543	Col. Villa Centroamericana	P	248	264	281	297											
N544	Col. Villa Centroamericana (III)	M	1,381	1,476	1,566	1,657											
N545	Col. Villa de los Reyes	T	366	391	415	439											
N546	Col. Villa Nelita	P	287	307	326	344											
N547	Col. Villa Nueva Suyapa	T	8,613	9,205	9,769	10,334											
N548	Col. Villa San Antonio o El Boqueron	L	639	682	724	766											
N549	Col. Villa Santa Margarita	L(P)	460	492	522	552											
N550	Col. Villa Universitaria (II etapa)	M	317	339	359	380											
N551	Col. Villas del Rio	P	490	524	556	588											
N552	Col. Vista Hermosa	T	2,960	3,163	3,358	3,552											
N553	Col. Residencial Monte Carmelo	P	426	455	483	511											

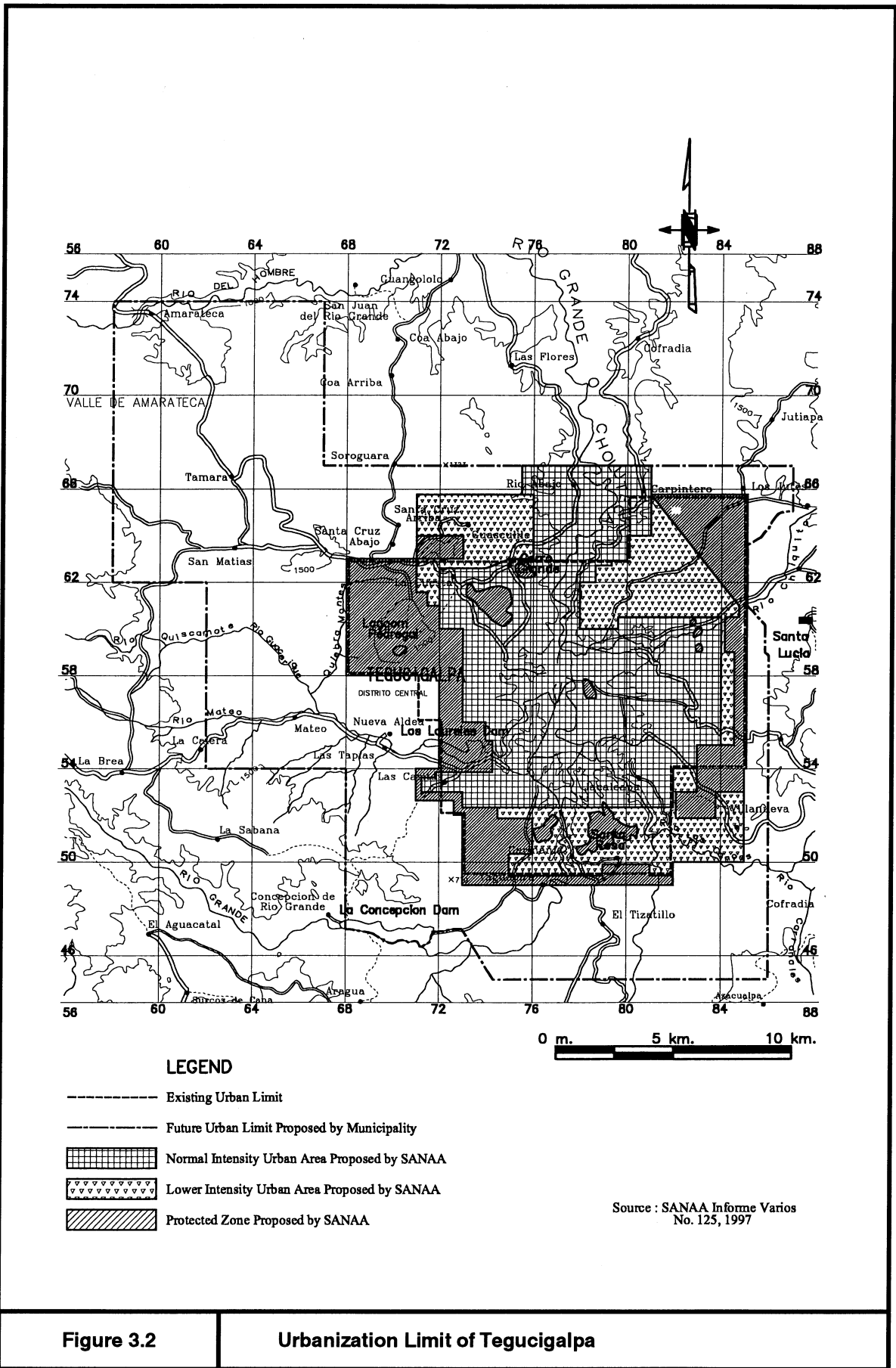


Figure 3.2

Urbanization Limit of Tegucigalpa

The present study esteems these conclusions as well as the proposed urbanization limit in the said reports, as shown in *Figure 3.2*. At the same time, we understood that the definition of the existing urban areas is a boundary of the existing neighborhoods listed in the pre-census 2000, as shown in *Figure 3.3*.

As a conclusion, the urban boundary is defined in the Study as follows.

To apply the boundary of the existing neighborhood listed in the pre-census 2000 as the existing urban area.

To apply the proposed urbanization limit by SANAA as the boundary of future urban development.

### **3.4 WATER DEMAND FORECAST**

#### **3.4.1 GENERAL**

Water demand was forecasted by the following category.

- Domestic use
- Commercial use
- Industrial use
- Public use

Water demand for domestic use can be calculated with multiplying unit water demands by number of users, however, the lack of adequate data makes it very difficult to estimate water demand for commercial, industrial, and public uses based on unit water demand. The Study adopts the assumption that the proportion of demands of these water uses to that of domestic use is constant.

For the analysis of the spatial distribution of the water demand, the Study applied a neighborhood as a spatial unit, because of the following reasons.

- A neighborhood is the most adequate from the viewpoint of resolution and data availability.
- A neighborhood can be treated as an aggregation of households of a certain social class, based on which different unit water demands can be applied.

#### **3.4.2 WATER SUPPLY POLICIES**

Presently the domestic use can be classified by supply method as follows.

- Pipelines
- Tank lorries
- Wells

From the viewpoint of users' convenience, water supply through pipelines is the most preferable. The Study aims to expand water supply area through pipelines, however, it does not mean that the whole domestic users will be supplied water through pipelines in 2015, the target year of the master plan. The Study applies the following water supply policies.

Neighborhoods where water is supplied by well are left as it is for the effective utilization of limited water sources.

In existing, planned and expanded neighborhoods, water is supplied by pipeline.

In neighborhoods to be formed in future other than planned one, water is supplied by tank lorry.

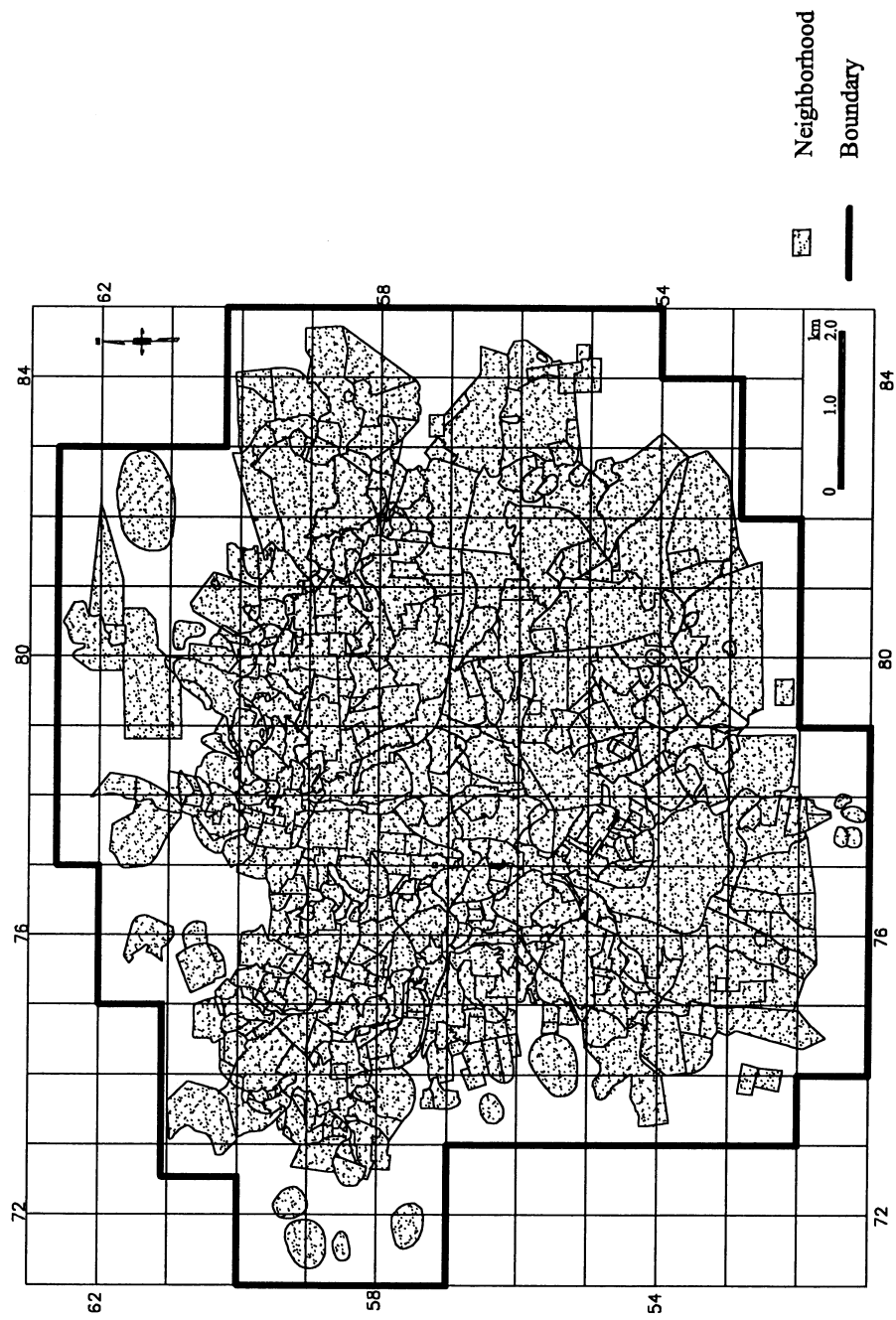


Figure 3.3

Existing Urban Area of Tegucigalpa

Since most of immigrants will settle down outside the existing neighborhoods as in the past, the most of future neighborhoods will be formed as developing communities without control. For these neighborhoods distribution system can not be planned without spatial information.

Furthermore, it is necessary to establish a policy for control of such unplanned housing. They exist outside of public services in the initial stage of the formation, and as time goes on, residents of those neighborhoods start to complain about no existence of public services and to put pressures to expand their services to their areas. Finally, they become parts of urban areas where ordinary public services are available. SANAA has been being forced to expand their service area for this reason for long time. Unfortunately, as such housing used to occur in higher areas, SANAA was often forced to construct new reservoirs and pumping systems with unreasonably high costs. Therefore, restrictions of the water supply method in these areas may contribute to control such unplanned housing or to lighten the abovementioned SANAA's heavy burden.

### 3.4.3 SERVICE AREA AND SERVICE POPULATION

As mentioned above, water supply areas through pipeline is limited to the areas of which locations can be identified by currently available information. The neighborhoods to be formed in the future are supposed to be located out of the pipe water supply areas and within the future urban area. *Figure 3.4* shows the planned service areas of SANAA water supply service through pipe and by tank lorry.

The existing service population is estimated based on the existing population in each neighborhood and its social class classified by SANAA. The future service population is estimated according to the aforementioned water supply policies, with the following assumptions.

The social class of each neighborhood will remain until 2015.

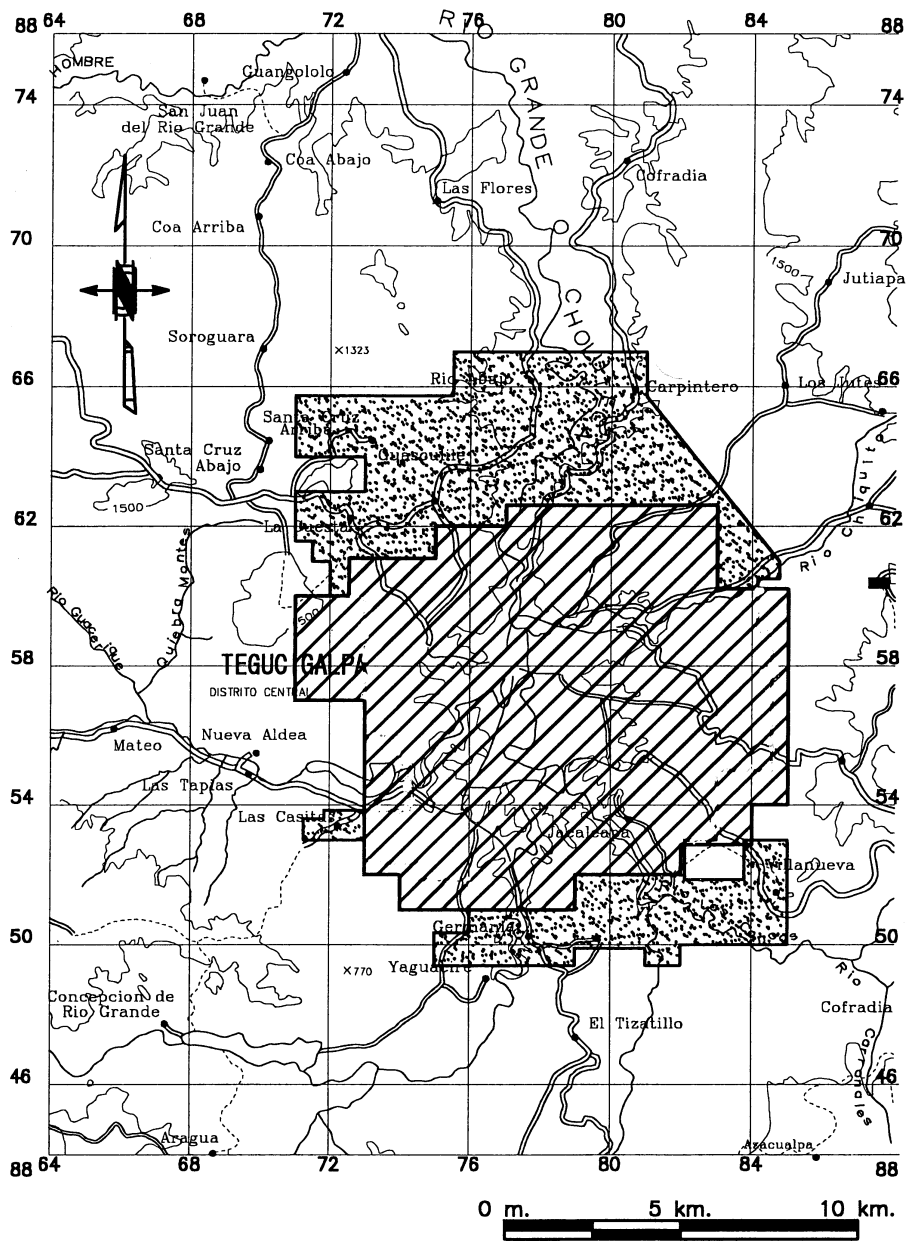
The existing L class neighborhoods will be served by pipe from the beginning of 2008.

*Table 3.7* shows the result of service population projection.


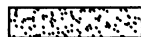
**Table 3.7 Result of Service Population Projection**

Year	Served by pipe	Class S	Class A	Class M	Class C	Class B	Class P	Class T	Served by tank lorry	Served by well	Total
2000	852,271	13,994	28,121	76,374	19,770	69,973	198,322	445,718	66,706	13,311	932,288
2001	871,457	14,186	28,507	81,592	20,042	71,315	203,974	451,840	76,966	13,501	961,924
2002	890,642	14,378	28,893	86,811	20,313	72,657	209,627	457,962	87,225	13,692	991,559
2003	909,828	14,570	29,280	92,029	20,585	74,000	215,279	464,085	97,484	13,882	1,021,195
2004	929,013	14,763	29,666	97,248	20,857	75,342	220,932	470,207	107,744	14,073	1,050,830
2005	948,199	14,955	30,052	102,466	21,128	76,684	226,585	476,329	118,003	14,264	1,080,466
2006	959,836	15,138	30,421	103,724	21,387	77,625	229,365	482,175	135,827	14,439	1,110,101
2007	971,473	15,322	30,790	104,981	21,647	78,566	232,146	488,021	153,651	14,614	1,139,737
2008	1,062,327	15,505	31,910	106,239	22,005	79,507	244,672	562,489	92,256	14,789	1,169,373
2009	1,074,902	15,689	32,288	107,496	22,265	80,448	247,568	569,147	109,143	14,964	1,199,008
2010	1,087,476	15,872	32,666	108,754	22,526	81,389	250,465	575,805	126,029	15,139	1,228,644
2011	1,100,051	16,056	33,043	110,011	22,786	82,330	253,361	582,463	142,915	15,314	1,258,279
2012	1,112,625	16,239	33,421	111,269	23,047	83,271	256,257	589,121	159,801	15,489	1,287,915
2013	1,125,200	16,423	33,799	112,526	23,307	84,213	259,153	595,779	176,687	15,664	1,317,550
2014	1,137,774	16,607	34,176	113,784	23,567	85,154	262,049	602,437	193,573	15,839	1,347,186
2015	1,150,348	16,790	34,554	115,042	23,828	86,095	264,945	609,095	210,459	16,014	1,376,822

Unit : Persons



**LEGEND**

-  Service Area by Pipe
-  Service Area by Tank Lorry

Source : SANAA Informe Varios  
No. 125, 1997

**Figure 3.4**

**Planned Water Supply Service Area in 2015**

### 3.4.4 UNIT WATER DEMAND FOR DOMESTIC USE

As mentioned in Chapter 2, the existing unit water consumption for the domestic use is estimated 111 l/c/d. In Tegucigalpa the unit water demand must be larger than the unit water consumption because it is apparent that people can not consume water as much as they want due to severe rationing of water supply. However, it is very difficult to estimate the existing unit water demand quantitatively. The Study applies SANAA's design standards of unit water demand of each social class as shown in *Table 3.8*.

**Table 3.8 SANAA Design Standards of Unit Water Demand**

Class	Unit Demand (l/c/d)
S	300
A	230
M	180
C, B, and P	150
T	100

Source: SANAA, April 2000

Based on SANAA design standards, the weighted average unit demand for domestic use supplied by pipe is 132 l/c/d. This value is 19 % bigger than the estimated unit water consumption of 111 l/c/d.

As a unit water demand for tank lorry the Study adopts 30 l/c/d based on the standards for public tap users in developing countries. For the domestic use supplied by well, the unit water demand for the class T of 100 l/c/d is adopted.

### 3.4.5 RESULT OF WATER DEMAND FORECAST

#### (1) Domestic Use

Water demand for domestic use is forecasted based on the unit water demand and service population of each social class. It is assumed that the adopted unit water demand of each social class shown in *Table 3.9* will be constant until 2015.

**Table 3.9 Adopted Unit Water Demand**

Class	Unit Demand (l/c/d)
S	300
A	230
M	180
C, B, and P	150
T and W	100
L	30

It is noted that during 2000 to 2007 the water demands of classes L(A), L(C), L(P), and L(T) are calculated based on the unit demands for the classes A, C, P, and T respectively, however, the estimated demands are counted as the demands of tank lorry supply.



**(2) Non-domestic Use**

Based on the existing composition of water uses shown in *Table 2.10* with slight modification, the future water demand for non-domestic uses are estimated by the following equations. Here,  $D_p$  is demand for domestic use through pipe system.

$$\begin{aligned} \text{Commercial use} &= 0.130 \times D_p \\ \text{Industrial use} &= 0.039 \times D_p \\ \text{Public use} &= 0.130 \times D_p \end{aligned}$$

**(3) Estimated Water Demand**

The results of water demand forecast are shown in *Table 3.10*. Water demands in 2000 and 2015 are compared in *Table 3.11*.

**Table 3.11 Comparison of Water Demands in 2000 and 2015**

Category	Water Demand in 2000 (m <sup>3</sup> /day)	Water Demand in 2015 (m <sup>3</sup> /day)	Increase (%)
Domestic by pipe	112,195	150,832	34.4
<i>Class S</i>	4,198	5,037	20.0
<i>Class A</i>	6,468	7,947	22.9
<i>Class M</i>	13,747	20,707	50.6
<i>Class C</i>	2,966	3,574	20.4
<i>Class B</i>	10,496	12,914	23.0
<i>Class P</i>	29,748	39,742	33.6
<i>Class T</i>	44,572	60,909	36.7
Domestic by tank lorry	3,010	6,314	209.8
Domestic by well	1,331	1,601	20.3
Commercial	14,571	19,589	34.4
Industrial	4,371	5,877	34.4
Public use	14,571	19,589	34.4
Total demand	150,049	203,800	35.8

The water demands for pipe increase by 34.4%, which is almost equal to the service population increase of 34.7 %. The water demand for tank lorry supply increase by 209.8 %, however, its impact on the total demand is small. The increase of total demand is 35.8 %.

**3.5 REQUIRED FLOW RATE**

**3.5.1 INTRODUCTION**

Design capacities for facility planning are determined based on the following flow rates.

- Required intake rate
- Required production rate

Both flow rates on average daily base are defined as follows.

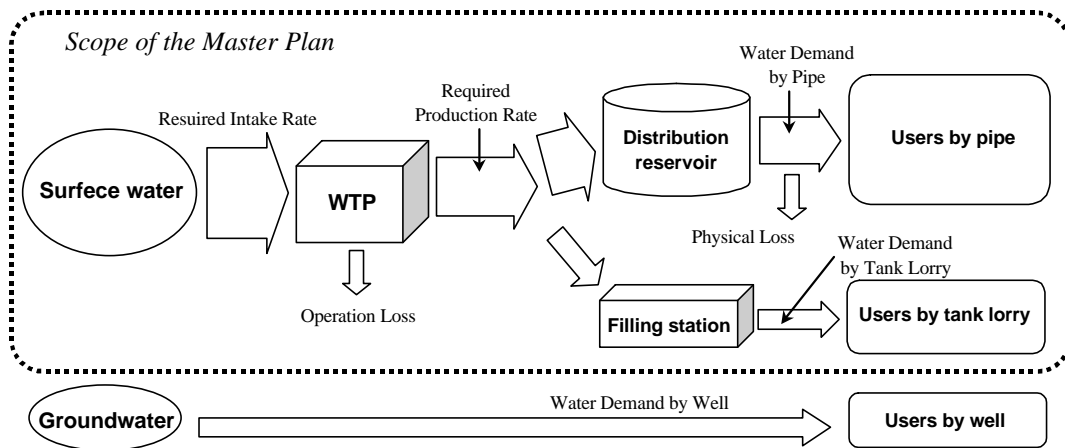
$$\begin{aligned} \text{Required production rate} &= \text{Water demand} + \text{Physical loss} \\ \text{Required intake rate} &= \text{Required production rate} + \text{Operation loss} \end{aligned}$$

**Table 3.10 Result of Water Demand Forecast**

Customer	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Domestic use by pipe	112,195	114,983	117,771	120,559	123,347	126,135	127,683	129,231	139,290	140,939	142,588	144,237	145,885	147,534	149,183	150,832
Class S	4,198	4,256	4,313	4,371	4,429	4,486	4,541	4,597	4,652	4,707	4,762	4,817	4,872	4,927	4,982	5,037
Class A	6,468	6,557	6,645	6,734	6,823	6,912	6,997	7,082	7,339	7,426	7,513	7,600	7,687	7,774	7,861	7,947
Class M	13,747	14,687	15,626	16,565	17,505	18,444	18,670	18,897	19,123	19,349	19,576	19,802	20,028	20,255	20,481	20,707
Class C	2,966	3,006	3,047	3,088	3,128	3,169	3,208	3,247	3,301	3,340	3,379	3,418	3,457	3,496	3,535	3,574
Class B	10,496	10,697	10,899	11,100	11,301	11,503	11,644	11,785	11,926	12,067	12,208	12,350	12,491	12,632	12,773	12,914
Class P	29,748	30,596	31,444	32,292	33,140	33,988	34,405	34,822	36,701	37,135	37,570	38,004	38,439	38,873	39,307	39,742
Class T	44,572	45,184	45,796	46,408	47,021	47,633	48,217	48,802	56,249	56,915	57,580	58,246	58,912	59,578	60,244	60,909
Commercial use	14,571	14,933	15,295	15,657	16,019	16,381	16,582	16,783	18,090	18,304	18,518	18,732	18,946	19,160	19,374	19,589
Industrial use	4,371	4,480	4,588	4,697	4,806	4,914	4,975	5,035	5,427	5,491	5,555	5,620	5,684	5,748	5,812	5,877
Public use	14,571	14,933	15,295	15,657	16,019	16,381	16,582	16,783	18,090	18,304	18,518	18,732	18,946	19,160	19,374	19,589
Domestic use by tank lorry	3,010	3,443	3,876	4,308	4,741	5,173	5,728	6,283	2,768	3,274	3,781	4,287	4,794	5,301	5,807	6,314
Domestic use by well	1,331	1,350	1,369	1,388	1,407	1,426	1,444	1,461	1,479	1,496	1,514	1,531	1,549	1,566	1,584	1,601
<b>Total demand</b>	<b>150,049</b>	<b>154,121</b>	<b>158,194</b>	<b>162,266</b>	<b>166,339</b>	<b>170,411</b>	<b>172,994</b>	<b>175,576</b>	<b>185,143</b>	<b>187,809</b>	<b>190,474</b>	<b>193,139</b>	<b>195,804</b>	<b>198,470</b>	<b>201,135</b>	<b>203,800</b>

Unit : m<sup>3</sup>/day

The relation of both flow rates is schematically explained in *Figure 3.5*.



**Figure 3.5 Definition of Various Planning Bases**

The design capacities for facility should be able to absorb a fluctuation of water demand. Thus following design flows are used as design capacities.

Average daily value : an average value of daily mean flow during a year

Maximum daily value : a maximum value of daily mean flow during a year

Maximum hourly value : a maximum value of hourly mean flow during a year

For example, treatment plants and distribution reservoirs are designed based on the maximum daily value because they have storage capacity to absorb fluctuation in a day. On the other hand, distribution pipes are designed based on the maximum hourly value because no storage capacity did they have.

It is common to obtain the maximum daily and hourly flows by multiplying the average daily value by daily and hourly peak factors, respectively. The peak factors are determined empirically based on the size of service population, climate of the service area, etc. In the Study the following peak factors are adopted.

Daily peak factor : 1.2

Hourly peak factor : 1.8

It should be noted that the physical loss is not related to peak factors because the physical loss does not correspond to demand fluctuation.

### 3.5.2 REQUIRED PRODUCTION RATE

As explained in the previous chapter, the existing physical loss is estimated at 30% of the distributed rate by pipe. It is assumed that the physical loss will decrease at a constant rate to 25% by the year 2015, considering the effect of the leakage control proposed in the master plan.

The average daily required production rate is given by the following equation.

$$\text{Average daily required production rate} = \text{WD}_p + \text{WD}_{\text{TL}} + \text{PL}$$

$$\text{PL} = \text{WD}_p \times R_p / (1 - R_p)$$

Where,  $\text{WD}_p$  : Water demand by pipe,  $\text{WD}_{\text{TL}}$  : Water demand by tank lorry,  $\text{PL}$  : Physical loss, and  $R_p$ : Ratio of physical loss to distributed water by pipe.

The maximum daily required production rate is given by the following equation.

$$\text{Maximum daily required production rate} = 1.2 \times (\text{WD}_p + \text{WD}_{\text{TL}}) + \text{PL}$$

The required production rate is estimated as shown in *Table 3.12*.

**Table 3.12 Estimated Required Production Rate**

Required production rate	2000	2005	2010	2015
Average daily rate	211,164	233,747	256,298	267,494
Maximum daily rate	240,908	267,544	294,090	307,934

(Unit: m<sup>3</sup>/day)

The required production rate will increase 26.7 % on average daily base and 27.8 % on maximum daily base during 2000 to 2015.

The daily peak factor of the required production rate becomes 1.1512 (= 307,934÷267,494), which is different from 1.2 of the applied daily peak factor of water demand. This is because the required production rate includes the physical loss, which does not correspond to demand fluctuation. The Study applies 1.1512 as the daily peak factor of the required production rate.

### 3.5.3 REQUIRED INTAKE RATE

Based on the estimated existing operation loss and empirical data, the operation loss is assumed constant at 6 % of the required intake rate until 2015. Then, the required intake rate is given by the following equation.

$$\text{Average daily required intake rate} = \text{Average daily required production rate} / (1 - 0.06)$$

$$\text{Maximum daily required intake rate} = \text{Maximum daily required production rate} / (1 - 0.06)$$

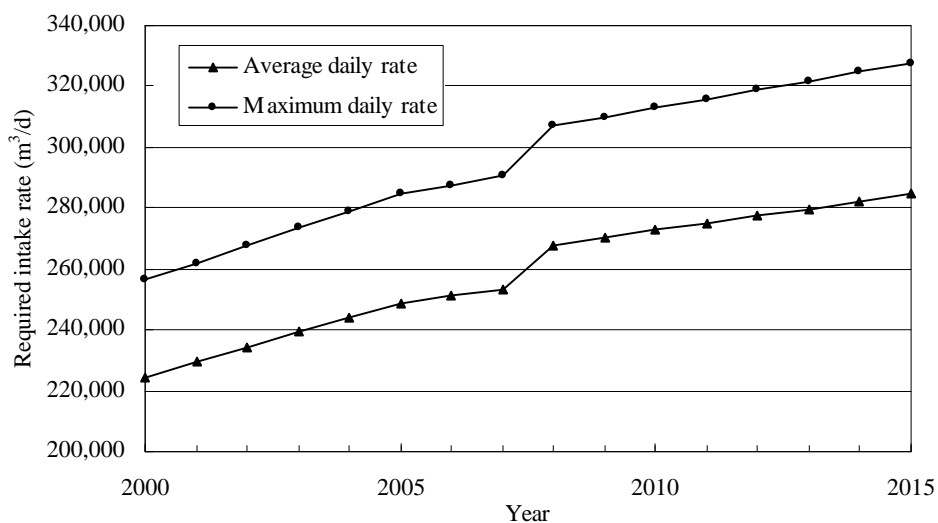
The required intake rate is estimated as shown in *Table 3.13*.

**Table 3.13 Estimated Required Intake Rate**

Required intake rate	2000	2005	2010	2015
Average daily rate	224,643	248,668	272,657	284,568
Maximum daily rate	256,285	284,668	312,862	327,589

(Unit: m<sup>3</sup>/day)

*Figure 3.6* shows the estimated average daily and maximum daily required intake rates.



**Figure 3.6 Required Intake Rate**