

Pressure Measurement Data

Fuera de Managua

No. : 34

DATE: 2004/SEP/21 --- 2004/SEP/22

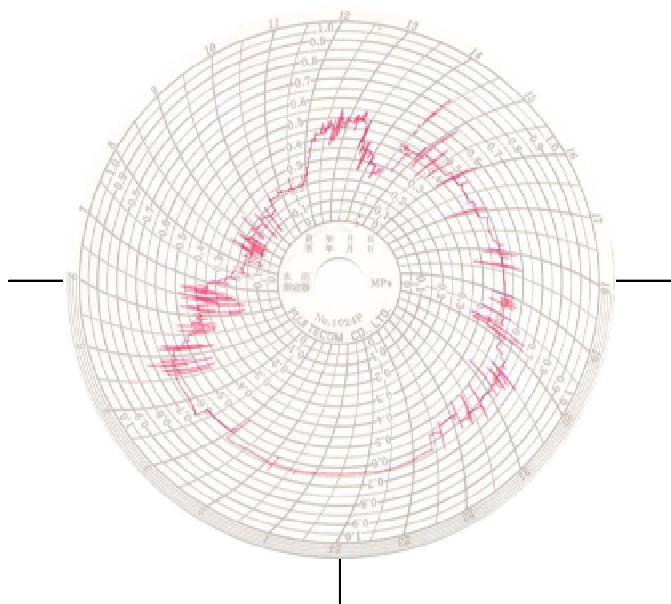
LOCATION: CAMINO A LOS VALDORINOS

COORDENADAS: Este 585536 Norte 1332463 Elev. 182 m

MEASURED VALUEH	Pressure	[MPa]	[psi]
	High	0.66	95.7
	Average*	0.46	66.7
Low	0.09	13.1	

* Average of Hourly variation

Hourly variation [MPa]												
time	1	2	3	4	5	6	7	8	9	10	11	12
value	0.64	0.64	0.60	0.64	0.59	0.40	0.34	0.17	0.19	0.18	0.22	0.25
time	13	14	15	16	17	18	19	20	21	22	23	24
value	0.49	0.34	0.44	0.45	0.45	0.50	0.51	0.54	0.60	0.55	0.64	0.64



Note:

Pressure Measurement Data

Zona Alta Superior Este

No. : 33

DATE: 2004/OCT/25 --- 2004/OCT/26

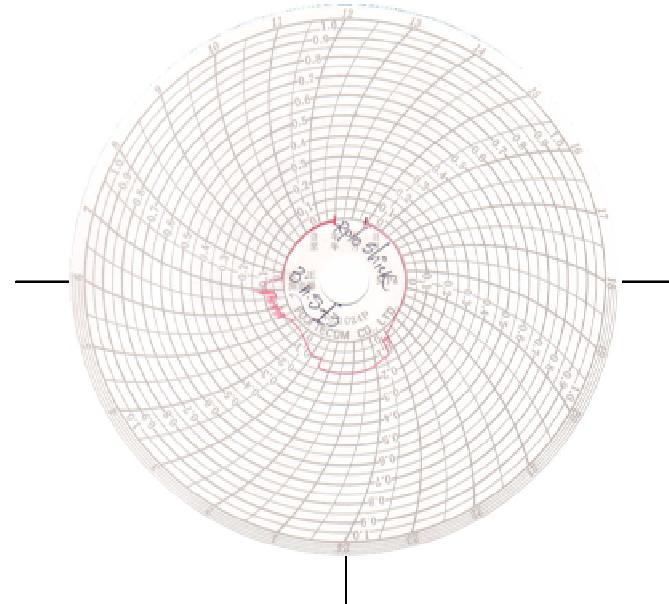
LOCATION:

COORDENADAS: Este 584102 Norte 1338640 Elev. 191 m

MEASURED VALUEH	Pressure	[MPa]	[psi]
	High	0.15	21.8
	Average*	0.03	4.4
Low	0.00	0.0	

* Average of Hourly variation

Hourly variation [MPa]												
time	1	2	3	4	5	6	7	8	9	10	11	12
value	0.15	0.15	0.10	0.04	0.03	0.06	0.08	0.00	0.00	0.00	0.00	0.00
time	13	14	15	16	17	18	19	20	21	22	23	24
value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.14



Note:

Pressure Measurement Data

Fuera de Managua

No. : 36

DATE: 2004/NOV/15 --- 2004/NOV/16

LOCATION: TICUANTEPE

COORDENADAS: Este 586423 Norte 1329033 Elev. 310 m

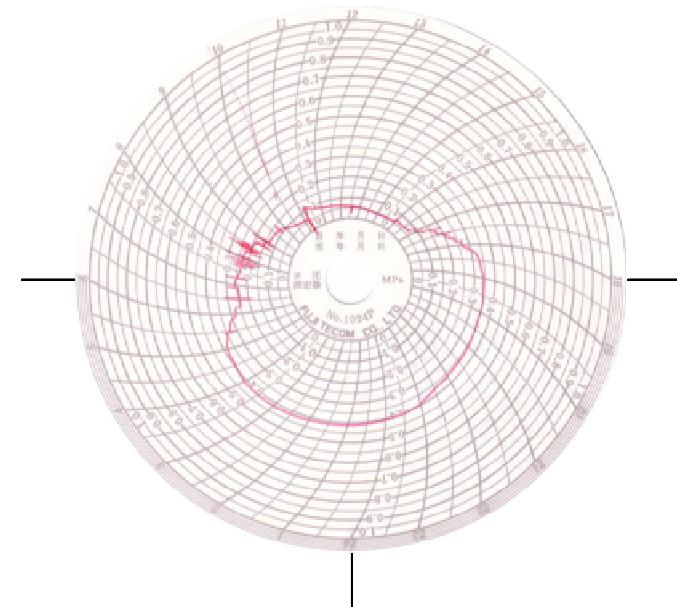
MEASURED VALUE	Pressure	[MPa]	[psi]
	High	0.41	59.5
	Average*	0.25	36.3
Low	0.05	7.3	

* Average of Hourly variation

Hourly variation

[MPa]

time	1	2	3	4	5	6	7	8	9	10	11	12
value	0.40	0.41	0.41	0.41	0.39	0.28	0.25	0.24	0.13	0.10	0.06	0.07
time	13	14	15	16	17	18	19	20	21	22	23	24
value	0.06	0.05	0.05	0.06	0.10	0.26	0.35	0.35	0.35	0.36	0.40	0.40



Note:

Pressure Measurement Data

Fuera de Managua

No. : 35

DATE: 2004/NOV/15 --- 2004/NOV/16

LOCATION: Lomoo de Veracruz

COORDENADAS: Este 589154 Norte 1333948 Elev. 167 m

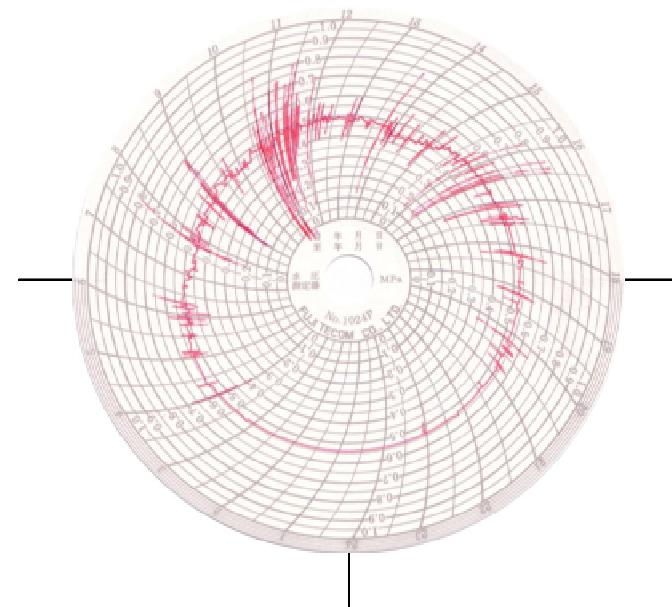
MEASURED VALUE	Pressure	[MPa]	[psi]
	High	0.55	79.8
	Average*	0.50	72.5
Low	0.45	65.3	

* Average of Hourly variation

Hourly variation

[MPa]

time	1	2	3	4	5	6	7	8	9	10	11	12
value	0.54	0.54	0.54	0.55	0.54	0.50	0.47	0.45	0.45	0.45	0.46	0.48
time	13	14	15	16	17	18	19	20	21	22	23	24
value	0.49	0.43	0.46	0.50	0.50	0.51	0.54	0.53	0.54	0.54	0.54	0.54



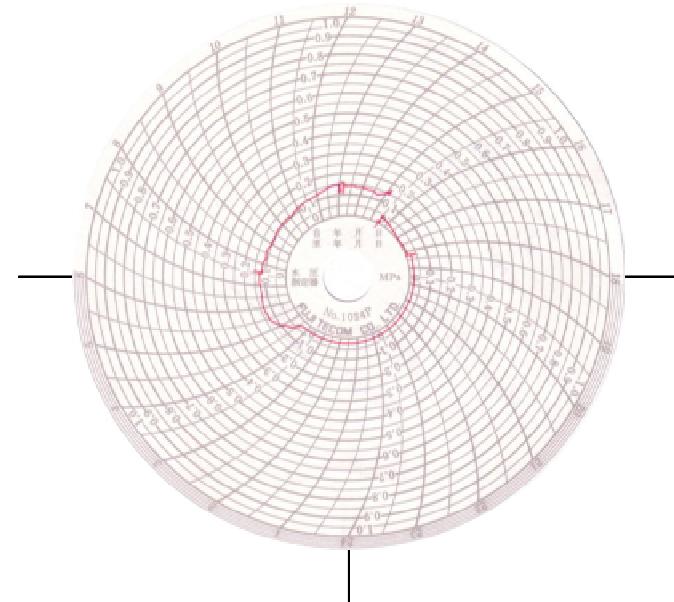
Note:

Pressure Measurement Data

Fuera de Managua		No. : 38	
DATE: 2004/NOV/18 --- 2004/NOV/19			
LOCATION: NINDIRI			
COORDENADAS:	Este 595973	Norte 1327301	Elev. 215 m
MEASURED VALUEH	Pressure	[MPa]	[psi]
	High	0.15	21.8
	Average*	0.07	10.2
	Low	0.00	0.0

Hourly variation [MPa]

time	1	2	3	4	5	6	7	8	9	10	11	12
value	0.02	0.02	0.02	0.02	0.10	0.14	0.13	0.11	0.10	0.10	0.11	0.13
time	13	14	15	16	17	18	19	20	21	22	23	24
value	0.15	0.14	0.15	0.03	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.02



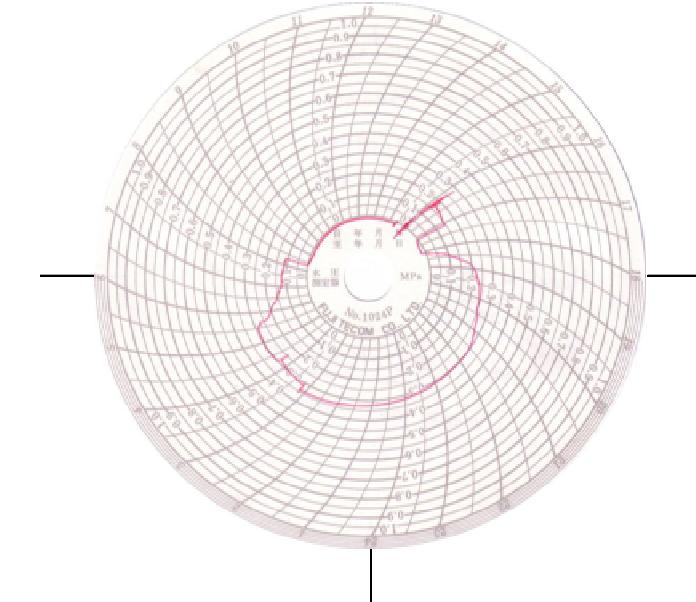
Note:

Pressure Measurement Data

Fuera de Managua		No. : 37	
DATE: 2004/NOV/18 --- 2004/NOV/19			
LOCATION: EL RAIZON			
COORDENADAS:	Este 590639	Norte 1329456	Elev. 311 m
MEASURED VALUEH	Pressure	[MPa]	[psi]
	High	0.34	49.3
	Average*	1.20	174.0
	Low	0.00	0.0

Hourly variation [MPa]

time	1	2	3	4	5	6	7	8	9	10	11	12
value	0.32	0.34	0.34	0.30	0.30	0.20	0.13	0.11	0.00	0.00	0.00	0.00
time	13	14	15	16	17	18	19	20	21	22	23	24
value	0.00	0.00	0.00	0.18	0.15	0.00	0.21	25.00	0.27	0.30	0.30	0.31



Note:

**JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)**

**EMPRESA NICARAGÜENSE DE ACUEDUCTOS Y
ALCANTARILLADOS SANITARIOS (ENACAL)**

**THE STUDY ON IMPROVEMENT OF
WATER SUPPLY SYSTEM
IN MANAGUA IN THE REPUBLIC OF
NICARAGUA**

FINAL REPORT

**Supporting Report No.6
Water Consumption and Awareness
Surveys**

DECEMBER 2005

**NIHON SUIDO CONSULTANTS CO., LTD.
ASIA AIR SURVEY CO., LTD.**

**THE STUDY ON IMPROVEMENT OF WATER SUPPLY SYSTEM
IN MANAGUA IN THE REPUBLIC OF NICARAGUA**

FINAL REPORT

Supporting Report No.6
Water Consumption and Awareness Surveys

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Annex 6B	Water Consumption and Awareness Surveys Questionnaire for Domestic Users
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Annex 6D	Water Consumption Survey Questionnaire for Commercial Users
Annex 6E	Classification of Asentamientos

6.1 OBJECTIVES OF WATER CONSUMPTION AND AWARENESS SURVEYS

The specific objectives of the water consumption and awareness surveys are:

- to understand the actual status of water usages by domestic, industrial and commercial-institutional consumers and to assess their problems;
- to understand the actual amount of water consumed and utilized by domestic, industrial and commercial/institutional users;
- to understand the income, expenditure level of households, water supply service disposition, willingness to pay for water supply service; and
- to assess the level of users satisfaction and expectation

The consumption survey and awareness surveys started in September 2004 for completion in October the same year.

6.2 SUMMARY OF SURVEY RESULTS

6.2.1 Domestic Users

- Average household size for all domestic users is 5.07 persons. For users in asentamientos this figure rises to 5.34.
- 96% of users have regular water supply service from ENACAL, 72% of them have sewerage service from ENACAL.
- Only 70% of users have water meter, and 51% of them are in good condition. In asentamientos water metered houses is only 2%.
- The average water consumption for metered users is 28.73 m³/month in last 12 months (189 liters/day per capita).
- 86% of users have water supply service every day, 67% have water service all day, 69% receive water with good pressure. Water storage and water buy in bottles is low: 47% and 21% of users, respectively.

6.2.2 Non Domestic Users

- 71% of industries exclusively use ENACAL supply services, 20% have mixed service and 8% have self wells supply.
- In institutional & commercial sector, 3% are government organizations, 10% are educational centers, 1% medical center, 5% hotels, 23% shops, 19% offices and 39% are other commercial entities.
- Industries with ENACAL service consumption are 621m³/month,. Institutional & commercial sector, average consumption are 165m³/month.
- In industrial sector, 98% of industries have every day service, 89% have all day service, 87% have good pressure service. For 78% of industries water quality is acceptable.
- In institutional & commerce sector, 86% have every day service, 74% have all day service, 77% have good pressure service. But water quality is acceptable only for 64% of users.

6.3 SURVEY METHODOLOGY

6.3.1 Data and Information Collected

The following information and data was collected prior to the start of field surveys:

- (1) Population data
- (2) Households statistics

- (3) Water distribution networks
- (4) Water bill and meter record
- (5) Water Users cadastral maps

6.3.2 Interview Survey

(1) Survey Method and Activities

In order to obtain the users information, domestic, commercial-institutional and industrial interview surveys were planned separately. The following activities were included in the survey:

- Review of ENACAL users cadastral data, existing reports, maps and relevant data.
- Reconnaissance of the Study Area
- Formulation of sampling plan
- Formulation of survey questionnaires
- Formulation of survey team
- Pre-test operation
- Conduction of survey
- Analysis and reporting

(2) Sampling Plan

The sampling method as outlined by the JICA study proposal on which the consumption and awareness surveys was based are as follows:

- 450 domestic users households
- 100 commercial/institutional users
- 50 industrial consumers

i) Domestic Water Consumption and Awareness Surveys

The sample for domestic consumption and awareness surveys were selected as follows:

- determinate the number of domestic consumers for each zones, in base to last ENACAL users database (August 2004).
- distribute the total sample number (450 households) over the 10 commercial zones of Managua, Ticuantepe Municipio and Nindirí Municipio in proportion to their residential population.
- identify and pick-up on a random basis (using random software program) of the selected number of households from each zones using the last ENACAL users database.
- make interview plan using the ENACAL GIS system and Managua Municipio Barrios Map.

Number of samples planned and interviewed by commercial zones is indicated in **Table 6.3.1** and the ENACAL's Commercial Zones are shown in **Annex 6A**.

Table 6.3.1 Number of Samples for Domestic Users

Zone	Total users	% of users	Planned samples	Interviewed
Z1	14,943	8.88%	40	40
Z2	17,509	10.40%	47	47
Z3	29,924	17.78%	80	79
Z4	5,369	3.19%	14	14
Z5	16,853	10.01%	45	45
Z6	27,836	16.54%	74	74
Z7	17,377	10.32%	46	46
Z8	17,891	10.63%	48	48
Z9	14,472	8.60%	39	39
Z10	780	0.46%	2	2
Ticuantepe	3,953	2.35%	11	11
Nindiri	1,406	0.84%	4	4
Total	168,313	100%	450	449

Note: No. of residential users in August, 2004

ii) Industrial Consumption Survey

The sample for industrial consumption survey were selected as follows:

- only 285 industrial consumers were identified in the Study Area, and they are concentrated in some areas. For that reason, the industrial consumers were classified in three types: with only ENACAL water supply service, with self water well service, and with combination service.
- distribute sample over the Study Area, covering all consumers type with self well services and mixed services (18 samples).
- identify and pick-up on a random basis of the selected number of consumers from industries with only ENACAL services (remain 33 samples).

Number of samples planned and interviewed is indicated in **Table 6.3.2**

Table 6.3.2 Number of Samples for Industrial Users

Type of industries	Total consumers	Planned samples	Interviewed
Only ENACAL water supply	267	32	35
Self wells service	8	8	4
ENACAL and self service	10	10	10
Total	285	50	49

Note: No. of industrial consumers of ENACAL in August, 2004

iii) Commercial-Institutional Consumption Survey

The sample for commercial-institutional consumption survey were selected as follows:

- to distribute the total sample number (100 consumers) over the 10 commercial zones of Managua, Ticuantepe and Nindiri in proportion to the zones commercial-institutional users.
- to determinate the number of commercial-institutional users for each zones
- to identify and pick-up on a random basis (using random software program) of the selected number of commercial-institutional users from each zones.

The number of samples planned and interviewed in each commercial zone are indicated in **Table 6.3.3**

Table 6.3.3 Number of Samples for Commercial & Institutional Users

Commercial Zone	Total users	Planned samples	Interviewed users
Z1	566	10	10
Z2	1,232	21	21
Z3	1,356	23	23
Z4	216	4	4
Z5	1,090	18	18
Z6	275	5	5
Z7	633	11	11
Z8	195	3	3
Z9	261	4	4
Z10	5	1	1
Ticuanape	31	1	1
Nindiri	34	1	1
Total	5,894	100	100

Note: Total users for ENACAL commercial and institutional users in August, 2004

(3) Interview Survey

Ten interviewers conforming five teams were employed to conduct the domestic survey, industrial survey and commercial-institutional survey and they were trained during the pre-test survey period. ENACAL officers planned and supervised the interview and the JICA Study Team monitored their interviews and inappropriate interviews were corrected.

6.3.3 Questionnaires

(1) Domestic Water Users

Seventy questions regarding the following items were compiled in the questionnaire for domestic consumption and awareness surveys. Domestic Survey Questionnaire is shown in **Annex 6B**.

- 1) Socio economic condition of household
- 2) ENACAL water supply service condition
- 3) Sanitation condition of household
- 4) Electricity service condition
- 5) Awareness in water service and use

(2) Industrial Water Consumers

Thirty-six questions regarding the following items were compiled in the questionnaire for industrial consumption survey. Industrial Survey Questionnaire is shown in **Annex 6C**.

- 1) Information on consumers
- 2) Water supply service condition
- 3) Sanitation condition

(3) Institutional and Commercial Users

Forty-three questions regarding the following items were compiled in the questionnaire for institutional and commercial consumption survey. Institutional and Commercial Survey Questionnaire is shown in **Annex 6D**.

- 1) Information on users

- 2) Water supply service condition
- 3) Sanitation condition

The questionnaire for domestic, industrial and institutional-commercial surveys was attached in **Annexes 6A, 6B and 6C**, respectively.

6.3.4 Data Processing

The questionnaire filled by the interviewers was checked and processed by ENACAL officers and the JICA Study Team.

6.4 RESULTS OF WATER CONSUMPTION SURVEY

6.4.1 Domestic Users

(1) Household Size

Average household size for all domestic users is 5.07 persons in the Study Area. For the users in asentamientos (tariff 10), this average increased in 5.34 persons per house. (See **Table 6.4.1**). According to the 1995 National Census, the estimate value for Managua city was 5.37.

Table 6.4.1 Household Size in Each Commercial Zone

Zone	Sampling No	Pers/house (All Study Area)	Pers/house (Only Asentamientos)
Z1	40	5.75	7.50
Z2	47	4.35	4.75
Z3	79	4.52	4.40
Z4	14	4.71	6.00
Z5	45	4.71	4.57
Z6	74	5.59	5.43
Z7	46	5.48	7.29
Z8	48	5.40	5.70
Z9	39	5.10	5.00
Z10+T+N	17	4.94	4.00
Study Area	449	5.07	5.34

(2) Age Distribution

In the Study Area, 12% of users are less than 6 years old and 63% of the users are more than 18 years old.

Table 6.4.2 Age Distribution by Zone

Zone	Less than 1 year old	From 1 to 6 years	From 7 to 12 years	From 13 to 18 years	More than 18 years
Z1	1%	14%	8%	10%	66%
Z2	1%	10%	9%	14%	67%
Z3	4%	8%	11%	11%	66%
Z4	2%	12%	9%	11%	67%
Z5	0%	4%	9%	9%	73%
Z6	2%	9%	26%	10%	52%
Z7	2%	10%	12%	12%	65%
Z8	1%	10%	14%	18%	57%
Z9	2%	17%	18%	15%	66%
Z10+T+N	0%	14%	10%	11%	65%
Study Area	2%	10%	14%	12%	63%

(3) Water and Sewerage Service and Years of Service

In the Study Area, 96% of users have ENACAL water supply service. Average year of water supply service is more than 20 years. Lower water supply and sewerage coverage areas are Zone 8, 9, 5, 6 and 7. Lowest coverage in Zone 4 is special for their condition: isolated in west highland of Managua with high income residential area.

Table 6.4.3 Water and Sewerage Service

Zone	With Water Supply Service	Years of Water Supply Service	With Sewerage Service	Years of Sewerage Service
Z1	95%	21.7	90%	19.4
Z2	100%	23.1	96%	23.7
Z3	99%	21.6	96%	21.5
Z4	93%	19.4	14%	12.8
Z5	96%	22.3	84%	22.6
Z6	97%	18.5	74%	19.8
Z7	89%	18.4	63%	19.4
Z8	98%	19.9	33%	18.9
Z9	90%	16.7	72%	17.5
Z10+T+N	100%	16.4	0%	0.0
Study Area	96%	20.1	72%	19.4

(4) Type of Water Service Tariff

For Domestic users in Managua city area, ENACAL, classifies in 4 types of tariff: tariff 01 and tariff 06 for medium income residential areas, tariff 07 for high income residential areas and tariff 10 for low income residential areas (asentamientos). The sampled distribution for each tariff is shown in the **Table 6.4.4**. Low quantity of samples in asentamientos are due to the difficulty in the access to asentamientos users (wrong address, security problems, absence of householders).

Table 6.4.4 Type of Water Service Tariff

Zone	Tariff 01	Tariff 06	Tariff 07	Tariff 10
Z1	85%	0%	0%	15%
Z2	83%	0%	0%	17%
Z3	66%	6%	3%	25%
Z4	14%	0%	79%	7%
Z5	62%	0%	20%	16%
Z6	65%	0%	0%	32%
Z7	57%	0%	26%	15%
Z8	77%	0%	0%	21%
Z9	79%	0%	0%	18%
Z10+T+N	94%	0%	0%	6%
Study Area	70%	1%	8%	20%

(5) Water Meters Conditions

Consumption survey results in 70% of Domestic users have water meters and 51% of them are no functioning. For asentamientos areas only 2% of them have water meters and half of them are in good conditions.

Table 6.4.5 Water Meter Condition

Zone	Metered Houses (All Area)	Meter in Good Condition (All Area)	Metered Houses (In Asentamientos)	Meterd in Good Condition (In Asentamientos)
Z1	73%	45%	3%	0%
Z2	81%	61%	9%	2%
Z3	72%	57%	3%	3%
Z4	79%	43%	0%	0%
Z5	76%	58%	0%	0%
Z6	55%	41%	0%	0%
Z7	80%	54%	2%	0%
Z8	60%	46%	2%	2%
Z9	67%	49%	0%	0%
Z10+T+N	82%	59%	6%	6%
Study Area	70%	51%	2%	1%

(6) Water Consumption

According to ENACAL water meter record, last 12 months monthly average of water consumption per household was 28.73 m³/month (See **Table 6.4.6**). Considering the sampled household size (5.07 persons per house), the average per capita consumption is 189 liters per day.

Table 6.4.6 Last 12 months consumption

Zone	Last 12 month Consumption
1	24.80
2	26.84
3	36.18
4	20.88
5	33.14
6	30.63
7	35.12
8	16.67
9	25.83
10+T+N	21.40
Study Area	28.73

(7) Water Supply Conditions

86% of consumers have water service every day. Only 67% of consumers have water service all day. 69% of consumers have water service with good pressure. Weak water supply service are in commercial zone 3, 6, 7 and 8.75% of consumers satisfied in water quality. About half of consumers storage water, but this proportion is very low in Commercial Zone 1, 2 and 9.

Table 6.4.7 Water Supply condition In Residential Area

Zone	Every Day Service	All Day Service	Good Pressure	Good Quality Water	Water Storage
Z1	93%	80%	75%	70%	25%
Z2	93%	91%	80%	76%	20%
Z3	85%	63%	66%	65%	44%
Z4	93%	71%	71%	93%	86%
Z5	89%	80%	80%	84%	53%
Z6	89%	62%	80%	68%	46%
Z7	76%	41%	46%	80%	65%
Z8	73%	44%	48%	85%	69%
Z9	85%	79%	69%	79%	21%
Z10+T+N	88%	65%	76%	76%	88%
Total	86%	67%	69%	75%	47%

(8) Bottled Water Uses

21% of users buy bottled water, principally for assuring water quality. In asentamientos, only 1% buy bottled water for assure water quality.

Table 6.4.8 Bottled Water Uses

Zone	Buy Water	Buy for Taste	Buy for hygiene	Buy because is insufficient
Z1	30%	3%	23%	0%
Z2	28%	2%	22%	0%
Z3	27%	3%	25%	3%
Z4	14%	0%	14%	0%
Z5	22%	4%	16%	0%
Z6	18%	4%	16%	0%
Z7	28%	15%	24%	0%
Z8	0%	0%	8%	2%
Z9	18%	3%	18%	0%
Z10+T+N	12%	6%	12%	0%
Total	21%	4%	19%	1%

6.4.2 Industrial Users**(1) General**

In Study Area, there are 285 registered industries, 71.4% of them with only ENACAL services, 8 have self wells without ENACAL water supply services and 9 with self well supply and ENACAL supply. The samples covered 35 industries of the first type (71% of samples), 4 of second type (8% of samples) and 10 of third type (20% of samples). Total interview industries, 49. Collaboration in survey in industries with self well without any service by ENACAL was very low.

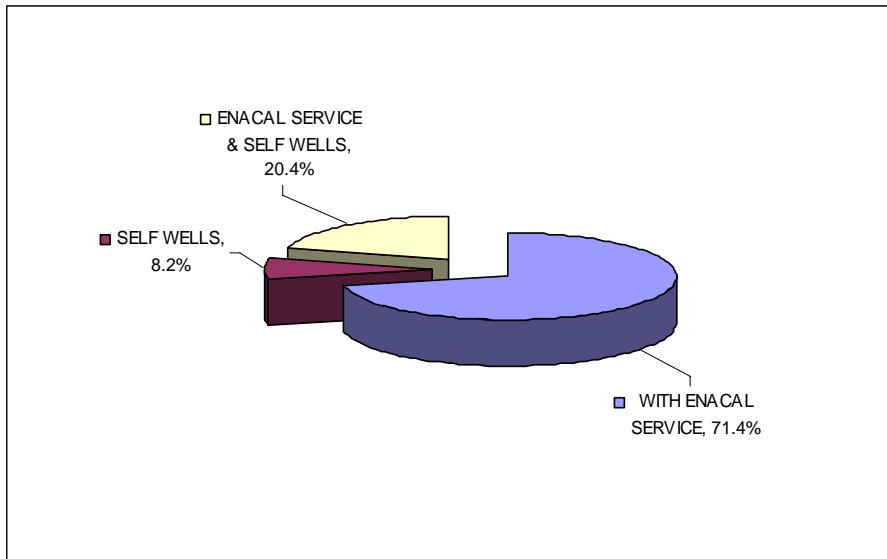


Figure 6.4.1 Type of Industrial Users

(2) Types of Water Use

38.8% of industries uses water for industrial process, 20.4% of them uses for refrigeration and boiling, 36.4% uses water for washing machines. Average consumption of ENACAL water is $621.3\text{m}^3/\text{month}$.

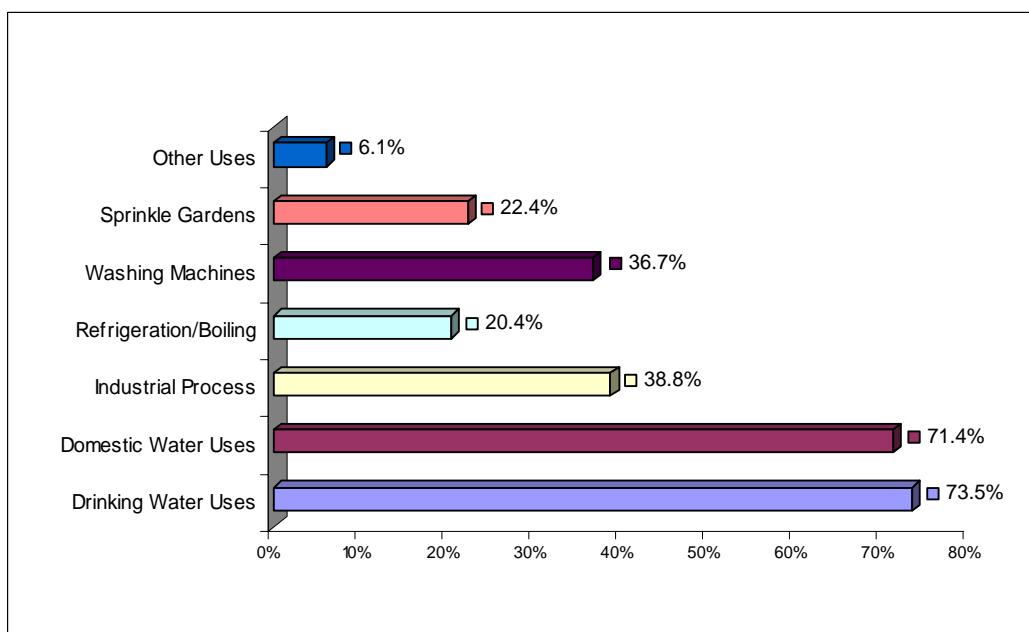


Figure 6.4.2 Water Uses in Industrial Sector

(3) Water Supply Conditions

44 of industries with ENACAL services receive water supply every day, 40 industries receive water for 24 hours.

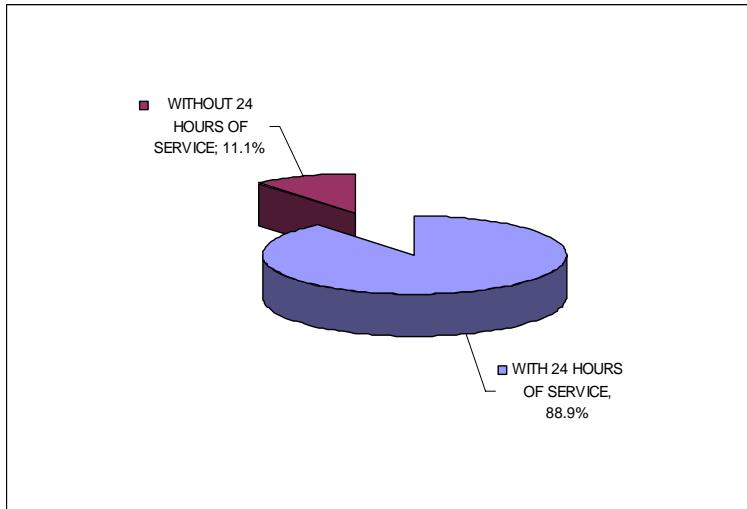


Figure 6.4.3 Hours of Service

39 industries have good pressure services from ENACAL, 10 industries with poor quality: 2 with odor, 3 with color, 4 with problems in taste and 7 with other quality problems (See **Fig. 6.4.4**).

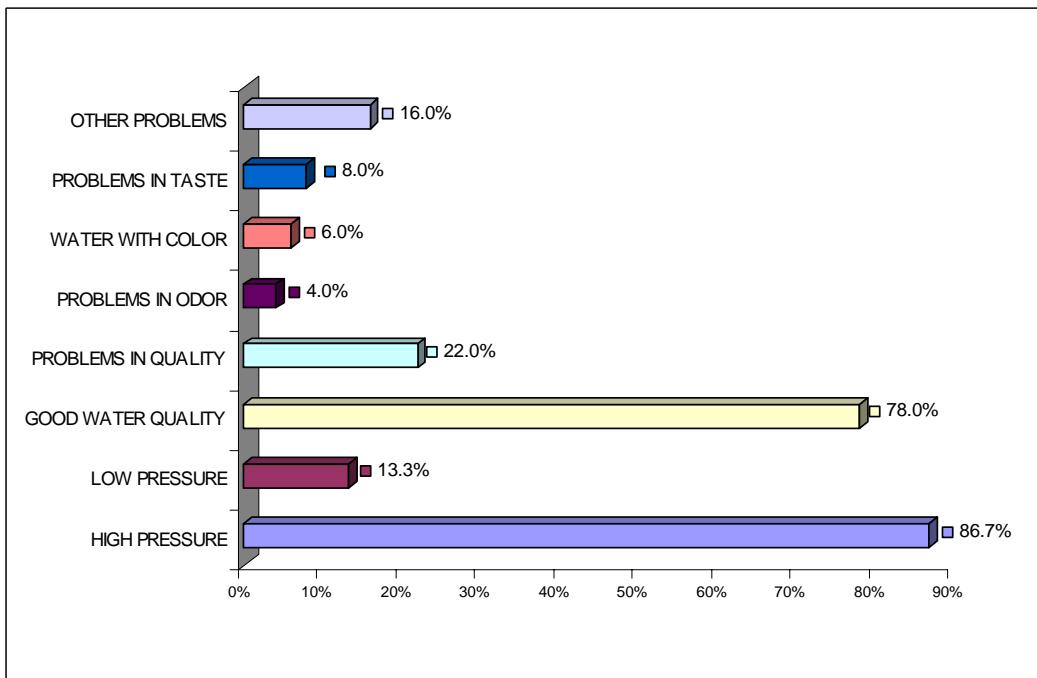


Figure 6.4.4 Other Water Supply Conditions

6.4.3 Institutional & Commercial Users

(1) Type of Institutional & Commercial Users

3% of users are government offices, 10% educational center, 1% hospital& clinic, 5% are hotels, 23% shops, 19% offices and 39% are other commercial users.

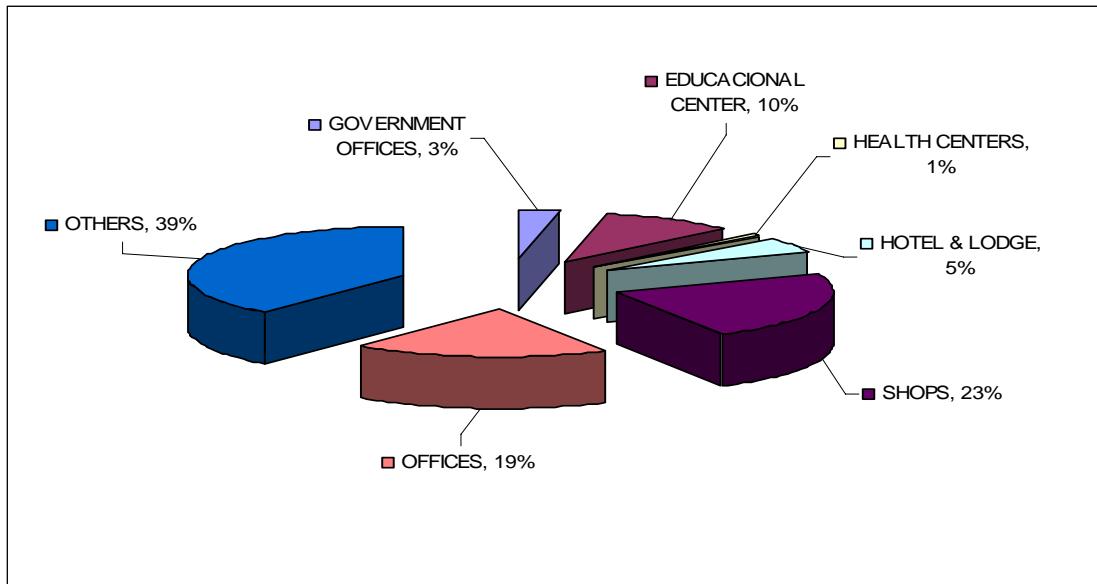


Figure 6.4.5 Types of Institutional&Commercial Users

(2) Types of Water Use

8% of users use water for institutional& commercial personnel needs, 85% for visitors, 22% for sprinkle local garden, 38% for other uses. Average consumption of these users are $165\text{m}^3/\text{month}$.

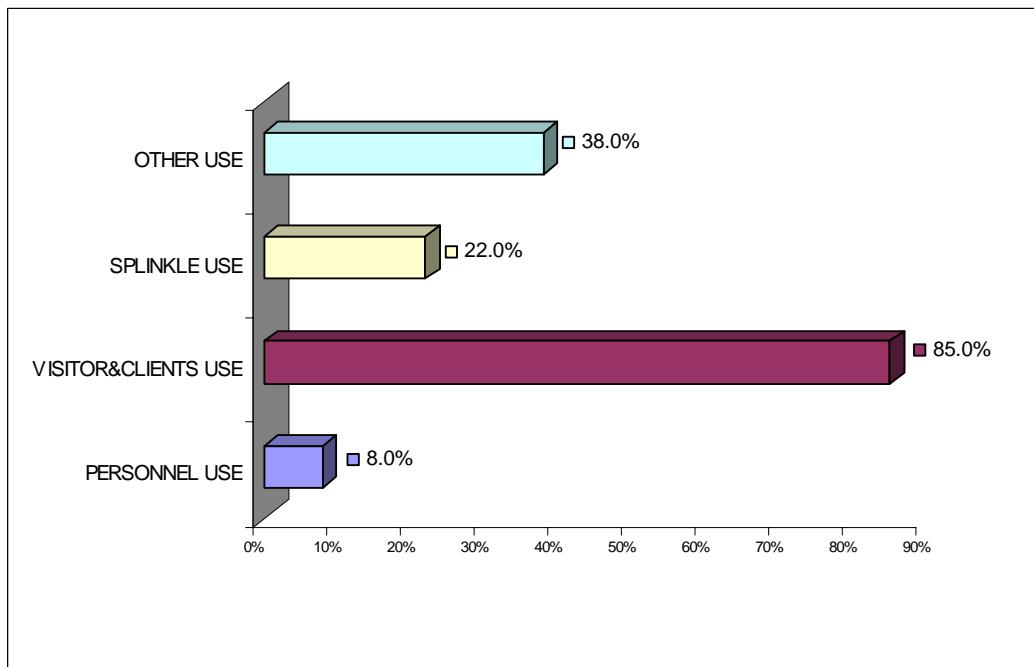


Figure 6.4.6 Use of Water

(3) Water Supply Conditions

86% of users have every day service, 74% of users have all day service, 77% of users have good pressure service.

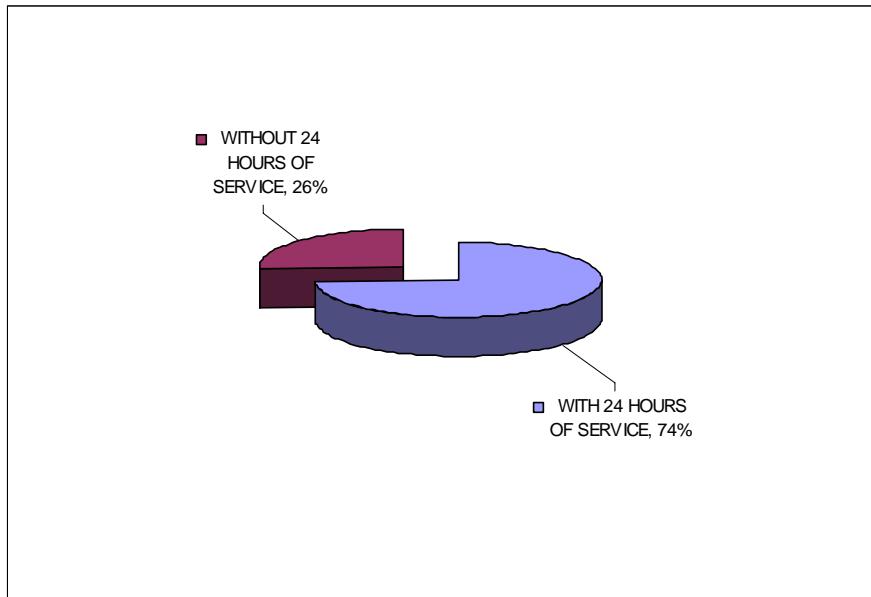


Figure 6.4.7 Hours of Service

Only 64% of users have service with good water quality, 9% of water with odor, 6% with color, 12% with bad taste and 14% with other quality problems.

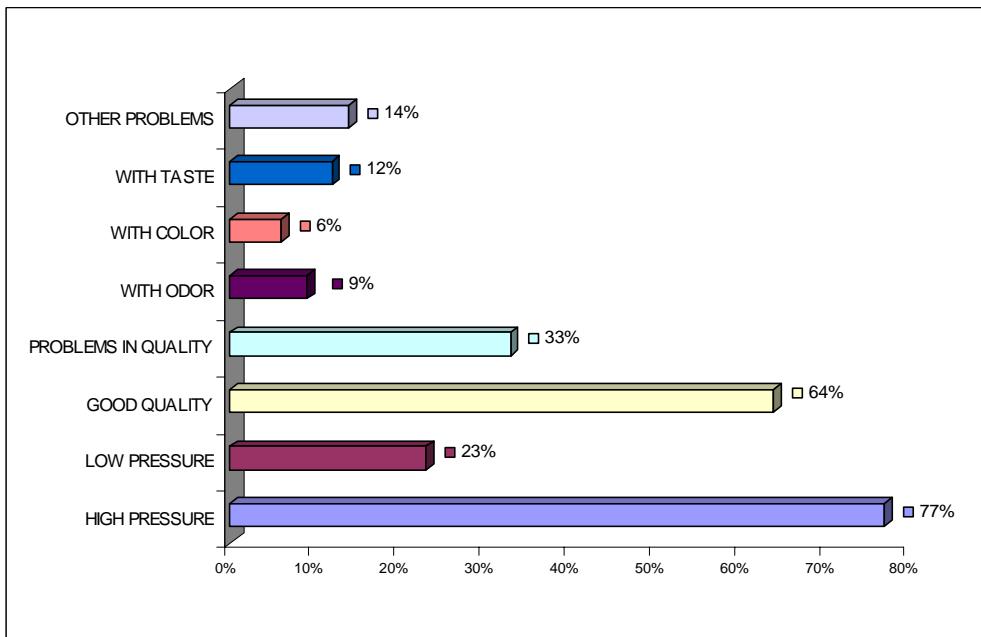


Figure 6.4.8 Supply Conditions

6.5 RESULTS OF AWARENESS SURVEY

6.5.1 The Level of Satisfaction

(1) ENACAL's Water Service

45% of all users are satisfied in ENACAL Services. 52% of all users, 11% of asentamientos users claim in ENACAL services. Higher claims areas are zona 6, 7, and 8.

Table 6.5.1 General Service Satisfaction

Zone	Claims to ENACAL Services	Satisfaction to ENACAL Service	No Comments
1	35%	60%	5%
2	35%	57%	9%
3	51%	48%	1%
4	29%	71%	0%
5	47%	49%	4%
6	64%	34%	3%
7	65%	35%	0%
8	65%	35%	0%
9	49%	49%	3%
10+T+N	59%	35%	6%
Study Area	52%	45%	3%

Claims related to meter reading and billing accounted for 24% of the total, followed by improvement in water supply service of 19%.

Table 6.5.2 Claims Related to ENACAL's Service in All Types of Users

Zone	Related to Meter&Bill	Attention of Service	Water Quality	Improvement of Water Supply	Other
Z1	86%	0%	7%	7%	0%
Z2	63%	6%	6%	13%	13%
Z3	45%	0%	8%	53%	10%
Z4	25%	0%	0%	50%	25%
Z5	62%	5%	0%	29%	5%
Z6	47%	0%	13%	9%	38%
Z7	33%	3%	3%	70%	13%
Z8	16%	0%	0%	77%	6%
Z9	53%	0%	0%	21%	26%
Z10+T+N	50%	10%	10%	20%	10%
%Total Claims	46%	2%	6%	38%	16%
%of Samples	24%	1%	3%	19%	8%

(2) Water Quality

Water quality claims consist in: 25% for water taste, 29% for water odor, 40% for water color (dirt or clay mixed), and for other problems in quality 44%.

Table 6.5.3 Water Quality

Zone	Problems in Taste	Problems in Odor	Problems in Color	Other Quality Problems
Z1	30%	58%	67%	33%
Z2	24%	9%	27%	36%
Z3	35%	39%	50%	36%
Z4	7%	0%	0%	100%
Z5	16%	14%	29%	29%
Z6	32%	21%	21%	63%
Z7	20%	0%	22%	44%
Z8	15%	0%	100%	29%
Z9	21%	75%	38%	38%
Z10+T+N	24%	25%	0%	100%
% of Claims	25%	29%	40%	44%

(3) Meter Reading

70% of users of ENACAL have meters and only 54% of them (38% of all users) is lecture monthly, and only 35% metered users (only 25% of all users) are satisfied with the lecture. ENACAL meter lecture have very low consumer satisfaction and consequently the highest number of claims.

Table 6.5.4 Meter Reading

Zone	Metered Houses	Lectured Periodically by ENACAL	Monthly Frequency of Lecture	Conform with Lecture	Satisfaction with Lecture Staff
Z1	73%	83%	48%	52%	24%
Z2	83%	74%	21%	61%	42%
Z3	73%	90%	60%	62%	38%
Z4	79%	100%	82%	45%	27%
Z5	78%	94%	66%	51%	46%
Z6	55%	83%	59%	54%	41%
Z7	78%	92%	67%	50%	28%
Z8	60%	90%	66%	52%	28%
Z9	67%	65%	46%	46%	27%
Z10+T+N	82%	71%	29%	43%	36%
Study Area	70%	85%	54%	54%	35%

(4) Billing and Collection

85% of user receipt water bill and almost all them are satisfied in bill distribution and collection.

Table 6.5.5 Billing and Collection

Zone	Monthly Receipt of Bills	No. Reception of Bills	Others	Bill Collection in House	Satisfaction With ENACAL Staff
1	75%	18%	8%	18%	86%
2	98%	0%	2%	11%	100%
3	87%	9%	4%	9%	100%
4	93%	0%	7%	0%	0%
5	80%	7%	13%	2%	100%
6	72%	9%	19%	22%	50%
7	89%	4%	7%	0%	0%
8	90%	8%	2%	46%	95%
9	82%	5%	13%	15%	100%
10+T+N	100%	0%	0%	53%	78%
Study Area	85%	7%	8%	16%	84%

6.5.2 Willingness to Pay (WTP)

(1) Willingness to Pay

Mean value of WTP in all type of users are, C\$121/month, and the lowest answer was C\$10/month from a user of Tariff 01 in zone 9.

Table 6.5.6 Willingness to Pay in All Types of Users

Zone	No. Answer	Other	Effective Answer	WTP Mean Value (C\$/month)	Lowest Answer (C\$/month)
Z1	18%	23%	60%	100	30
Z2	39%	15%	46%	124	60
Z3	27%	24%	49%	144	50
Z4	0%	21%	79%	187	50
Z5	24%	33%	42%	140	50
Z6	4%	16%	80%	112	20
Z7	0%	4%	96%	131	45
Z8	0%	25%	75%	114	40
Z9	3%	13%	85%	95	10
Z10+T+N	0%	29%	71%	86	50
Study Area	14%	20%	67%	121	10

(2) Water Service Cost

41% of all users think that water service bill is expensive, but in asentamientos only 11% express that the water bill is expensive. 37% of all users and 44% of users in asentamientos think that water bill is cheap.

Table 6.5.7 Water Service Cost

Zone	Expensive (All Users)	Expensive (Asent)	Cheap (All Users)	Cheap (Asent)	No Comment (All Users)	No Comment (Asent)	Other Opinion (All Users)	Other Opinion (Asent)
Z1	43%	0%	23%	33%	25%	67%	10%	0%
Z2	35%	13%	39%	63%	22%	13%	4%	13%
Z3	37%	5%	42%	30%	11%	35%	10%	30%
Z4	36%	0%	50%	0%	7%	0%	7%	100%
Z5	47%	14%	31%	14%	16%	71%	7%	14%
Z6	38%	9%	27%	74%	31%	13%	4%	4%
Z7	46%	43%	46%	14%	4%	43%	4%	0%
Z8	50%	10%	38%	30%	8%	40%	4%	20%
Z9	36%	0%	51%	71%	8%	29%	5%	0%
Z10+T+N	59%	100%	41%	0%	0%	0%	0%	0%
Total	41%	11%	37%	44%	15%	32%	6%	13%

6.6 GENERAL EVALUATION OF SURVEY RESULTS AND IDENTIFICATION OF SOCIAL PROBLEMS IN WATER SERVICE

6.6.1 General Evaluation of Domestic Users

(1) Survey Coverage

The household survey carried out in the Study Area covers a total of 449 houses out of 168,313 users of the Study Area (from ENACAL users Cadastral Data). The survey coverage is 0.26%. The number of interview in asentamientos (low income areas), was 91, 20% of the total interview. In all the Study Area, asentamientos represents 33% of users, this low coverage in asentamientos results from difficulty in access to targeted houses: incomplete address, incomplete cadastral data, absence of householders, etc.

(2) User Types and Characteristics

In the Study Area, there are 12% of population are less than 6 years old and 63% of the users are more than 18 years old. The average household size is 5.07 persons, less than estimate value in 1995 National Census (5.37 for Managua City). 96% of users have ENACAL water supply service, 72% with sewerage service of ENACAL, and 95% have electricity service. Only 70% of users have water

meter and 51% of them are in good condition; but 95% of same users have electricity meter. Low-income settlements have different condition and characteristics. The analysis for this low income settlement called asentamientos is made separately.

(3) Water Supply Condition

86% of users have water supply service every day, 67% have all day supply service, 69% have water service with good pressure and 75% receipt water with good quality. Results of this situation, only 47% of the consumers storage water and 21% of users buy water in bottles. Water supply service is weak in zone 3, 6 and 7.

In interviewed metered houses, last 12 months consumption registered $28.73 \text{ m}^3/\text{month}$, that represents 189 liters /day per capita consumption (considering 5.07 persons/house).

(4) Water Supply Service Satisfaction

52% of users have claims against ENACAL service and most of those claims (24%) are related to metering and billing service.

(5) Willingness to Pay (WTP)

Mean value of WTP in all type of users are C\$121/month, and the lowest answer was C\$10/month (an illegal users of tariff 01). 41% of all users think that actual water bill is expensive.

6.6.2 General Evaluation of Non Domestic Users

(1) Survey Coverage

Consumption survey for non domestic users carried out in the Study Area covers 285 registered industries and 5,894 institutional & commercial users. Survey coverage is 17% for industrial users and 1.7% for institutional & commercial users. Total number of interview for non domestic users was 149.

(2) User Types and Characteristics

71.4% of industries use exclusively ENACAL water supply service, 20.4% ENACAL with self well supply and 8.2% have self supply service. 38% of industries uses water for industrial process, 20.4% for refrigeration and boiler, 36.4% for washing machines. Average consumption for industries with ENACAL service is $621\text{m}^3/\text{month}$.

In institutional & commercial users, 3% are government institution, 10% educational center, 1% medical center, 5% hotels, 23%shops, 19%offices and 39% other commerce locals. In this sector 85% of users use water for visitors or clients, 22% for sprinkle local garden, 38% for other uses. Average consumption is $165\text{m}^3/\text{month}$.

(3) Water Supply Condition

In industrial sector, 44 industries have every day service, 40 industries have all day service, 39 industries have good pressure service. But, the water quality is acceptable in only 39 industries: 2 industries with odor, 3 with color, 4 with taste and 8 with other problems. In institutional & commerce sector, 86% have every day service, 74% have all day service, 77% have good pressure service. But, the water quality is acceptable in only 64% of users: 9% with odor, 6% with color, 12%

with bad taste and 14% with other problems.

6.6.3 Conditions of Low Income Settlements

(1) Asentamientos

ENACAL grouped low income settlements as a generic name of asentamientos, with special subsidized tariff 10. There are approximately 56,000 users of ENACAL. In domestic users survey 91 users asentamientos were interviewed, with 0.17% of survey coverage (List of asentamientos and their locations by Districts are shown in **Annex 6E**).

In asentamientos, average household size is 5.34 persons, 5% more than average household size of the Study Area. In asentamientos, there are an average of 2.6 working persons /house. 6% of family in asentamientos have a income less than C\$599/month, this low income families (extremely poor) is high in zone 3, 5 and 9. 53% of asentamientos users have income between C\$600 to C\$1,599/month, 29% have income between C\$1,600 to C\$3,099, and 12% of users have high income with more than C\$3,100/month.

Table 6.6.1 Asentamientos Users' Monthly Income

Zone	Working persons/ users	N/A	Less than C\$599/month	C\$600 to C\$1,599/month	C\$1,600 to C\$3,099/month	More than C\$3,100/month
Z1	3.6	17%	0%	40%	60%	0%
Z2	3.6	16%	0%	40%	60%	0%
Z3	2.2	75%	20%	40%	40%	0%
Z4	2.0	0%	0%	100%	0%	0%
Z5	2.0	71%	50%	0%	0%	50%
Z6	2.6	9%	0%	67%	24%	10%
Z7	2.9	0%	0%	71%	14%	14%
Z8	3.0	50%	0%	40%	60%	0%
Z9	2.8	43%	25%	25%	0%	50%
Z10+T+N	2.0	0%	0%	0%	100%	0%
Total	2.7	11%	6%	53%	29%	12%

(2) Water Supply and Sewerage Service Conditions in Asentamientos

From information of interviewers, ENACAL and site verification, most of water sources for domestic users in the Study Area is from ENACAL wells. There aren't shallow wells or rivers for domestic uses in urban area. Same asentamientos of low and middle land are connected to the ENACAL water supply system without any technical and legal considerations. In high lands of extreme southwest (Zona 8 of District III) and southeast (Zona 6 in District V and District VI) of Managua city, some households use ENACAL water source and private tanker. The water supply coverage in surveyed asentamientos is 100%, sewerage coverage is very low with 49%.

Table 6.6.2 Water and Sewerage Service and Years of Service

Zone	With Water Supply Service	Years of Water Supply Service	With Sewerage Service	Years of Sewerage Service
Z1	100%	9.5	67%	5.8
Z2	100%	8.6	100%	6.8
Z3	100%	10.7	85%	10.7
Z4	100%	2.0	0%	0.0
Z5	100%	10.4	14%	5.0
Z6	100%	9.5	39%	7.5
Z7	100%	16.9	29%	14.0
Z8	100%	15.6	20%	4.0
Z9	100%	5.8	14%	3.5
Z10+T+N	100%	5.0	0%	0.0
Study Area	100%	10.4	49%	0.0

Only 59% of asentamientos have 24 hours of service, remain asentamientos have limited hourly supply service. Water storage in bucket or barrel is 57%, the highest storage rate are shown in 3 areas of the Managua, southwest and southeast high land areas (Zones 8, 5 and 6).

Table 6.6.3 Water Supply Conditions in Asentamientos

Zone	Asentamientos Sample No.	Every Day Service	All Day Service	Good Pressure	Good Quality Water
Z1	6	83%	67%	67%	67%
Z2	8	75%	75%	88%	75%
Z3	20	70%	50%	45%	75%
Z4	1	100%	100%	0%	100%
Z5	7	100%	86%	57%	86%
Z6	24	87%	52%	87%	91%
Z7	7	86%	29%	14%	86%
Z8	10	80%	60%	40%	90%
Z9	7	86%	71%	86%	86%
Z10+T+N	1	100%	100%	100%	0%
Total	91	82%	59%	63%	82%

Only 2% of householders in asentamientos have water meter, households without meter apply flat rate service from ENACAL. It's very difficult to estimate volume of consumption in asentamientos, because there aren't water meter in asentamientos area. In asentamientos, 57% of residents store water in bucket (about 5 gallons) or barrel (55 gallons).

Table 6.6.4 Water Storage in Asentamientos

Zone	Asentamientos Sample No.	Storage Water	%	Barrel (55 gallons)
Z1	6	2	33%	1.38
Z2	8	0	0%	-
Z3	20	12	60%	1.83
Z4	1	1	100%	1.00
Z5	7	6	86%	2.00
Z6	23	15	65%	1.20
Z7	7	6	86%	1.14
Z8	10	8	80%	0.67
Z9	7	1	14%	1.25
Z10+T+N	1	0	0%	-
Total	91	51	57%	

(3) Views on Water and Sewerage Service

The survey identified three types of expectation: Asentamientos of lowland (The Study Team called Type A Asentamientos), “we want sewerage facilities..., in rainy seasons overflow of drainage system is problem...”. Other different type expectation are in asentamientos of highland zones 3,6, 7 and 8, South High land areas of southwest an south west of Managua (The Study Team called Type C Asentamientos): “we want service at least 3 days a week....; new pipelines to obtain a good service...”. The mixed type of expectation is observed in middle land of the city (The Study Team called Type B Asentamientos): “ we want more service pressure....; sewerage facilities....; we don’t have water meter, the pipelines was donated by an European country, we not pay”. The classification of asentamientos into Type A, Type B and Type C is discussed in detail in **Annex 6E**.

(4) Willingness to Pay (WTP)

Average WTP is C\$93 and the lowest is C\$45. The average WTP is 60% more than actual flat rate (C\$55.60) for asentamientos.

Table 6.6.5 Willingness to Pay in Asentamientos

Zone	Effective Answer	WTP Mean Value (C\$/month)	Lowest Answer (C\$/month)
Z1	100%	74	50
Z2	75%	113	76
Z3	75%	101	50
Z4	100%	50	50
Z5	57%	78	50
Z6	74%	93	50
Z7	100%	57	45
Z8	70%	114	50
Z9	86%	104	60
Z10+T+N	100%	120	120
Total	78%	93	45

(5) Affordability to Pay (ATP)

Electricity expenditure is useful information for the evaluation of Affordability to Pay of asentamientos families. This payment is C\$122 to C\$245 per month, and about 95% of householders have electricity meters.

Table 6.6.6 Electricity Service Payment

Zone	Less than C\$599/month	C\$600 to C\$1,599/month	C\$1,500 to C\$3,099/month	More than C\$3,100/month
Z1	167	125	247	265
Z2	0	190	205	0
Z3	0	116	680	0
Z4	0	30	0	0
Z5	0	90	150	490
Z6	0	124	167	335
Z7	0	198	0	80
Z8	0	120	174	0
Z9	0	70	0	155
Z10+T+N	0	150	0	0
Average	167	121	232	265

6.6.4 Identification of Social Problems in Water Service

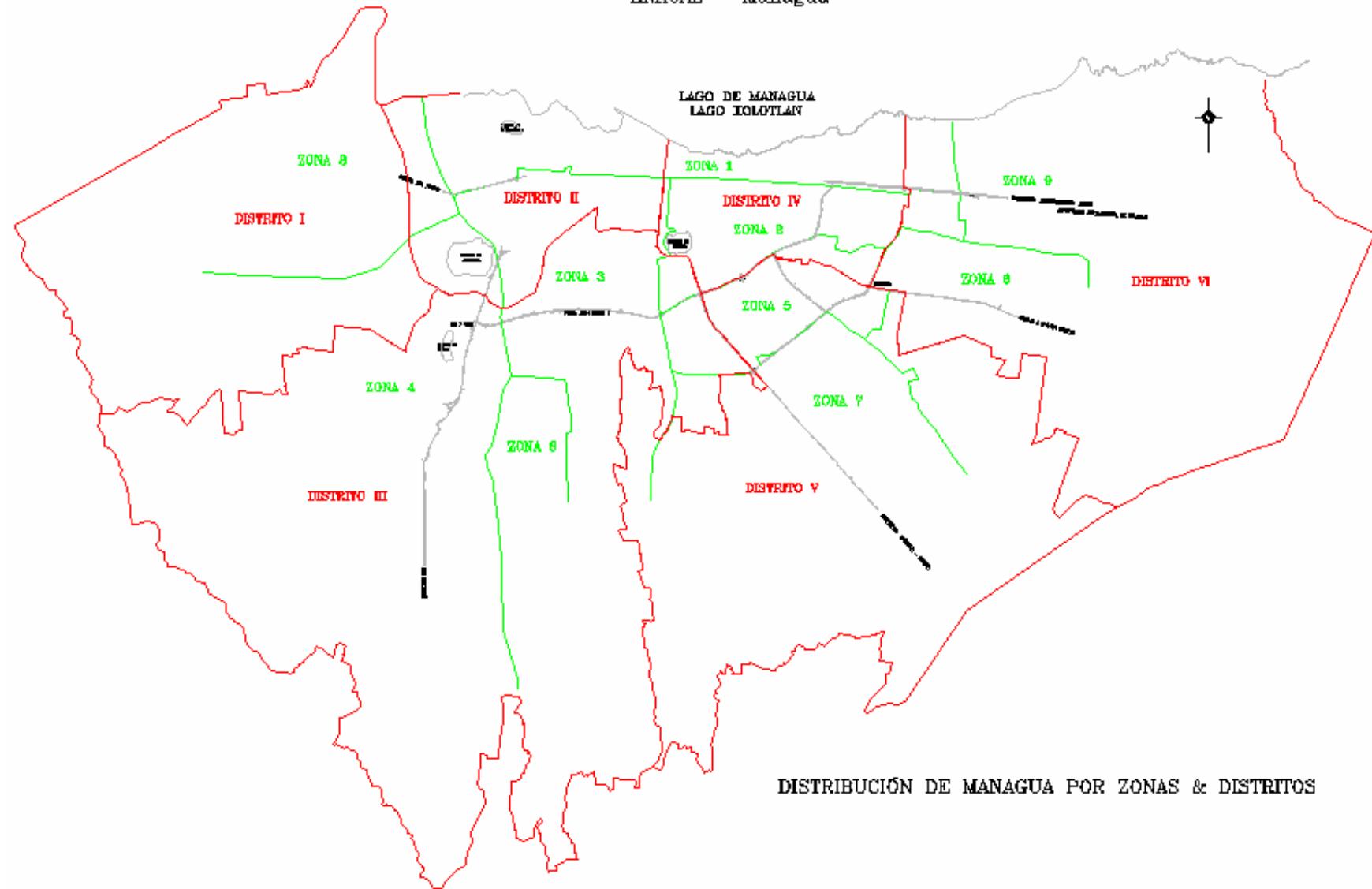
- (1) Main social problems in water supply service are located in asentamientos. Considering water supply service conditions there are 3 types of asentamientos in the Study Area, especially in urban area of Managua city (Zone 1 to 9). Generally speaking, low elevation areas have good service and high elevation areas have poor service condition (asentamientos located in zone 3, 5, 6, 7 and 8).
- (2) In general, users in asentamientos have more WTP than formal domestic users. This survey indicates that the average WTP and ATP are about C\$100/month in asentamientos.
- (3) In asentamientos approximately 3,400 users or 18,000 persons live below poverty line. Considering that the coverage of asentamientos in this survey is only 60%, their total number could be 5,600 users or 30,000 persons in the entire Managua city. The number of extremely poor persons was estimated as 23,851 in 1998 PRSP and 25,440 (80% of Managua Department extremely poor persons) in INEC's MECOVI 2001 Survey. There is a clear need for social protection which ensures access to the service for these extremely poor households.
- (4) In higher elevation asentamientos, main problem is the improvement in daily, hourly and pressure water supply service.
- (5) In residential area, ENACAL doesn't have credibility, particularly in metering and billing.

ANNEX 6A

ENACAL's Commercial Zones and Municipal Districts

EMPRESA NICARAGUENSE DE ACUEDUCTOS Y ALCANTARILLADOS
ENACAL - Managua

I-A-1



ANNEX 6B

Water Consumption and Awareness Surveys Questionnaire for Domestic Users

ENCUESTA

SECCION I : SITUACIÓN SOCIO ECONOMICA FAMILIAR

I.1. IDENTIFICACIÓN GEOGRAFICA Y UBICACIÓN DE LA VIVIENDA (PARA SER LLENADO ANTES DEL LEVANTAMIENTO DE DATOS EN EL TERRENO)

FECHA		ENCUESTA NO.	
NOMBRE DEL ENCUESTADOR		ESTRATO :	TIPO DE TARIFA:
ZONA, RUTA Y CUENTA		1.-ASENTAMIENTOS	
NOMBRE DEL BARRIO O ASENTAMIENTO		2.- BARRIOS	
DIRECCIÓN DE LA VIVIENDA		3.-URB. RESIDENCIALES	
NO. DE CASA		4.- COMERCIALES	

I.2. DATOS GENERALES :

NOMBRE Y APELLIDOS DEL ENTREVISTADO		SEXO DEL ENTREVISTADO	FEM.	MASC.
RELACION CON EL JEFE DE FAMILIA		SEXO DEL JEFE DE FAMILIA	FEM.	MASC.
NOMBRE Y APELLIDOS DEL JEFE DE FAMILIA		NO. PERSONAS QUE HABITAN LA VIVIENDA		
EDAD DEL ENTREVISTADO		NO. DE FAMILIAS QUE HABITAN LA VIVIENDA		
EDAD DEL JEFE DE FAMILIA				

I.3. DETALLE DE PERSONAS QUE HABITAN LA VIVIENDA

RANGOS DE EDADES	SEXO		TOTAL
	FEMENINO	MASCULINO	
Menores de 1 año			
1 - 6 años			
7 - 12 años			
13 - 18 años			
Mayores de 18 años			
Total			

I.4 SALUD (Solo para Asentamientos)

I.4.1 Existe alguna unidad de Salud en el barrio / asentamiento, indique :

Unidad de Salud	Si	No	Cerca	Lejos	Unidad de Salud	Si	No	Cerca	Lejos
Casa Base					Puesto de SALud				
Centro de Salud					Hospital				

I.4.2. En su hogar, las enfermedades mas frecuentes son :

Enfermedad	Si	No	Enfermedad	Si	No
Diarreas			Resfriados y enfermedades respiratorias		
Enfermedades de la piel			Dengue		
Enfermedades en los ojos			cólera		
Malaria			Plagas (piojos, etc.)		

I.5. EDUCACIÓN (Sólo para Asentamientos)

I.5.1. ¿Sabe usted leer y escribir? Si _____ No._____

I.5.2. Nivel de instrucción formal de los miembros de la familia, incluyendo al entrevistado.

RANGOS DE EDADES	ESCOLARIDAD APROBADA					TOTAL
	CURSO DE ALFABETIZ.	primaria	secundaria	tecnico	Superior/ Universitario	
6 - 13 años						
14 - 21 años						
22 - 29 años						
29 - 36 años						
Mayores de 37 años						
Total						

I.5.3. Existencia de Centros Educativos en el barrio, asentamiento o área donde habita :

Centro Educativo Nivel	PUBLICO	PRIVADO	CERCA	LEJOS	EN OTRO BARRIO/ZONA
Pre-Escolar					
Primaria					
Secundaria					
Técnica					
Superior/ Universitaria					

I.6. EMPLEO Y SITUACIÓN ECONOMICA (Solo para Asentamientos)

I.6.1. Indique el Número de personas que trabajan en su hogar?

Ninguno	Solo Una	Dos	Tres	cuatro	Todos trabajan

I.6.2. En cuanto valora el total del Ingreso Mensual de su familia :

Menos de C\$ 500 x mes	Entre C\$ 600 a C\$ 1,500	Entre C\$ 1,600 a C\$ 3,000	Entre C\$ 3,100 a C\$ 6.000	Mas de C\$ 6.000 por mes.

I.6.3. La vivienda que ocupa es : rentada _____ propia _____ prestada _____ otro _____

I.6.4. En el caso de rentar cuanto paga al mes :

Menos de C\$ 500 x mes	Entre C\$ 600 a C\$ 1,500	Entre C\$ 1,600 a C\$ 3,000	Entre C\$ 3,100 a C\$ 6.000	Mas de C\$ 6.000 por mes.

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I.6.5. Si la vivienda es propia, usted cuenta con titulo de propiedad ¿Si_____ No_____

I.6.6. Detalle la información solicitada a continuación :

RANGOS DE EDADES	(1)		(2)	(3)	(4) sector					TOTAL
	Empleado		Temp.	Perm.	Gob.	Emp. Priv.	Micro Emp.	Comercio	Emp. domest . .	
	SI	No								
6 - 13 años										
14 - 21 años										
22 - 29 años										
29 - 36 años										
Mayores de 37 años										
Total										

I.7. SITUACIÓN DEL ENTORNO Y LA VIVIENDA (OBSERVACIÓN) (Solo para asentamientos)

Aspectos Observados	1	2	3	4
Tipo de Calle	Adoquinado	Asfaltada	Tierra	Otra
Material Predominante en paredes de la Vivienda	Ladrillo, piedra Bloques, y/o Losetas	Madera o minifalda	Adobe	Ripios u otros
Material Predominante del piso	Ladrillo, o embaldosado	Madera	Tierra	Otros
Estado General de la vivienda	Buen estado	Regular estado	Mal estado	
Existencia de Vehículo o bienes suntuario	Vehículo liviano, motos, o vehículo pesados	Electrodomésticos, radio, televisión , abanicos etc.	Refrigeradora, lavadora,	Otros

SECCION II : SITUACIÓN ACTUAL DEL SERVICIO DE AGUA POTABLE Y SANEAMIENTO

II.I. AGUA POTABLE

II.I.1. Cuenta con servicio de agua potable en su hogar? SI_____ No_____ (No, pase a la II.3)

II.I.2. Desde hace cuento, tiene conexión de agua potable? _____

II.I.3. Cuenta con servicio de Alcantarillado Sanitario SI_____ No_____ (No, pase a la II.31)

II.I.4. Desde hace cuanto tiempo tiene conexión de Alcantarillado Sanitario? _____

II.I.5. Recibe abastecimiento de agua potable continuo, todo el dia ? Si_____ No_____ (En este caso) indique el horario : De las _____ a las _____.

II.I.6. Recibe abastecimiento de agua potable todos los días : Si _____ No_____ (En este caso indique los días que recibe el servicio : _____).

- II.I.7. El agua llega a su casa con suficiente presión : Si _____ No _____
- II.I.8. Tiene algún problema con la calidad del agua que recibe? Si _____ (Olor,____, Color, ____ , otro____) No._____
- II.I.9. Almacena agua en su casa? Si _____ No _____
- II.I.10. En que la almacena ? baldes _____, barriles, _____ tanques _____(que capacidad tiene este tanque)_____.
- II.I.11 En que utiliza el agua ? Uso domestico _____ Higiene familiar_____ riego de jardines____ otros_____
- II.I.12. Compra usted agua en botella? Si _____ NO._____
- II.I.13 Por que compra agua embotellada :
- Por su sabor_____ Por que es mas higiénica_____ Porque no hay agua potable en su casa_____
- II.I.14. Cuanto paga por el agua embotellada mensualmente ¿_____ -
- II.I.15. Tiene pozo en su casa? Si_____ (Cuanto mide _____) No_____
- II.I.16 Sabe usted cuanto es el consumo de agua de su familia al mes ? Si _____ No._____
- Si fuesen barriles de agua, cuantos consumirían al dia?_____
- II.I.17.Cuanto paga por el agua y alcantarillado sanitario al mes ¿_____
- II.I.18. Este pago es : Caro_____, Barato_____,
Este pago es : Justo_____ Injusto_____
- II.I.19. Usa medidor ¿ SI_____ No._____ Podemos ver el medidor? Si_____ No_____
- Comentario del entrevistador en el caso de tener un medidor a la vista._____
- II.I.20. Su medidor es leído regularmente por Enacal ¿ Si____ Que dias pasa _____, cada cuento tiempo pasa ;_____ NO_____
- II.I.21 Esta usted satisfecho(a) con la lectura del medidor que hace Enacal ? SI____ No____ N/A
- II.I.22 Esta usted satisfecho(a) con la actitud del lector del Enacal? SI _____ No_____No lo conoce_____
- II.I.23 . Con que frecuencia recibe usted las facturas de Enacal?
- Mensualmente____ Eventualmente____ No llega_____
- Recibe en _____ Paga en _____
- II.I.24. Usted recibe visitas de parte del colector de Enacal para hacer sus pagos de agua ?Si____ No____
- (Si contesta No) Indique en donde realiza sus pagos de agua _____
- II.I.25. Que dias pasa? _____ Con que frecuencia lo (a) visita?_____
- II.I.26. Esta usted satisfecho (a) con la actitud del colector (a) de Enacal? Si _____
NO_____ (En caso de ser no, indique por que ;_____.)0
- II.I.27. Ha cambiado su modo de vida desde que esta conectado al servicio de agua potable?
Si _____ NO_____ (En caso afirmativo, indique de que forma ha cambiado :_____)
- II.I.28. Tiene algun problema o queja sobre el servicio de agua potable : Si _____ No_____
(En caso afirmativo, indique de que forma ha cambiado :_____)
- II.I.29 Tiene alguna sugerencia para mejorar el servicio de agua potable :_____.
- II.I.30. Han disminuido los casos de diarrea desde que esta conectado al servicio de agua potable?
Si_____
No_____
- II.I.31. Cual seria el monto máximo que usted deseria pagar si el servicio de agua potable , fuese mejorado ?_____ C\$ por mes.

Preguntas para los que carecen del servicio de Agua Potable :

II.I.32. De donde obtiene el agua para el consumo de su hogar?

FUENTE	DENTRO DEL BO/ASENTAMIENTO	OTRO BARRIO / ASENTAMIENTO
Pozo privado		

Pozo Publico		
Puesto de A.P. Publico		
Pipa		
Aqua embotellada		

II.I.33. Cuanto paga por el agua que consume por mes :_____ C\$

II.I.34. Estaria dispuesto a pagar para la instalación de un medidor en su casa? Si _____ No _____

II.I.35. Cuanto estaria dispuesto a pagar? _____ C\$ mes.

II.I.36. Usted piensa que es necesario pagar por el servicio de Agua Potable ? Si _____ No _____

II.I.37. Cuanto dinero estaria dispuesto a pagar al mes por el Servicio de Agua Potable?C\$ _____

II.II SANEAMIENTO :

II.II.1 Que tipo de servicio sanitario utiliza : _____

Inodoro c/A.S. _____ Inodoro c/F.S. _____ Letrina Sencialla _____ Nada _____

II.II.2.¿ Tiene algún problema con su servicio sanitario? Si _____ No _____

Que tipo de Problema : _____

II.II.3. Con qué frecuencia se obstruye la tubería de alcantarillado, o agua negras? _____

II.II.4. Cuanto paga por este tipo de trabajo? _____

II.II.5. (En caso de existencia de fosa séptica) Con que frecuencia retira el lodo del artefacto sanitario? _____

II.II.6. Quien realiza este tipo de trabajo _____

II.II.8. Cada cuento tiempo realizan este tipo de trabajo ? _____

II.II.9. Alguna vez ha intentado utilizar el lodo de desecho como fertilizante? Si _____ No _____

II.II.10. Cuando alguien en su casa se enferma, cuánto gasta en promedio de consultas medicas y medicinas mensualmente _____ C\$

II.II.11. Estas enfermedades son causadas por problemas con el agua ¿ Si _____ NO _____

II.II.12 Usted o alguien de su familiar ha recibido educación sobre higiene y salud ¿? Si _____ NO _____

En _____ caso _____ afirmativo _____ ¿donde _____ ?

II.3 ENERGIA ELECTRICA :

II.3.1 Cuenta con servicio de energía eléctrica Si _____ No _____

II.3.2. Cuenta con medidor instalado Si _____ No _____

II.3.3. Cuanto paga al mes por el consumo de Energía Eléctrica C\$ _____

SECCION III: CONCIENCIA SOBRE EL USO Y EL VALOR DEL AGUA.

III.1 ¿Sabe usted cual es la institución de gobierno que es responsable del servicio del Agua Potable?

Si _____ No _____, En caso de responder afirmativamente
indique cual es el nombre de la Institución

III.2. Conoce usted de donde viene el agua que consume, cómo es tratada y distribuida? Si _____ No _____

III.3. Que tipo de papel juegan las mujeres y los niños en su familia en lo relacionado al tema del agua?

El papel de las mujeres es _____

El papel de los niños es _____

III.4. Existe alguna organización comunitaria que este relacionada con el agua (incluyendo el servicio de agua potable?, Si la respuesta si, cual es el area de trabajo o rol que tienen en su comunidad?

Si hay _____ No Hay _____

En caso afirmativo indique el Nombre de la Organización _____

Proyectos o actividades que realizan ? _____

ANNEX 6C

Water Consumption Survey Questionnaire for Industrial Users

ENCUESTA INDUSTRIAL

SECCION I : SITUACIÓN SOCIO ECONOMICA

I.1 IDENTIFICACIÓN GEOGRAFICA Y UBICACIÓN DEL LOCAL

FECHA		ENCUESTA No	
NOMBRE DEL ENCUESTADOR		TARIFA	
ZONA, RUTA Y CUENTA		DIRECCIÓN DE LA INDUSTRIA	

I.2 DATOS GENERALES :

RAZON SOCIAL:		Tamaño de la entidad	Micro	Otro
Observaciones		Grande	Mediana	
NOMBRE Y APELLIDOS DEL ENTREVISTADO				
Cargo del ENTREVISTADO				
Teléfono				

1.3 Características de la Industria

Tipo de Industria:
Actividad de la Industria:

Número Empleados	Número de baños, urinarios, Servicios sanitarios	USO DEL AGUA						
		Bebida	Doméstico	Procesos Industriales	Refrigeración /Calderas	Lavado de equipos	Riego	Otros

--	--	--	--	--	--	--	--	--

1.4 SITUACION DEL ENTORNO Y LA EDIFICACION (OBSERVACION)

Aspectos Observados	1	2	3	4
Tipo de Calle	Adoquinado	Asfaltada	Tierra	Otra
Material Predominante en paredes de la Edificación	Ladrillo, piedra Bloques, y/o Losetas	Madera o minifalda	Adobe	Ripios u otros
Material Predominante del piso	Ladrillo, o embaldosado	Madera	Tierra	Otros
Estado General de la Edificación	Buen estado	Regular estado	Mal estado	
Jardinería (Area estimada)	No tiene	Menos de 10 m ²	Entre 10 a 100 m ²	Mayor a 100m ²

SECCION II : SITUACIÓN ACTUAL DEL SERVICIO DE AGUA POTABLE Y SANEAMIENTO

II.I. AGUA POTABLE

II.I.1. Con que servicio de agua potable cuenta?

Exclusivo de ENACAL	Solo Pozo Propio (Caudal estimado) m ³ /mes	De ENACAL y Pozo Propio	Otro (especifique)

II.I.2. Desde hace cuanto, tiene conexión de agua potable de ENACAL?

II.I.3. Recibe abastecimiento de agua potable de ENACAL 24 horas continuas al día? Si _____

No _____(En este caso) indique el horario : De las _____ a las _____.

II.I.4. Recibe abastecimiento de agua potable de ENACAL todos los días : Si _____

No _____(En este caso indique los dias que recibe el servicio : _____

II.I.5. El agua de ENACAL llega con suficiente presión : Si _____ No_____

II.I.6. Tiene algún problema con la calidad del agua que recibe de ENACAL? Si _____ (Olor,_____, Color, _____, otro _____) No._____

II.I.7. Almacena agua ? Si _____ No_____

II.I.8. En que la almacena ? baldes _____, barriles, _____ tanques _____ (que capacidad tiene este tanque)_____.

II.I.9. Cuanto paga por el agua y alcantarillado sanitario al mes?

II.I.10. Este pago es : Caro_____, Barato_____, Justo_____, Injusto_____

II.I.11. Usa medidor? SI_____ No._____ ¿Podemos ver el medidor? Si_____ No_____

Comentario del entrevistador en el caso de tener un medidor a la vista.

II.I.12. ¿Su medidor es leído regularmente por ENACAL? Si _____ (Que días pasa _____, cada cuanto tiempo pasa ;_____ NO_____

II.I.13 ¿Esta usted satisfecho(a) con la lectura del medidor que hace Enacal ? SI____ No_____

II.I.14 ¿Esta usted satisfecho(a) con la actitud del lector del ENACAL? SI _____ No_____

II.I.15. ¿Con que frecuencia recibe usted las facturas de Enacal?

Recibe en _____ Paga en _____

II.I.16. ¿Usted recibe visitas de parte del colector de Enacal para hacer sus pagos de agua? Si____ No____ (Si contesta No) Indique en donde realiza sus pagos de agua

II.I.17. Tiene algún problema o queja sobre el servicio de agua potable : Si _____ No_____
(En caso afirmativo, indique cual es el problema : _____)

II.I.18 Tiene alguna sugerencia para mejorar el servicio de agua potable :

II.I.19. Estaría dispuesto a pagar más de lo que hoy paga si el servicio de agua potable fuese mejorado?

Si _____ No _____ ¿Cuánto C\$ por mes? _____

PREGUNTAS PARA LOS QUE NO UTILIZAN EL SERVICIO DE AGUA DE ENACAL

II.I.20 ¿Por qué no usa el servicio de agua de ENACAL? Muy caro _____, Servicio Inestable _____, La calidad no es satisfactoria _____ Otro _____

II.I.21. ¿Lleva un registro del agua que consume? Si _____ No _____ ¿Cuál ese consumo?

_____ (m³/mes)

II.I.22. Cuanto paga por el agua que consume por mes : _____ C\$

II.II SANEAMIENTO :

II.II.1 ¿Cuál es la forma de disposición de las aguas residuales? Alcantarillado Sanitario _____ Fosas Sépticas _____ Sumidero _____ Cauce _____ Otro _____

II.II.2. ¿Tiene algún problema con la disposición de las aguas residuales? Si _____ No _____

Que tipo de Problema : _____

II.II.3. En el caso de contar con sistemas individuales para la disposición de las aguas residuales (fosa séptica, sumideros, etc) ¿Con que frecuencia retira el lodo del sistema? _____

II.II.4. ¿Quién realiza este tipo de trabajo? _____

II.II.5. ¿Cuánto paga por este trabajo? _____

II.II.6 Poseen unidades de pretratamiento antes de la descarga final de las aguas residuales? Rejillas-

_____ Desarenadores _____ Separadores de grasas y aceite _____

Otro _____

II.II.7 ¿Tiene quejas del servicio de alcantarillado sanitario? _____

III.OBSERVACIONES

ANNEX 6D

Water Consumption Survey Questionnaire for Commercial Users

ENCUESTA COMERCIAL, DE SERVICIO E INSTITUCIONAL

SECCION I : SITUACIÓN SOCIO ECONOMICA

I.1 IDENTIFICACIÓN GEOGRAFICA Y UBICACIÓN DEL LOCAL

FECHA		ENCUESTA No	
NOMBRE DEL ENCUESTA DOR		TARIFA	
ZONA, RUTA Y CUENTA		DIRECCIÓN:	

I.2 DATOS GENERALES :

RAZON SOCIAL:		Tamaño de la entidad	Micro	Otro
Indicar si el local tiene otro nombre		Grande	Mediana	
NOMBRE Y APELLOS DEL ENTREVIST ADO				
Cargo del ENTREVIST ADO		Teléfono:		

I.3 SI ES UN CENTRO EDUCATIVO LLENE LO SIGUIENTE:

Centro Educativo Nivel	PUBLICO	PRIVADO	Numero Alumnos	Numero docentes	Numero Empleados
Pre-Escolar					
Primaria					
Secundaria					
Técnica					
Superior/ Universitaria					

I.4 SI ES UNA UNIDAD DE SALUD LLENE LO SIGUIENTE:

Unidad de Salud	PUBLICO	PRIVADO	Numero Empleados	Atencion Promedio Diario	Numero de Camas
Centro de Salud					
Puesto de Salud					
Hospital					

1.5 SI ES UN LOCAL DE ALOJAMIENTO U HOSPEDAJE LLENE LO SIGUIENTE:

Tipo de local	Numero Empleados	Numero de Habitaciones	Numero de baños	Tamano de la Piscina

1.6 SI ES UN LOCAL COMERCIAL LLENE LO SIGUIENTE:

Tipo de comercio	Numero Empleados	Numero de banos, urinarios, Servicios sanitarios	Tiene Baño para el publico? Cuantos?	
Gasolineras				
Lavaderos de carros				
tiendas				
Pulperias				
Taller de mecanica				
Mercado				
Lavanderia				

1.7 SITUACION DEL ENTORNO Y LA EDIFICACION (**OBSERVACION**)

Aspectos Observados	1	2	3	4

Tipo de Calle	Adoquinado	Asfaltada	Tierra	Otra
Material Predominante en paredes de la Edificación	Ladrillo, piedra Bloques, y/o Losetas	Madera o minifalda	Adobe	Ripios u otros
Material Predominante del piso	Ladrillo, o embaldosado	Madera	Tierra	Otros
Estado General de la Edificación	Buen estado	Regular estado	Mal estado	
Jardineria (Area estimada)	No tiene	Menos de 10 m2	Entre 10 a 100 m2	Mayor a 100m2

SECCION II : SITUACIÓN ACTUAL DEL SERVICIO DE AGUA POTABLE Y SANEAMIENTO

II.I. AGUA POTABLE

II.I.1. Con que servicio de agua potable cuenta?

Exclusivo de ENACAL	Solo Pozo Propio (Caudal estimado)	De ENACAL y Pozo Propio	Otro (especifique)

II.I.2. Desde hace cuanto, tiene conexión de agua potable de ENACAL?

II.I.3. Cuenta con servicio de Alcantarillado Sanitario de ENACAL? SI _____ No _____

II.I.4. Desde hace cuanto tiempo tiene conexión de Alcantarillado Sanitario de ENACAL?

II.I.5. Recibe abastecimiento de agua potable continuo, todo el dia de ENACAL? Si _____
No _____(En este caso) indique el horario : De las _____ a las
_____.

II.I.6. Recibe abastecimiento de agua potable de ENACAL todos los días : Si _____
No _____(En este caso indique los dias que recibe el servicio :

II.I.7. El agua de ENACAL llega con suficiente presión : Si _____ No _____

II.I.8. Tiene algún problema con la calidad del agua que recibe de ENACAL? Si _____ (Olor,____,
Color, ___, otro___) No._____

II.I.9. Almacena agua ? Si _____ No _____

II.I.10. En que la almacena ? baldes _____, barriles, _____ tanques
_____ (que capacidad tiene este tanque) _____(galones, litros, m³).

II.I.11 En que utiliza el agua ? Uso del personal _____ uso de visitantes_____ riego de
jardines_____
otros_____

II.I.12. Compra usted agua en botella? Si _____ Por que? _____
No _____

II.I.13. Cuanto paga por el agua embotellada
mensualmente?_____

II.I.14.Cuanto paga por el agua y alcantarillado sanitario al mes? _____

II.I.15. Este pago es : Caro_____, Barato_____, Justo_____
Injusto_____

II.I.16. Usa medidor? SI_____ No._____ Podemos ver el medidor? Si_____
No_____

Comentario del entrevistador en el caso de tener un medidor a la vista

II.I.17. Su medidor es leido regularmente por ENACAL? Si_____ (Que días pasa
_____, cada cuanto tiempo pasa ;_____
NO_____

II.I.18 Esta usted satisfecho(a) con la lectura del medidor que hace Enacal ? SI_____
No_____

II.I.19 Esta usted satisfecho(a) con la actitud del lector del Enacal? SI_____ No_____

II.I.20.. Con que frecuencia recibe usted las facturas de Enacal?

Recibe en _____ Paga en _____

II.I.21. Usted recibe visitas de parte del colector de Enacal para hacer sus pagos de agua ? Si_____
No_____

(Si contesta No) Indique en donde realiza sus pagos de agua

II.I.22. Que dias pasa? _____ Con que frecuencia lo (a) visita?_____

II.I.23. Esta usted satisfecho (a) con la actitud del colector (a) de Enacal? Si _____
NO_____ (En caso de ser no, indique por que ;
______).

II.I.24. Tiene algun problema o queja sobre el servicio de agua potable : Si _____ No_____
(En caso afirmativo, indique cual es el problema :

II.I.25 Tiene alguna sugerencia para mejorar el servicio de agua potable :

II.I.26. Estaría dispuesto a pagar más de lo que hoy paga si el servicio de agua potable fuese mejorado?

Si _____ No _____ ¿Cuánto C\$ por mes?

PREGUNTAS PARA LOS QUE NO UTILIZAN EL SRVICIO DE AGUA DE ENACAL

II.I.28 Porque no usa el servicio de agua de ENACAL: Muy caro _____ Servicio
Inestable _____, La calidad no es satisfactoria _____ Otro _____

II.I.29. Cuanto paga por el agua que consume por mes : _____ C\$

II.II SANEAMIENTO :

II.II.1 Cual es la forma de disposición de las aguas residuales? Alcantarillado Sanitario _____ Fosas
Sépticas _____ Sumidero _____ Cauce _____
Otro _____

II.II.2.¿Tiene algun problema con la disposición de las aguas residuales? Si _____
No _____

Que tipo de problema :

II.II.3. En el caso de contar con sistemas individuales para la disposición de las aguas residuales (fosa séptica, sumideros, etc) Con que frecuencia retira el lodo del sistema? _____

II.II.4. Quien realiza este tipo de trabajo _____

II.II.5. Cuanto paga por este trabajo? _____

II.II.6 Poseen unidades de pretratamiento antes de la descarga final de las aguas residuales? Rejillas-
_____ Desarenadores _____ Separadores de grasas y aceite _____
Otro _____

II.II.7 Tiene quejas del servicio de alcantarillado sanitario?

III.OBSERVACIONES

ANNEX 6E

Classification of Asentamientos

(1) Low Income Settlements Situation

Low income settlements in Managua shown in **Figure 6.E.1** are called asentamientos espontaneos, urbanizaciones populares, barrios marginales, etc. by different agencies. Recently ENACAL unified these names to “asentamientos” and applied subsidiary tariff 10 for these low income settlements. In this Study the name “asentamientos” is used for formal or informal (semi illegal, illegal) low income settlements.

There are different lists of asentamiento users in different sections of ENACAL, Users Cadastral Department, ANC Department, Asentamientos Department (VGA), as shown in **Table 6.E.1**. Evaluation of these data indicate duplications, omissions, different names, etc. Cadastral Department has asentamientos 50,816 users, ANC site investigation in September 2003, register 45,107 users and VGA registered 43,525 users. For first approximation, this Study adopts data of Cadastral Department, because the data are more complete and detailed.

Table 6.E.1 Managua City Asentamientos

District	No. Asentamientos	Cadastral Dept users	ANC verified users	VGA users
II	19	3,303	2,676	3,134
III	45	13,605	15,016	11,379
IV	13	3,952	3,106	4,061
V	37	12,990	10,797	10,585
VI	54	17,011	13,512	14,366
Total	168	50,861	45,107	43,525

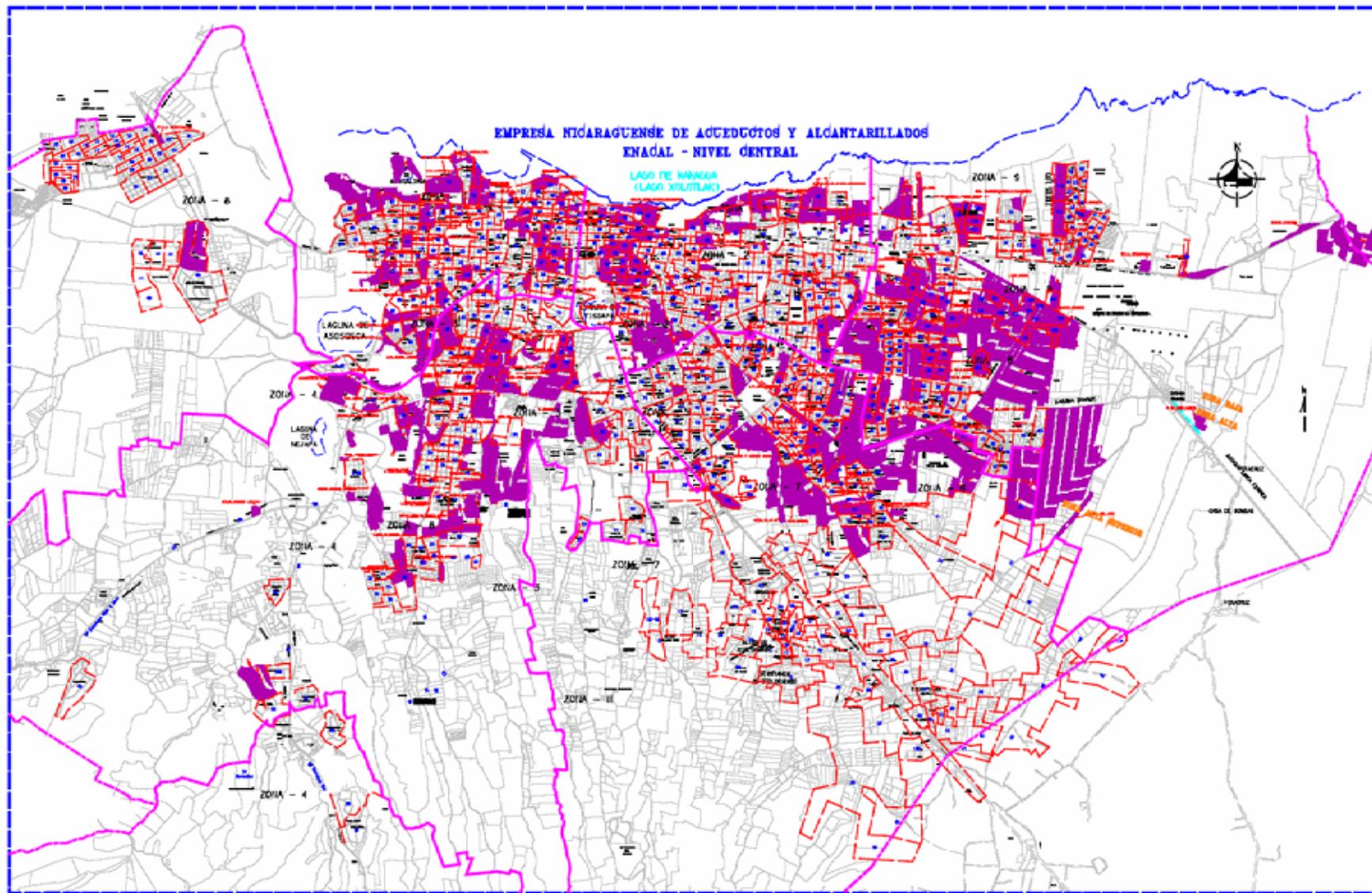
Source: ENACAL Cadastral Users:2004, ANC:2003, VGA:2004

(2) Water Supply Conditions in Asentamientos

- i) **District II and IV:** In these Districts asentamientos are situated in low areas of the city, water supply volume is abundant and supply problems are originated by maintenance of secondary distribution network, relatively small inversion in improvement in distribution.
- ii) **District III:** There are 4 asentamientos in Zone 4 with relatively good service condition, this zone is isolated in high areas with predominance of high income residences. Asentamientos located between Av. Juan Pablo and Suburban Road have hourly limited water supply. There were many social infrastructure projects in this area, assure stable water supply service and construction of sewerage system are the main needs of this zone.
- iii) Asentamientos located South of Suburban Road (part of Zona 3 and Zona 3), lacks in waters distribution facilities and the service is worse.
- iv) **District V:** Service condition in asentamientos located in Zone 5 is relatively good, small scale of improvement in supply facilities is needed. Asentamientos located between east of Las Colinas and west of Las Jaguitas Road, have limited hourly supply, assure stable water supply and construction of sewerage system are the main needs in this zone. Asentamientos located east of Las Jaguitas Road to north are relatively recent formation asentamientos lacks in basic social infrastructure including water supply and sewerage facilities.

Figure 6.E.1 Locations of Low Income Settlements (Asentamientos)

6E - 2



- v) **District VI:** There are a lot of Basic social infrastructure, including water supply facilities in Zona 1, Zona 2 and North part of zona 9 (north of Panamerican Highway, except new asentamientos near coast line of Lago Managua), improvement of supply facilities and sewerage services are the main needs of this area.. South sector of zona 9 have limited hourly water supply service, assure stable water supply and construction of sewerage system are the main needs in this zone. Zone 6 asentamientos lacks in basic social infrastructure including water supply and sewerage facilities.

(3) Proposed classification of asentamientos

- i) From water supply service point of view, asentamientos in Managua will be classified in 3 types: Type A: Relatively good service, Type B: With needs in stable supply service and sewerage facilities service. Type C: With needs in supply facilities construction
- ii) Asentamientos Type A: Basically they are distribute in lowland of old Managua city. Reconstruction work of 1972 earthquake was no complete and turn this area in asentamientos (semi informal barrios). Basic social infrastructure exists; but NRW is high, This type include Zona 4 asentamientos located in high income residential area. There are about 82 asentamientos of this type.
- iii) Asentamientos Type B: Basically there are distributed in medium elevation zones of Managua, many social infrastructure inversion was made in this sector in 80 and 90 decades. This area include middle land between South of Av Juan Pablo and South of Av. Suburbana in District III. Between East of Las Colinas and Las Jaguitas Road in District V and North Panamerican Highway of Zone 9 (District VI) .There are about 31 asentamientos of this type B.
- iv) **Asentamientos Type C:** This asentamientos are relatively recent formation and lack in all kind of basic social infrastructure, including water supply facilities, Located south of Av. Suburbana in District III (highland of south west of the city), East of Las Jaguitas Road in District V and South part (South of Sabana Grande Road) of Zone 6 in District VI. There are about 53 asentamientos of this Type.

Table 6.E.2 Proposed Classification of Asentamientos

District	II	III	IV	V	VI	Total	%
Type A	All	C Zona 4, North of Av. Juan Paulo	All	C. Zone 5	C Zone 9 (south of Panamerican), Zone 1 and Zone 2		
No Asent	17	17	13	12	23	82	49%
No Users	3,303	5,780	3,952	3,612	9,892	26,539	52%
Type B	None	Between North of Av Juan Pablo and South of Av Suburbana	None	Between East of Las Colinas and Las Jaguitas Road	Zone 9 (North of Panamerican Highway)		
No Asent	0	13	0	16	2	31	19%
No Users	0	5366	0	6,053	438	11,857	23%
Type C	None	South of Av Suburban and C Zone 8	None	East of Las Jaguitas Road	C Zona 6		
No Asent	0	15	0	9	29	53	32%
No Users	0	2,459	0	3,325	6,681	12,465	25%
Total Asenta	17	45	13	37	54	166	100%
Total Users	3,303	13,605	3,952	12,990	17,011	50,861	100%

TABLE 6.E.3 DISTRITO II ASENTAMIENTOS

No	Zona	Ruta 1	Ruta 2	Asentamiento	Users (ANC)	Users (VGA)	Users(Catastro)	Comption m3/month	Consumption m3/month/users	Presion Zone	Hours of Service	Macro Medition	Sewerage	Observation	Tariff
II-1	1	105		La Chureca (Acahualinca)	Inactivo			***		ZB		N			
II-2	1	106		Alfredo Silva	425	433	425			ZB	A	N	Y		76.94
II-3	1	107	108	Julio Buitrago	407	416	405	42,913.99	105.44	ZB	A	Y	Y		79.94
II-4	1	125		Rafael Angel Rios	210	212	211			ZB	A	N	N		55.60
II-5	1	127		Manchester	Inactivo			***		ZB		N			
II-6	1	137	138,139	Carlos Nuñez (los Martínez)	Inactivo	361	361	8,959.91	24.82	ZB	B	Y	N		55.60
II-7	3	104		Sur Este de la Embajada Americana (Batahola Sur I y II)	246	250	248			ZA	A	N	N	Bahahola Sur?	55.60
II-8	3	107		Manuel Olivares	158	194	158			ZA	A	N	N		55.60
II-9	3	109	114	Dinamarca	115	376	374	24,402.20	212.19	ZA	A	Y	Y		79.94
II-10	3	127		Daniel Chavarría	92	92	92	9,036.12	98.22	ZA/ZAS	C	Y	N		55.60
II-11	3	130		Bo. San José y Anexo Sn. Anton.	76	?	76			ZB	C	N			
II-12	3	138		Batahola Sur	267	702	267			ZA	C	N	N	Usuarios ? Repetido?	55.60
II-13	3	139		Anexo a Batahola Sur	181	?	181			ZA	C	N			
II-14	3	141		Anexo Boer	95	98	95			ZB	B	N	N		55.60
II-15	3	144		Costado Suroeste de Batahola Sur	254	?	254			ZA	C	N	N	Repetido?	55.60
II-16	3	164		Juan Emilio Menocal	150		156	3,919.14	26.13	ZA	C				
II-17	1	137	138	Anexo Las Brisas	Inactivo			5238.83		ZB		Y			
				Total	2,676	3,134	3,303								

A: 10 to 20 hours/day	ZB : Low Pressure Zone	Y: Yes
B: 6 to 8 hours/day	ZA : High Pressure Zone	N: No
C: 2 to 4 hours/day	ZAS: Super High Pressure Zone	
ZI	: Independent pressure Zone	

TABLE 6.E.4 DISTRITO III ASENTAMIENTOS

TABLE 6.E.5 DISTRITO IV ASENTAMIENTOS

No	Zona	Ruta 1	Ruta 2	Asentamiento	Users (ANC)	Users (VGA)	Users(Catas tro)	Comption m3/month	Consumpti on m3/month/ users	Presion Zone	Hours of Service	Macro Medition	Sewerag e	Observation	Tariff
IV-1	1	124		Shelim Shible	207	226	209			ZB	A	N	Y		76.94
IV-2	1	126		Hilario Sánchez	260	261	260			ZB	B	N	Y		76.94
IV-3	1	128		Benedicto Valverde	127	128	127			ZB	A	N	N		55.60
IV-4	1	129		Carlos Reyna	Inactivo	111	111			ZB	A	N	N		55.60
IV-5	1	130	132-133	Las Torres	436	449	446			ZB	B	N	N		55.60
IV-6	1	135		Villa Pedro Joaquín Chamorro	68	72	68			ZB	A	N	N		55.60
IV-7	2	133	103	Oscar Turcios	156	133	156				A	N	Y		76.94
IV-8	2	104	105	Francisco Meza	Inactivo	389	390	40,625.21			B	Y	Y		76.94
IV-9	2	110		Chico Pelón	82	88	88			ZB	A	N	N		55.60
IV-10	2	120	131, 121 to 128	Jorge Dimitrov	1,408	1,740	1,574	219,184.38	155.67	ZA	A	Y	Y	Include Largaespada?	76.94
IV-11	2	136		Enrique Smith (Frente al Dimitrov)	Inactivo	161	161			ZA	B	N	N		55.60
IV-12	5	154		Unión Soviética	301	303	301	50,329.53	167.21	ZA	A	Y	Y/N		55.6/76.94
IV-13	5	161		Parrales Vallejos	61	?	61			ZA		N			
			Total		3,106	4,061	3,952								

A: 10 to 20 hours/day	ZB : Low Pressure Zone	Y: Yes
B: 6 to 8 hours/day	ZA : High Pressure Zone	N: No
C: 2 to 4 hours/day	ZAS: Super High Pressure Zone	
	ZI : Independent pressure Zone	

TABLE 6.E.6 DISTRITO V ASENTAMIENTOS

TABLE 6.E.7 DISTRITO VI ASENTAMIENTOS

No	Zona	Ruta 1	Ruta 2	Asentamiento	Users (ANC)	Users(VGA)	Users(Cat astro)	Compton m3/month	Consump m3/month/user s	Presion Zone	Hours of Service	Macro Medition	Sewerage	Observation	Tariff
VI-1	1	122		14 de Septiembre	116	119	116			ZB	B		Y/N		55.60/76.94
VI-2	1	123		Anexo La Primavera	794	796	796	9,937.18	12.52	ZB	B	Y	N		55.60
VI-3	2	132	133/134/135/136/137/(6)132	Carlos Marx	616	896	769	6,191.95	10.05	ZA	A	Y	N		55.60
VI-4	6	108-114	116-127	Laureles Sur (Arnoldo Alemán)	292		746	56,039.25	191.92	ZA				Usuarios??	
VI-5	6	124	125/126/137/(9)177/178/179	Concepción de María	543	1,032				ZA			N		55.60
VI-6	6	142		Milagro de Dios	190	142	195	6,759.54	35.58	ZAS		Y	N		55.60
VI-7	6	150		Jerico	174	150	174			ZA	B		N		55.60
VI-8	6	161	184/186/188/190	Georgino Andrade	1079	1,084	1,079	54,637.09	50.64	ZA	A	Y	N		55.60
VI-9	6	162		Villa Japón	47	47	47			ZA	C		N		55.60
VI-10	6	164		Coop. Manolo Morales	228	226	230			ZAS	B		N		55.60
VI-11	6	165		Villa Bulgaria	290	165	290			ZA	B		N		55.60
VI-12	6	169		Villa Argentina (Niños de Ayapal)	238	259	238			ZA	C		Y		76.94
VI-13	6	170		Anexo a las Américas 4	23		23			ZA					
VI-14	6	172		Berling (Laureles Norte)	149					ZA	A		N	Repetido?	55.60
VI-15	6	180		Villa Francia	134	134				ZA	A		N		55.60
VI-16	6	181		La Tejera II Etapa	203					ZA					
VI-17	6	183		La Tejera	223					ZA					
VI-18	6	187		Anexo Villa Austria	217	217	217			ZA	A		N		55.60
VI-19	6	189		Pedro Alaniz Palacios	165	165	165	5,406.14	32.76	ZA	C	Y	N		55.60
VI-20	6	199		Villa Canada	158	158	158	8,570.70	54.24	ZA	C	Y	N		55.60
VI-21	6	200		Anexo Carlos Nuñez	240					ZB					
VI-22	6	201		(Ana Maria)	96	96	96			ZA	C		N		55.60
VI-23	6	207	208	Anexo Primero de Mayo	367	367	367	746.75	2.03	ZA	B	Y	N		55.60
VI-24	6	209		Bo. Alemania	117	117	117			ZA	C		N		55.60
VI-25	6	210	211	8 de Marzo	397	397	397			ZA	B		N		55.60
VI-26	6	212		Anexo Villa Fraternidad	156	156	156			ZA	A		N		55.60
VI-27	6	213		14 de Febrero	163	163	163			ZA	A		N		66.60
VI-28	6	215	216	El Paraiso (Laureles Norte)	428			45,865.89	107.16	ZA		Y	N		55.60
VI-29	6	215	216/217/218/172/180/183	Laureles Norte (Franklin Hockson/El Paraiso/Berlin)		1,105	1,457			ZA	A		N		55.60
VI-30	6	232		Villa Feliz	158	156	158			ZA			N		55.60
VI-31	6	233		19 de Febrero	140		141			ZA					
VI-32	9	95		Francisco Aguilar	167					ZB					
VI-33	9	111		German Pomares	97	97	97			ZB	B	Y			76.94
VI-34	9	113		Jorge Casally	261	237	261			ZB	B	Y			76.94
VI-35	9	114		Carlos Nuñez	18	542	542			ZB	A	Y			76.94
VI-36	9	115	B-15		539	541	541	4,416.00	8.19	ZB	A	Y	Y		76.94
VI-37	9	116	117	Waspan Sur(Anexo Waspan Sur)	209	286	209			ZB	A				76.94
VI-38	9	117		(Waspan Sur)	77		77			A					
VI-39	9	118	119/120	Waspan Norte	541	542	541	64,509.09	119.24	ZB	A	Y	N		55.60
VI-40	9	121		Camilo Chamorro	97	100	97			ZB	B		N		55.60
VI-41	9	122		Monte Fresco	134	110	135			ZB	B		N		55.60
VI-42	9	123		Jorge Salazar	271	271	271			ZB	B		N		55.60
VI-43	9	128		El Rodeito	131	131	131			ZB	B		N		55.60
VI-44	9	129		Villa Democracia	90		90	3,960.77	44.01			Y			
VI-45	9	130		Walter Ferreti (Waspan Norte)	279	278	279	18,995.73	68.09	ZB	A	Y	N		55.60
VI-46	9	131		San Cristobal (carretera norte)	91	101	93			ZB	B		N		55.60
VI-47	9	132		Anexo Camilo Chamorro	95	95	95			ZB	B		N		55.60
VI-48	9	133	134/135	Villa Israel	426	274	426	11,582.69	27.19	ZA	C	Y			
VI-49	9	136		Bo. Canada (Por el Mayoreo)	227	227	227			ZB	B		N		55.60
VI-50	9	137		Anexo Concepción de María	187		938			ZB	A		N		55.60
VI-51	9	95	100/110235-237,240-242	Villa Reconciliación Norte	1286	2,213	3,035	14,621.21	11.37	ZA	A	Y	N		55.60
VI-52	9	140	141/142	Hugo Chávez		174	273			ZB	B		N		55.60
VI-53	2	134		Reparto Vallarta, Contiguo a Tona	81		291	7543.55		ZB		Y		(1)134?	
VI-54	6	221		Camino al Rio 1ra Etapa	67		67			ZB					
				TOTAL		13,512	14,366	17,011							