Detailed Report for Pump: PMP-3(D-Pump)

Scenario Summary	
Scenario	Improvement of Nindiri Area
Active Topology Alternative	Base-Active Topology
Physical Alternative	Base-Physical
Demand Alternative	Base-Demand
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
	<None>	Roughness	<None>

Geometric Summary			
X	1,087.65 m	Upstream Pipe	P-7
Y	3,825.71 m	Downstream Pipe	P-8
Elevation	201.00 m		

Pump Definition Summary	
Pump Definition	Distribution Pump

Initial Status			
Initial Pump Status	Off	Initial Relative Speed Facto	1.00

Simple Controls

Controls
On at time from start 6.00
Off at time from start 11.0(

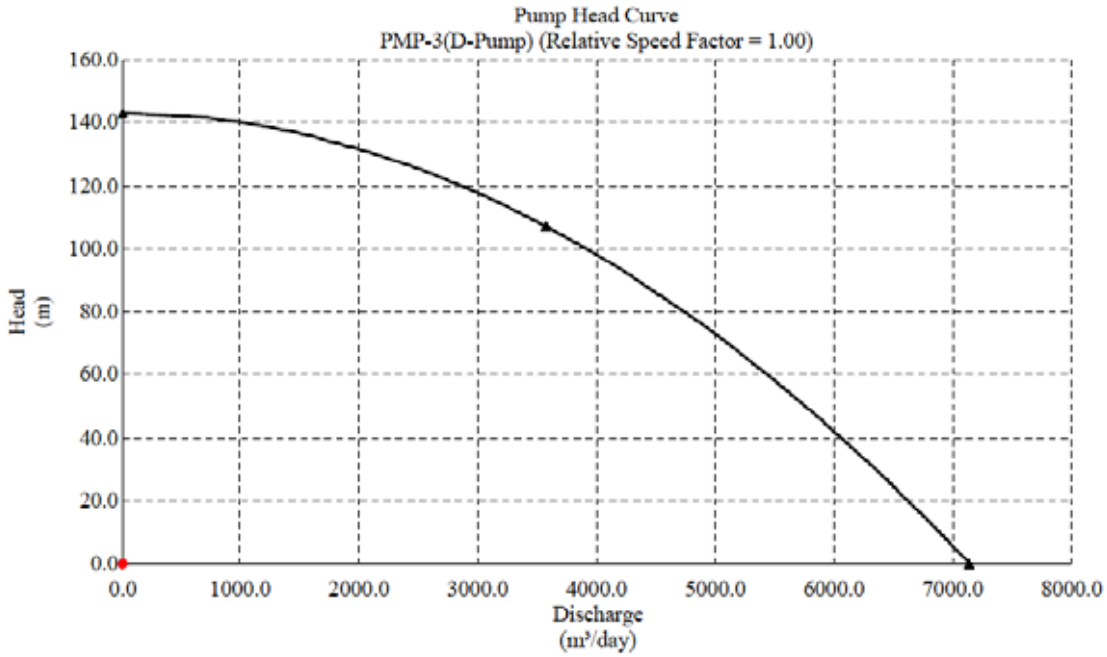
Calculated Results Summary

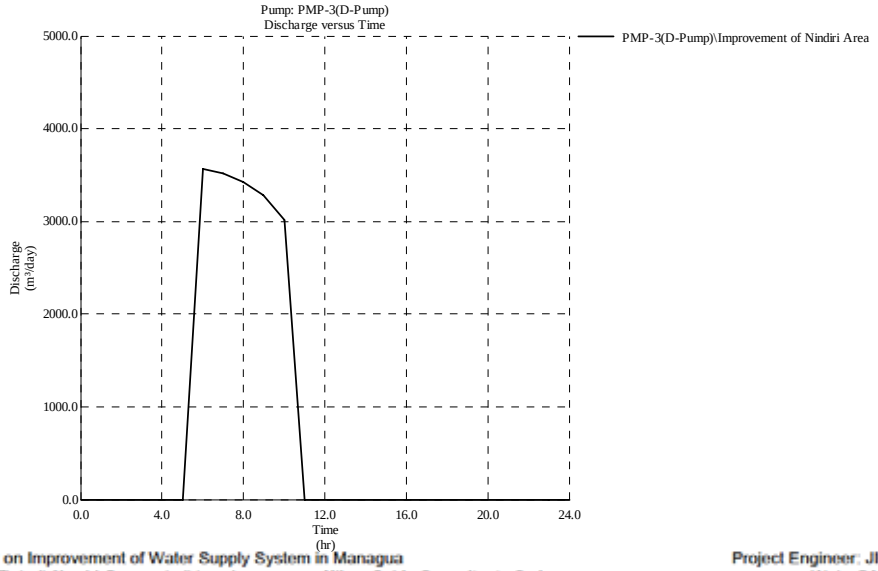
Time (hr)	Control Status	Intake Pump Grade (m)	Discharge Pump Grade (m)	Discharge (m³/day)	Pump Head (m)	Relative Speed	Calculated Water Power (kW)
0.00	Off	!04.50	327.08	0	0.00	1.00	0.00
1.00	Off	!05.06	327.64	0	0.00	1.00	0.00
2.00	Off	!05.62	326.26	0	0.00	1.00	0.00
3.00	Off	!06.16	320.46	0	0.00	1.00	0.00
4.00	Off	!06.64	329.21	0	0.00	1.00	0.00
5.00	Off	!06.78	292.99	0	0.00	1.00	0.00
6.00	On	!06.35	313.56	3,561	07.21	1.00	43.25
7.00	On	!05.67	313.71	3,519	08.04	1.00	43.07
8.00	On	!05.02	314.89	3,424	09.87	1.00	42.62
9.00	On	!04.41	317.04	3,277	12.63	1.00	41.82
10.00	On	!03.87	321.12	3,014	17.25	1.00	40.04
11.00	Off	!03.46	300.93	0	0.00	0.00	0.00
12.00	Off	!03.19	305.16	0	0.00	0.00	0.00
13.00	Off	!02.99	302.91	0	0.00	0.00	0.00
14.00	Off	!02.76	306.05	0	0.00	0.00	0.00
15.00	Off	!02.57	311.29	0	0.00	0.00	0.00
16.00	Off	!02.47	313.31	0	0.00	0.00	0.00
17.00	Off	!02.40	320.24	0	0.00	0.00	0.00
18.00	Off	!02.46	327.55	0	0.00	0.00	0.00

Detailed Report for Pump: PMP-3(D-Pump)

Calculated Results Summary

Time (hr)	Control Status	Intake Pump Grade (m)	Discharge Pump Grade (m)	Discharge (m³/day)	Pump Head (m)	Relative Speed	Calculated Water Power (kW)
19.00	Off	302.66	330.10	0	0.00	0.00	0.00
20.00	Off	302.91	290.30	0	0.00	0.00	0.00
21.00	Off	303.19	298.88	0	0.00	0.00	0.00
22.00	Off	303.53	312.56	0	0.00	0.00	0.00
23.00	Off	303.97	323.61	0	0.00	0.00	0.00
24.00	Off	304.50	327.08	0	0.00	0.00	0.00





Detailed Report for Pressure Pipe: P-2

Scenario Summary	
Scenario	Improvement of Nindiri Area
Active Topology Alternative	Base-Active Topology
Physical Alternative	Base-Physical
Demand Alternative	Base-Demand
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
	<None>	Roughness	<None>

Pipe Characteristics			
Material	PVC	Hazen- Williams C	110.0
Diameter	250.0 mm	Minor Loss Coefficient	0.00
Check Valve?	false	Length	4,100.00 m
From Node	J-3	To Node	J-4

Elevations			
From Elevation	201.00 m	To Elevation	270.00 m

Initial Status	
Initial Status	Open

Calculated Results Summary

Time (hr)	Control Status	Discharge (m³/day)	Velocity (m/s)	Upstream Structure Hydraulic Grade (m)	Downstream Structure Hydraulic Grade (m)	Calculated Friction Headloss (m)	Calculated Minor Headloss (m)	Pressure Pipe Headloss (m)	Headloss Gradient (m/km)
0.00	Open	3,890	0.92	311.45	291.55	19.90	0.00	19.90	4.85
1.00	Open	3,890	0.92	312.01	292.10	19.90	0.00	19.90	4.85
2.00	Open	3,890	0.92	312.57	292.66	19.90	0.00	19.90	4.85
3.00	Open	3,890	0.92	313.11	293.20	19.90	0.00	19.90	4.85
4.00	Open	3,890	0.92	313.59	293.68	19.90	0.00	19.90	4.85
5.00	Open	3,890	0.92	313.73	293.83	19.90	0.00	19.90	4.85
6.00	Open	3,890	0.92	313.32	293.42	19.90	0.00	19.90	4.85
7.00	Open	3,890	0.92	312.65	292.74	19.90	0.00	19.90	4.85
8.00	Open	3,890	0.92	311.99	292.09	19.90	0.00	19.90	4.85
9.00	Open	3,890	0.92	311.38	291.47	19.90	0.00	19.90	4.85
10.00	Open	3,890	0.92	310.83	290.93	19.90	0.00	19.90	4.85
11.00	Open	3,890	0.92	310.41	290.51	19.90	0.00	19.90	4.85
12.00	Open	3,890	0.92	310.15	290.24	19.90	0.00	19.90	4.85
13.00	Open	3,890	0.92	309.94	290.04	19.90	0.00	19.90	4.85
14.00	Open	3,890	0.92	309.71	289.80	19.90	0.00	19.90	4.85
15.00	Open	3,890	0.92	309.52	289.62	19.90	0.00	19.90	4.85
16.00	Open	3,890	0.92	309.42	289.52	19.90	0.00	19.90	4.85
17.00	Open	3,890	0.92	309.35	289.45	19.90	0.00	19.90	4.85
18.00	Open	3,890	0.92	309.41	289.50	19.90	0.00	19.90	4.85
19.00	Open	3,890	0.92	309.61	289.70	19.90	0.00	19.90	4.85
20.00	Open	3,890	0.92	309.86	289.95	19.90	0.00	19.90	4.85
21.00	Open	3,890	0.92	310.15	290.24	19.90	0.00	19.90	4.85
22.00	Open	3,890	0.92	310.49	290.58	19.90	0.00	19.90	4.85
23.00	Open	3,890	0.92	310.92	291.02	19.90	0.00	19.90	4.85
24.00	Open	3,890	0.92	311.45	291.55	19.90	0.00	19.90	4.85

Detailed Report for Pump: PMP-4(T-Pump)

Scenario Summary	
Scenario	Improvement of Nindiri Area
Active Topology Alternative	Base-Active Topology
Physical Alternative	Base-Physical
Demand Alternative	Base-Demand
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
	<None>	Roughness	<None>

Geometric Summary			
X	1,175.98 m	Upstream Pipe	P-9
Y	3,729.79 m	Downstream Pipe	P-10
Elevation	201.00 m		

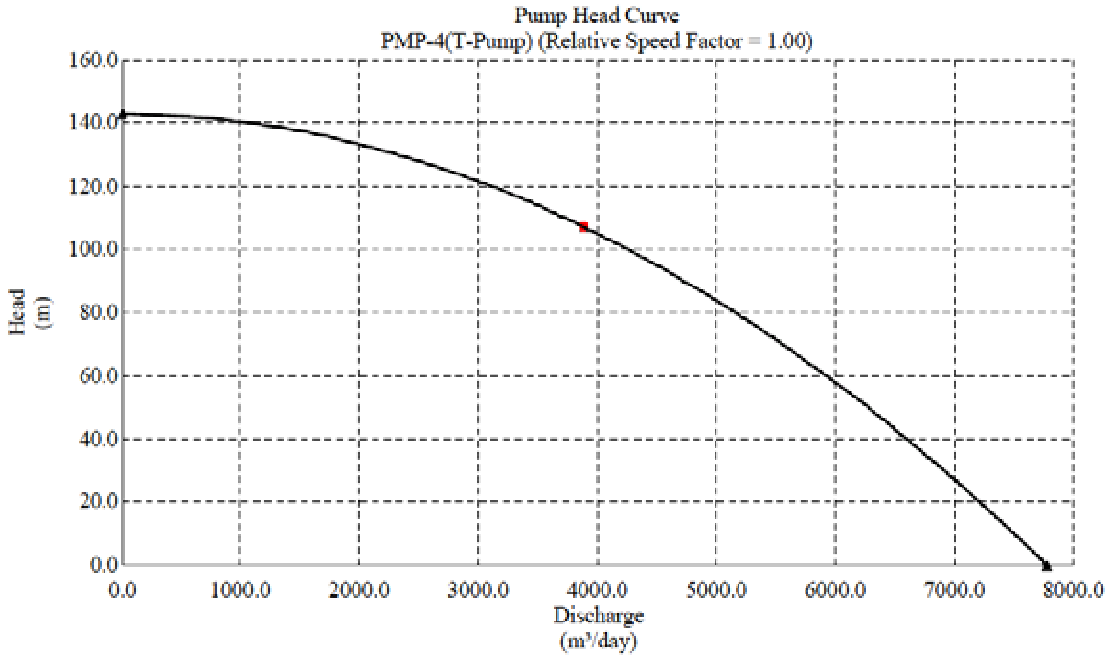
Pump Definition Summary	
Pump Definition	Transmission Pump

Initial Status			
Initial Pump Status	On	Initial Relative Speed Facto	1.00

Calculated Results Summary

Time (hr)	Control Status	Intake Pump Grade (m)	Discharge Pump Grade (m)	Discharge (m³/day)	Pump Head (m)	Relative Speed	Calculated Water Power (kW)
0.00	On	304.48	311.48	3,890	07.00	1.00	47.16
1.00	On	305.03	312.03	3,890	07.00	1.00	47.16
2.00	On	305.59	312.59	3,890	07.00	1.00	47.16
3.00	On	306.13	313.13	3,890	07.00	1.00	47.16
4.00	On	306.61	313.61	3,890	07.00	1.00	47.16
5.00	On	306.76	313.76	3,890	07.00	1.00	47.16
6.00	On	306.34	313.34	3,890	07.00	1.00	47.16
7.00	On	305.67	312.67	3,890	07.00	1.00	47.16
8.00	On	305.01	312.01	3,890	07.00	1.00	47.16
9.00	On	304.40	311.40	3,890	07.00	1.00	47.16
10.00	On	303.86	310.86	3,890	07.00	1.00	47.16
11.00	On	303.44	310.44	3,890	07.00	1.00	47.16
12.00	On	303.17	310.17	3,890	07.00	1.00	47.16
13.00	On	302.97	309.97	3,890	07.00	1.00	47.16
14.00	On	302.73	309.73	3,890	07.00	1.00	47.16
15.00	On	302.55	309.55	3,890	07.00	1.00	47.16
16.00	On	302.45	309.45	3,890	07.00	1.00	47.16
17.00	On	302.38	309.38	3,890	07.00	1.00	47.16
18.00	On	302.43	309.43	3,890	07.00	1.00	47.16
19.00	On	302.63	309.63	3,890	07.00	1.00	47.16
20.00	On	302.88	309.88	3,890	07.00	1.00	47.16
21.00	On	303.17	310.17	3,890	07.00	1.00	47.16
22.00	On	303.51	310.51	3,890	07.00	1.00	47.16
23.00	On	303.95	310.95	3,890	07.00	1.00	47.16
24.00	On	304.48	311.48	3,890	07.00	1.00	47.16

Detailed Report for Pump: PMP-4(T-Pump)



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.8
Strengthening of ENACAL's Institutional Capacity

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.8
Strengthening of ENACAL's Institutional Capacity

Table of Contents

8.1 OBJECTIVES

8.1.1 National Water & Sanitation Sector

ENACAL must be able to operate as a viable and sustainable entity for the provision of water & sanitation services within the national institutional and legal framework of the sector. ENACAL will be required to carry out its duties in accordance with GRN policies and strategies being developed by CONAPAS, and within the regulations as laid down from time to time by IAA the successor to INAA under SISEP.

The overall objective at National level is therefore:

- To Strengthen ENACAL's Institutional Capacity in accordance with the requirements of the sustainable development of national institutional and legal frameworks within the water and sanitation sector.

8.1.2 ENACAL as a National Water Service Provider

As a service provider ENACAL must have the institutional capacity to extricate itself from its current poor operational and financial situation, to return all of its systems to normal functions, to modernize, and to develop the capacity to be self sustaining in a more autonomous and commercial environment, whilst rehabilitating and expanding its services.

The overall objective for ENACAL is therefore:

- To commence and carry out a Program of Modernization and Plan of Institutional Strengthening (PFI).

This strengthening should concentrate on:

1) The Commercial System (Registration of Users, metering, billing & collection)
2) Computer Technology and Systems for Registration, Information and Communication, including:
    - Registration of Users, Metering, Billing & Collection
    - Accounting, Finances and Fixed Assets
    - Supplies and Inventory
    - Planning and Human Resources
    - Integration of the Commercial System
    - Customer Care
3) Operating Systems, including:
    - Reduction of non-revenue water
    - Reduction of physical losses
    - Cadaster of networks
    - Macro-sectoring and micro-sectoring
    - Improved operating efficiency and levels of service
4) Production of a long term Management Plan for Development of ENACAL, to strengthen and improve the company in the areas of:
    - Overall operation of the Company
    - Technical, commercial, management and financial
    - The financial results to move toward complete and sustainable self financing
    - Human Resources, training and technology transfer

8.1.3 ENACAL (Managua)

This study of ENACAL's operations in Managua shows that a sound financial and managerial base is required to allow for the transformation to an efficient utility. As mentioned elsewhere in this report, the overall objective of this long term improvement plan is therefore:

- To transform ENACAL Managua into an efficient utility with a degree of financial stability and managerial autonomy.

This may be achieved by:

1) A substantial tariff increase followed by restructuring of the tariff
2) Physical improvement works to the water transmission and distribution systems in the short term
3) Measures to improve ENACAL's financial management by increased revenue collection
4) Social and Institutional approaches to protect ENACAL's interests and reduce potential risks

Institutional reforms are required to assist with the following objectives:

- Reducing leakage and water losses
- Obtaining accurate data by area on distribution, consumption and water loss volumes.
- Updating and completing the register of customers
- Strengthening ENACAL's capability in meter reading, billing and collection
- Establishing a new section specifically designed to integrate the roles of reducing leakage, illegal connections, meter related losses, user none payment and receivables. In addition improving cost recovery in low-income settlements
- Establishing a completely independent financial account separated into water and wastewater accounts for Managua only
- Establishing an Ad Hoc Committee specifically designed to protect the interests of ENACAL and reduce potential risks
- Organizing and convening stakeholders meetings to disseminate the negative impacts of these social and institutional problems on ENACAL's water service operations in Managua

8.2 ENACAL'S EXISTING INSTITUTIONAL CAPACITY AND MAJOR WEAKNESSES

8.2.1 National Water and Sanitation Sector

The background to the current situation of ENACAL needs to be understood to review its capacity as an institution within the national water and sanitation sector.

The Institutional responsibility for all aspects of water supply was INAA. However, under the State Reform Strategy in 1998, there were far reaching reforms of the institutional framework for water supply and wastewater disposal systems in the country, creating:

- ENACAL As the Operator
- INAA As the Regulator (now succeeded by IAA under SISEP)
- CONAPAS As the Leader of the Sector for Policy and Strategy

ENACAL is required to work closely with IAA (formerly INAA) and CONAPAS and to integrate its operations with the health and environmental sectors and to work with many other entities for its nationwide operations.

ENACAL has its basis in Law No. 290, “Law of Organization, Jurisdiction and Procedures of the Executive Power", and those that have implications in the sector of water and sanitation are the Ministries of Health (MINSA); Finance and Public Credit (MHCP);Development, Industry and Trade (MIFIC); External Relations (MINREX) and; Environment and Natural Resources (MARENA) and among the Decentralized Entities, the Central Bank; the Social Investment Fund for Emergencies (FISE); the Nicaraguan Institute for Territorial Studies (INETER); the Nicaraguan Institute of Energy (INE) and the “Intendencia” of Aqueducts and Sewer Systems (IAA).

The “Intendencia” of Aqueducts and Sewer Systems (IAA) recently succeeded the Nicaraguan Institute of Aqueducts and Sewer Systems (INAA), under law No. 511 of 20th January 2005. This new law created the autonomous state organization “Superintendencia” of Public Services (SISEP) with administrative, functional and financial control of the “Intendencias” of former INAA, INE, TELCOR and a new “Intendencia” for Care of the Users and Customers of the three public service providers.

The Superintendent of SISEP and the Intendents of these Public Services are required to have relevant qualifications. They will be selected from a list prepared by the State President or the Deputies of the National Assembly for approval by not less than 60% of the National Assembly. There will be a Board of Directors of SISEP comprised of the Superintendent, who will be the board president, and the four Intendents.

Law No. 275 of 1998, the law of reform of INAA, has been revoked. However, among the items under its jurisdiction this new “Intendencia” retains the role of sector regulator and the powers to regulate, standardize and control the quality of the provision of services, as well as the economic-financial sustainability via tariffs, for the system of potable water and sanitary sewer systems, and also takes on the responsibility to develop the process of granting and award of concessions for public water services in the sector from the call for bids until the issue of the concession agreement.

Under the Intendencia for Care of customers and Users, non-profit making organizations of consumers, users and customers have the right to be represented before the Superintendencia of Public Services in accordance with the new law and its regulations.

A major weakness in the coordination and cooperation between ENACAL and INAA has been the inability of ENACAL to provide a satisfactory level of service to all of its customers and consequently the setting of a viable tariff by INAA under political influences and public opposition, mainly due to misunderstandings created by the lack of communication and information on the matter. This has prevented ENACAL from realizing an income commensurate with its costs.

CONAPAS, the National Commission of Potable Water and Sanitary Sewer Systems was created under Decree No. 51/98 and its modifications, as an inter-institutional organization to the Executive Power, to formulate the objectives, policies, strategies and general guidelines of the sector for potable water and sewerage, as well as that of indicative planning, with the purpose of promoting the development of these services to the population.

This organization has only recently become operative with the passing of Ordinance N° 75-2003 of 10 November 2003, preparing the restructuring of CONAPAS, with the Presidency of the Commission passing to SECEP and the incorporation of FISE in addition to INAA, ENACAL, INETER, MINSA, MARENA.

The Executive Secretariat was created in April 2004, and a Technical Committee was appointed comprising of senior representatives of the seven Ministries comprising the board of CONAPAS. Subsequently, the organization was temporarily strengthened with the appointment of six local consultants to produce the document on Sectoral Strategies for Water supply and Sanitation Systems which was completed by December 2004 and accepted by the CONAPAS Board.

The document reflects the commitment of GRN at the Millennium Summit to reduce by half by 2015 the percentage of the population without access to water and sanitation as per the Strengthened Growth and Poverty Reduction Strategy (SGPRS) and the National Development Plan (PND).

It is recognized that a good infrastructure of water supply and sanitation leads not only to social development, but also economic development. It is also recognized that for efficient management of the provision of services it is essential that the system is physically, operationally and financially self-sustainable and that with a strengthened legal and institutional framework, an environment can be created to promote investments for the efficient operation of the sector.

As well as following the concepts set down in the SGPRS, and the PND, the strategy follows the Environmental Policies, the National Plan of Health, the Policies of Decentralization and of Civic Participation. The Sectoral Strategy Document contains the following:

- The conceptual framework in which the strategies are developed including the current organization of the sector
- The basic principle policies in the aspects of control and regulation, decentralization, management of the services, financing, tariff and subsidies, protection of health and the environment, vulnerability in the face of emergencies, communication with the population and aspects of community participation and gender
- The objectives, the current situation, the visions for the years 2009 and 2015 and the strategic limits and work required to reach the objectives
- An analysis of the areas of special intervention which are the areas of high poverty, the Autonomous Regions of the Atlantic, the productive and tourist conglomerates, the special urban towns and the hydrographical basins and bodies of water

Included as attachments are 9 matrixes corresponding to the aspects above mentioned describing in more detail the activities and initiatives, with a timetable for execution and the broad investment requirements.

A possible weakness is that although CONAPAS has some financial support from GRN to create the departments of Information Systems and Monitoring & Evaluation it does not have a budget for drawing up the Sectoral Strategic Plan in 2005. The sum of US$ 386 900.00 is being sort from donors to finance this.

8.2.2 ENACAL as a National Water Service Provider

Under Law No. 276, the Nicaraguan Company of Aqueducts and Sanitary Sewer systems (ENACAL) was formed to provide the service of potable water, collection, treatment and disposal of waste waters, for the urban and rural areas under its jurisdiction. As a government enterprise of the Nicaraguan State it is organized on the basis of the Political Constitution of the State as the supreme law. The Board of Directors has seven members nominated by the State President who also designates the President, Vice President and Secretary from the members.

This institution has its basis in Law No. 290, “Law of Organization, Jurisdiction and Procedures of the Executive Power", and those that have implications in the sector of water and sanitation are the Ministries of Health (MINSA); Finance and Public Credit (MHCP);Development, Industry and Trade (MIFIC); External Relations (MINREX) and; Environment and Natural Resources (MARENA) and among the Decentralized Entities, the Central Bank; the Social Investment Fund for Emergencies (FISE); the Nicaraguan Institute for Territorial Studies (INETER); the Nicaraguan Institute of Energy (INE) and the Nicaraguan Institute of Aqueducts and Sewer system (INAA, now IAA under SISEP).

This Law No. 276 “Creates ENACAL as an entity of commercial business, with legal persons and its own equity, of indefinite duration and with the full ability to acquire rights and to contract obligations for the purpose of carrying out all the operational and commercial functions that were carried out by the Nicaraguan Institute of Aqueducts and Sewer Systems (INAA, now IAA). To complete such an objective, Article 4 defines: “ENACAL” as being able to perform and execute all the acts, and civil or commercial contracts, that are necessary, convenient, incidental, and conducive to this objective

ENACAL provides services in the whole Nicaraguan territory, with the exception of some places that are operated locally (Jinotega and Matagalpa); specifically it provides services to 181 cities and towns with a total of 410,000 registered users approximately to May 2004, of which Managua represents 50%, León and Chinandega approximately (ENACAL West) 16% of the domestic connections and the rest 34% of the domestic connections. In terms of Billing, out of a total of C $650 millions for 2003 at the national level, Managua represents 60%, ENACAL West 16% and the rest 24% (excluding Jinotega and Matagalpa).

At the moment ENACAL has approximately 2,800 employees, with an average length of service of 8.15 years, for a population served with potable water of 2.5 millions inhabitants out of the total population of Nicaragua of 5.3 millions, at an average occupancy rate of 5.31 persons per household.

Since the far reaching reforms of 1998, and the subsequent suspension of the granting of concessions for the provision of water services and decentralization to independent regional companies, ENACAL remains a state entity for the provision of services to the public, without further reference to it being a commercial entity as previously described in Law No. 276.

ENACAL is organized under a Board of Directors and an Executive President, and the General Manager, now supported by an Assistant to the Executive President, is responsible for eight management centers (departments) as listed below:

- Planning & Development of Human Resources
- Operations
- Projects & Investments
- Environmental Management
- Commercial
- Organization & Systems
- Administration & Finance
- Energy

In common with many other countries where water services are provided by central government nationally to both urban and rural communities, major difficulties can develop over the years resulting in poor service coverage and inequality of coverage, aging network systems and plant, Excessive employee numbers, lack of preventative maintenance etc. ENACAL has many of the negative features of state run national water utilities in developing countries.

All of this leads to high water losses, high financial losses due mainly to the size of the non-revenue water account, poor service to the community, and reliance on external funding for rehabilitation and expansion of services.

As an institution, ENACAL has major weaknesses with severe problems in its operating system, commercial system, and financial system. Among others, there are currently no short, medium or long term plans; systems information is poor; the infrastructure and the pumping plant etc. is old and lacks preventative maintenance; employee numbers are high; illegal connections are many; customer records are inadequate; metering is inadequate; billing and collection is poor; physical losses and non-revenue water is high; energy costs are high. ENACAL does not have the capacity to function efficiently and its financial position is precarious.

Currently, a plan exists to improve the institutional capacity of ENACAL. Following discussions between the government of Nicaragua and IDB/KfW in February 2004, IDB produced a Management Plan for Development for the ENACAL program of modernization (March 2004) which includes a plan for institutional strengthening (PFI) within ENACAL.

To achieve this aim, ENACAL envisages the hiring of the services of a company with wide experience in the operation and management of water services and sewer systems, in particular in developing countries, with experience in providing advice on management in commercial areas, computer technology, operation and administration, including the training of personal and the development of a Managerial Plan for Development (PED).

Accordingly, ENACAL produced a Bid Document to select a qualified international company in the operation of water services, sewerage systems and sanitation, to execute this Contract of Consultancy Services financed by (IDB) through Loan No. 1049/SF-NI, with some funding from OPEC for the financing of a program of expansion and rehabilitation of water services and sewer systems in settlements.

The IDB loan totals US $13.9 millions, of which US $11.6 millions will be dedicated to finance the Service Contract and its investments in equipment. The contract is for a period of 5 years and covers all the regions where ENACAL provides services, and by decision of the President of the Republic will concentrate attention on the function of the urban area of Nicaragua (excluding the areas covered administered by the independent companies of Matagalpa and Jinotega).

The IDB loan for the Services Contract includes the necessary investments for:

- Renovation of systems and hardware for computers
- Reduction of non-revenue water
- Remuneration for the Services Contract (fixed remuneration)

The extent of the services includes advice to ENACAL, in the entire area of its responsibility, that is to say Managua, regional districts and departments and to all the key tasks in the provision of services.

The objectives of the Contract are to support in the short-term the modernization of ENACAL with a program of managerial strengthening that allows it to implement high-priority work, to improve the rendering of services, the operational efficiency and the financial income, with integral and sustainable solutions. The program of managerial strengthening will include:

- Provision of consultancy and managerial technical advice in all the areas of the company.

- Design, implementation and management (management of the Commercial unit of ENACAL).
- Design and complete renovation of the computer system including supply of hardware.
- Production of a Managerial Plan of Development for the long term for ENACAL.

The application of the program of managerial strengthening is intended to give the following minimum results:

- To strengthen the operation of the company
- To improve the technical, commercial, and management indicators for finance and operation.
- To improve the financial results so that ENACAL can operate in a sustainable manner and finance its investments.
- To guarantee the sustainability of the improvements by the transfer of knowledge (" know-how ") based on a program of training.

8.2.3 ENACAL Managua

ENACAL Managua is mainly integrated into the ENACAL national framework except for some designated sections dealing only with matters related to Managua. Among other things, it has proved difficult to draw up a coherent organization chart, and abstract financial figures, and split these into water and sanitation costs and revenue for the Managua study area.

Managua which has 50% of the registered ENACAL connections and 60% of the billing has all of the weaknesses of the national organization and other unique problems particularly with its large amount of settlements (asentamientos). In particular there is no structured plan of action for the asentamientos where 30% of Managua's population resides, wastage of water is at its highest, and water consumption is well above that intended or required as a basic necessity by the subsidized tariff in a system of un-metered connections.

Managua has a complex system of water sources, mainly wells, and pumping arrangements into zones designated by elevation with interconnected transmission and distribution systems. As the Capital City of Nicaragua, Managua has the major share of commercial and industrial development with no effective regulation for the use of ground water by the private sector within its area of supply. In addition the sources are poorly protected from pollution by filling stations and other industrial chemicals.

The lack of regulations for residential development creates problems of supply in addition to the massive wastage of water and loss of revenue in its supply system to the asentamientos. The Regulation for Services to Consumers issued by INAA recognizes the minimum "lifeline" consumption for a family to be $10m^3$ per month whereas asentamiento none metered connections are billed for $26m^3$/month, but field tests show that consumption may be as high as $55m^3$ (including losses), all of which is charged at the subsidized rate of C$ 55.60/month equivalent to C$ 1.00/m^3 of total water supplied, the average tariff charge for water in Managua being C$ 5.80/m^3.

Within the institution of ENACAL the Commercial Department plays a major role in coordinating meter reading, billing and collection, and reduction of non-revenue water (NRW). The department is sub-divided into four major "Vicegerencias" which in turn control numerous smaller sections with diverse responsibilities. This department has the task of dealing with all commercial matters for the whole of ENACAL's supply areas throughout Nicaragua leading to a complex matrix of sub-departments. The buildings are old, the personnel scattered, and the office equipment, particularly in respect of the computer systems is out of date (see **Figure 8.1**).

As regards meter reading, billing and collection the existing organizational framework for Managua is as follows:

1) Meter Reading

Meter reading is carried out under the metering section of the technical department. There are 28 meter readers responsible for reading about 93,000 meters per month in 10 geographic zones each zone being divided into smaller areas. All meter readers operate in one particular zone each day being transported by two pick ups which allows from 5-6 hours of reading per day. The readers use computer generated sheets with, on average, 300 customers daily. Meters are generally located in the footpath outside the property many with covers missing and filled with trash. Readers experience problems with unreadable meters, heavy covers and no proper lifting keys, and at times violence and crime interferes with their work. In these conditions they are expected to read meters at the rate of one every 1-2 minutes. There are no supervisors, but the sheets are checked by the section head before being passed to the billing section. Most meter readers are long serving with good local knowledge of the areas.

2) Billing and delivery of bills to customers

The billing section receives the readers' sheets and the readings are again checked against historical information as they are entered into computers by a staff of 13. Invoices are then generated from the meter readings and all other none metered accounts in Managua are produced, including the asentamientos. These are then outsourced to Correos de Nicaragua or Xerox for printing, and the printed invoices are collected by the Billing Distribution Section. Distribution of invoices is as follows:

Domestic bills (Zones 1-10) are hand delivered to the customers' residence by 18 people from the distribution section at the rate of 5-6,000 per day (average 300 per person).

Invoices for high users and government (Zones 14, 15) and other institutions are sent to the Department for Collection for Government and High Users to be compiled, where necessary, into one consolidated bill (e.g. all schools would be combined for charging to the Ministry of Education). Invoices are then taken by hand to the institutions and the deliverer also acts as a collector if payments can be made within a short period of time. Further visits are made if bills can not be settled immediately.

Invoices for asentamientos (Zones 11,12,13) are sent to the "Mejoras de Barrios" (Improvements to Settlements) department for the approx. 180 asentamientos. For 67 of the settlements invoices are hand delivered by 12 personnel and the cash collected at the same time. In 87 of the settlements separate invoices are produced but collection is done by a visiting cashier. In 8 of the settlements only a computer printout is produced listing all of the customers. This is taken to the settlements on a pre-arranged day and a cashier collects payments. There are 7 cashiers. (NB 8 asentamientos are not provided with ENACAL services)

All accounts originally found to be incorrect by the checking system are re-done and contained in Zone 16 and the corrected bills are added to each relevant batch in any of the foregoing systems.

3) Collection of current billing and debt

Payment may be made as follows:

- Cashier at ENACAL office in Managua

- Other ENACAL special offices for payment in Managua
- By telephone to the department in the ENACAL office dealing with credit card payments
- At designated Banks
- Payment to special collectors and cashiers for asentamientos
- Direct collection for government and high users

A special unit has recently been established in the Commercial Coordination department to collect accumulated debts and to deal with defaulters in accordance with the Regulations for Services to Consumers which entails a cut off procedure for none payment. A rapid follow up team now operates in specially selected areas to check if customers are re-connecting illegally. A strong follow up has been initiated for government and high uses and contact and dialogue with asentamiento dwellers through their leaders has resulted in increased revenue collection.

Under the coordination of the Commercial Manager the various departments have had early successes in the collection of debt. About 30% of current bills are now being paid within 30 days, this rises to 60% at 120 days and it is hoped to reach an average of 6 months for full payment rather than the current figure of over 1 year. Aged debts go back to before year 2000 and totals almost C$600 million nationally. Collection in the domestic sector is improving with better application of the regulations and a more timely follow up procedures. Government and high users debts are being steadily reduced, and collections in assentamientos have increased through better contact with the people and their leaders. Existing consumers in these areas were registering for payment at an average rate of 70 per month over the last 3 months of 2004.

Whereas these are encouraging signs with a spirited dynamic approach the early successes are unlikely to be sustainable and whilst these new initiatives should continue it will be necessary to adopt a structured approach to the known problems and build this into the normal operating procedure of the Commercial department which lacks an officially approved organization chart and coherent budget after many recent changes in the organization.

Whilst it is recognized that this department is currently making a concerted effort to reduce the amount of accumulated debt and maintain higher levels of collection of current billing, it lacks the institutional capacity to improve all areas within its jurisdiction.

A major problem in ENACAL which has an impact on its Managua operation is its practice to be reactive rather than proactive to the concerns of the consumers, civic groups and others who disagree on the politics and policies of such vital issues as:

- Decentralization
- Modernization
- Private Sector Participation
- Tariff increases

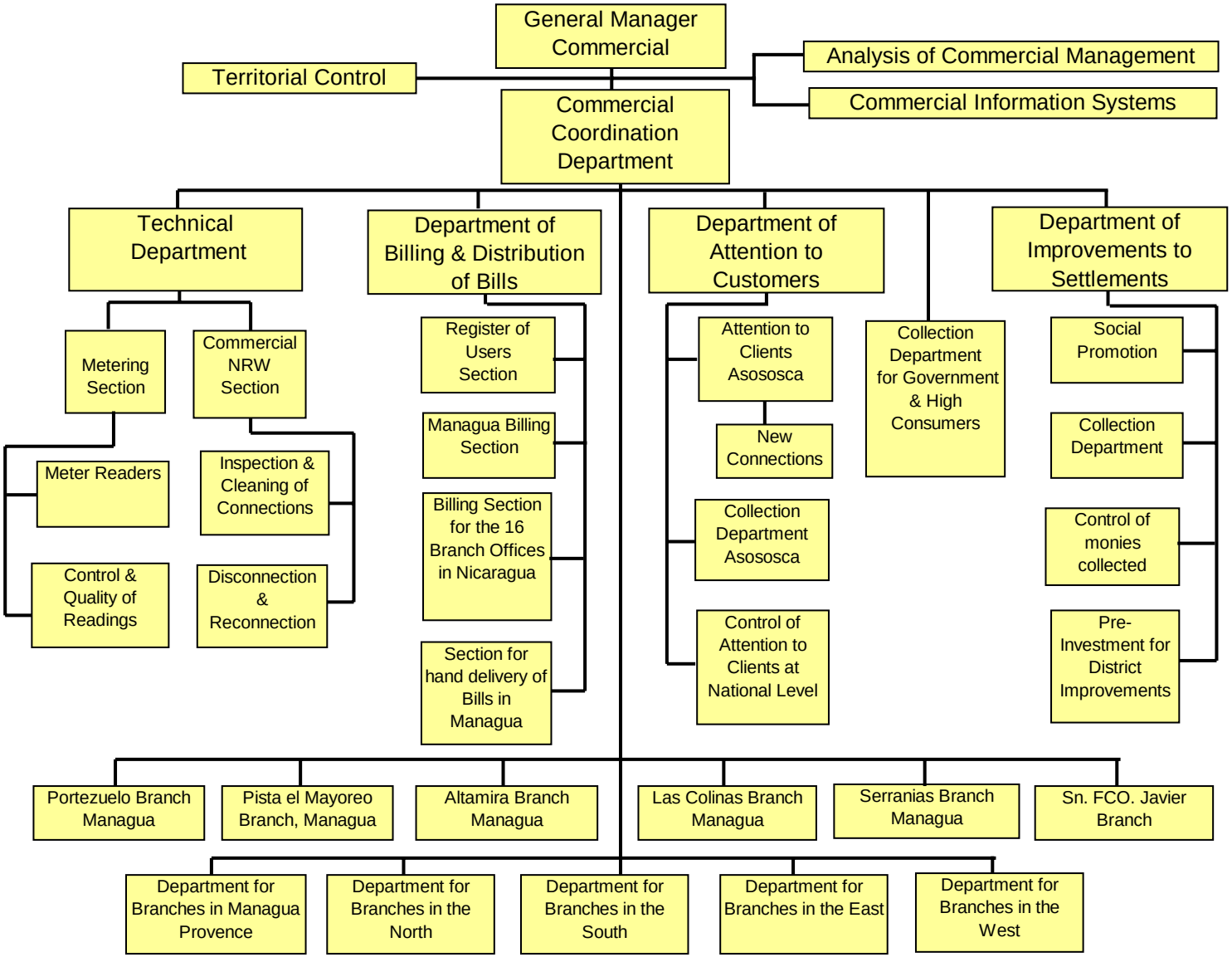
Civic groups and the mass media can be very vocal and aggressive on such issues and ENACAL is often defending itself against misconceptions brought on mainly by lack of information in the public domain. Also certain necessary changes become politicized and the damage is done before the facts are known.

Central government has, in the past, not actively supported decentralization, and modernization by a Service Contract is treated with great suspicion by the media and civic groups and seen as “backdoor” privatization; even modest tariff increases require delicate political handling and civic groups and the customers lack education on the need to pay for water and the necessity for periodic tariff increases.

Hence there are major weaknesses within the Institutional and Organizational Framework severely affecting the rational and economic provision of water services in Managua, and these may be summarized as follows:

- No mechanism to deal effectively with the media, civic groups and customers
- Lack of managerial and financial autonomy of the Managua section of ENACAL
- Lack of coordination on the reduction of leakage, illegal connections, and meter related losses
- The Register of Customers needs revising and updating
- No mechanism to deal effectively with the massive wastage of water and loss of revenue in its supply system to the asentamientos.
- No effective regulation for the use of ground water by the private sector within its area of supply and no protection from pollution by filling stations and other industrial chemicals.
- The lack of regulations for residential development creates problems of supply

Figure 8.1 ORGANIZATIONAL STRUCTURE - ENACAL COMMERCIAL DEPARTMENT



8.3 INSTITUTIONAL AND ORGANIZATIONAL REFORMS REQUIRED FOR IMPLEMENTATION OF PROPOSED IMPROVEMENT WORKS

8.3.1 National Water and Sanitation Sector

All institutional and organizational reforms within ENACAL must be carried out within the framework of the sector, principally with CONAPAS as the government entity for policy and strategy, and IAA (the successor to INAA under SISEP) as the regulator.

CONAPAS makes specific reference to several key issues in its recently released and approved Sectoral Strategies Report, which are associated with the implementation of the proposed improvement works; these being:

1) Sector Legal Framework

The existing framework needs to be cleaned up to ensure compliance with the National Development Plan to avoid duplications, ambiguities and gaps, and in particular the framework must allow for the inclusion of the new Law of Superintendence of Public Services, the new Water Law which is in the process of approval and other legal procedures which will result from the new Sector Strategy being produced by CONAPAS.

- The new Law of Superintendence of Public Services (SISEP)

This new law (No. 511 of 20/01/2005) created the autonomous state organization "Superintendencia" of Public Services (SISEP) with administrative, functional and financial control of the "Intendencias" of former INAA, INE, TELCOR and a new "Intendencia" for Care of the Users and Customers of the three public service providers.

- The new Water Law

This new law which has been in the process of approval for over a year may now have to be modified in view of the new Law of Superintendence and other sector laws and regulations which will result from the Sector Strategic Plan.

- Other Sector Laws and Regulations

These will include:

- The functions of MINSA, MARENA, INAA (SISEP) and the Service Providers
- Control and protection of Water Resources
- Functions of Protection of Consumers
- Tariff subsidies
- Decentralization
- Rationalizing government interference

ENACAL must adjust to the new laws and regulations and strengthen its communication with IAA (formerly INAA) by regular exchanges of views on legal issues to contribute to the formation of the new laws and to operate within the new legal framework. The principal laws, decrees and resolutions that provided the framework for the provision of water services in Nicaragua are given in **Annex 8A**.

2) Decentralization

A gradual move to decentralization of the service providers is planned in the new sector strategy to be directed and coordinated by CONAPAS. This will require wide political support and consensus among the stakeholders. A program of decentralization will have to be defined by CONAPAS and all other stakeholders.

This wide reaching reform of ENACAL will have a positive effect on the Managua operations and ENACAL itself must contribute to the decentralization process through its representation on the CONAPAS commission.

3) Tariff and subsidies

Whereas the current system is based on the long run marginal cost principle it is not operated in that manner. The regulator does not have the appropriate mechanisms to implement such a tariff, the service providers are not able to maintain a satisfactory level of service to the consumers, and there is therefore strong political and social opposition to any form of increase.

The Regulations for Services to Users requires updating and amending particularly in respect of the punishment for illegal users, and an appropriate system of subsidies for low income users is urgently required to safeguard the rights of these groups and at the same time ensuring a fair collection of the charges resulting in a healthy financial situation for the service provider.

ENACAL must strengthen its ties with IAA (formerly INAA) and play a central role to revise the structure of the tariff particularly in the examination of its customer register categorizing the users, adequate cost recovery, and a clear rational plan for subsidized services to low income groups particularly in settlements (asentamientos).

4) Marginal Urban Areas (Asentamientos)

Cross subsidies currently exist to benefit low income users but these are applied in blocks by location rather than classification of users. Furthermore water consumption in asentamientos is largely uncontrolled and far too high, customers are not metered and hence the subsidy covers much more than the lifeline supply required. Socio-economic community surveys are required to compile a register of users entitled to a subsidy and legal parameters need to be established as to the definition of low income users who lack the ability to pay at an economic rate.

ENACAL must correct the technical problems of supply to asentamientos, compile a register from baseline surveys, and develop a suitable system of supply to consumers and a tariff that will provide adequate supplies whilst collecting a level of payments that will not adversely affect the overall financial operations.

5) Community Participation and communication with the population

Lack of communication and information on such vital issues as tariff, subsidy, and private sector participation has long been a problem at government level, civil societies, users and the public in general. This is recognized in the CONAPAS strategy document and a framework has been developed to address these issues.

Currently there is very little community participation in urban areas, Customer Services departments do not provide such a service and there are no recognized Water User Groups for the dissemination of information. Within the Civil Societies there are local, national and international groups for the protection of consumers for all commodities and they have recently

been very active and vocal on the issue of the planned Service Contract for the modernization and institutional strengthening of ENACAL. Poor communication has resulted in a negative attitude with accusations of "backdoor" privatization etc.

The CONAPAS vision is for the sector to have ample commitment to community participation with the object of supporting User Groups and obtaining consensus on solutions to important issues.

The Strategy for 2005-2009 is for people to be better informed and integrated into the process of regulation and the provision of services, also for the Customer Services Offices of the regulator and the service providers to be integrated into the communication system, and to improve the assistance given to consumers. It is noted that the ENACAL main office has recently modernized its Customer Services Offices functions.

The service providers must now promote the formation of User Groups, organize meetings in particular in the marginal urban neighborhoods (asentamientos).

ENACAL must contribute to and adjust to these sector strategies and reforms by developing its own framework for strengthening communications with assistance through the Service Contract and in accordance with the CONAPAS strategy.

8.3.2 ENACAL as a National Water Service Provider

The major institutional and organizational reforms required have already been planned and it is hoped that implementation will soon commence through the Service Contract. The ENACAL Bid Document was based on the recommendations of IDB and ENACAL have three bidders (Biwater (UK), Inecom de Chile,and Apca de Espana) from International Company experienced in the operation of water services, for, among other duties, the development of a management modernization plan which includes a Plan for Institutional Strengthening (PFI) within ENACAL.

The Scope of Works of the Service Contract includes:

- Modernization in the commercial area.
- Renovation and development of the computer system, including supply of hardware, for improvement of operation and efficiency in all areas.
- The execution of a program of training, starting from the evaluation of the personnel
- The writing, together with ENACAL qualified personnel, of the procedures of service of the companies.
- The writing of reports;
- The preparation of a program of investments.

This process is expected to result in sustainable improvements to the following:

a) Reduction of the levels of non-revenue water.
b) Improve the efficiency in the metering.
c) Reduction of illegal connections.
d) Improvement of the levels of collection, and reduction of none payment and debt.
e) Implementation of an appropriate commercial policy of Customer Service.
f) Rationalization of the number of personal and their remunerations.
g) Implementation of policies to optimize the use of, and expenditure on, electric power, chemicals and other products.
h) Implementation of appropriate policies of routine and preventive maintenance.
i) Implementation of an optimized program of replacement of the assets.

j) Maintenance or improvement of the conditions of operation of the system of potable water and waste water, in compliance with the environmental standards and the regulations of services to the user.
k) Establishment of modern computer systems for the integral management of the services.
l) Identification and basic formulation of plans, programs and projects.
m) Development of capacities for strategic and operations planning.
n) Training of the personnel.

As can be seen from the foregoing, all of the problem areas within ENACAL should be addressed by this contract. However, the events from 1998 to the present time have not been without problems, particularly in the aspect of private sector participation (PSP). Consequently, although the idea of drawing up a Bid Document for the provision of Management Services commenced in 2000, five years on, a different concept of a Service Contract is now being followed, and is yet to be awarded.

The traditional Management Contract usually clearly sets out the operators authority for control of operations, sets targets for levels of service to be achieved, and is accompanied by substantial funding for rehabilitation and expansion of services. This is often the forerunner to the awarding of a concession to a private operator. Due to current legislation and sentiment Management Contracts and Concessions are not possible. This "Service Contract" has seven target goals to achieve as shown in **Table 8.1**.

Table 8.1 GOALS (Initial values estimated at 31/12/2003)

Year	NRW Physical Losses	Meters Measuring	Illegal Connections	Energy Consumed KWh/m^3	Cost of Energy US$/KWh	Collection Index	Connections Per Employee
Initial	41.69%	52.00%	16.23%	0.6900	0.0955	85.0%	137
1	40.69%	57.48%	14.23%	0.6000	0.0850	85.5%	189
2	38.69%	59.26%	12.23%	0.5500	0.0800	86.0%	208
3	36.69%	61.15%	10.23%	0.5000	0.0800	86.5%	222
4	34.69%	63.02%	8.23%	0.5000	0.0800	87.0%	238
5	32.69%	64.73%	7.23%	0.5000	0.0800	87.5%	250

Source: ENACAL Bid Document

However, the authority of the consultant to initiate action to achieve targets within ENACAL appears to rely somewhat on goodwill rather than on specific powers, and whereas this should be forthcoming there are certain risks associated with this methodology. Furthermore there is, as yet, no specific program for the purchase of equipment which may assist the contractor in achieving the goals. There should be about US$ 7 million in total to satisfy the needs of the contract (excluding the fixed fee), for the consultant to use in agreement with ENACAL management for the purchase of equipment.

ENACAL hope to attract further finance for capital works of rehabilitation and expansion of about US$ 20 million, from BCIE and Spanish sources. However, this finance if forthcoming will not form part of the contract.

This 5 year Service Contract will have to be carried out in accordance with the framework of the newly issued Sector Strategy developed by CONAPAS.

If all goes according to plan and the Service Contract is awarded, the reforms of the management modernization program and the plan for institutional strengthening including the

recommendations of this Study should ensure that a much improved ENACAL organization is developed for the implementation of the proposed improvement works.

8.3.3 ENACAL Managua

This Study presents a Long-term Improvement Plan up to the year 2015 with diverse aspects covering the technical, financial, and social & institutional measures required for ENACAL Managua to be transformed into an efficient utility to provide sustainable water services to its customers.

Since ENACAL is a national entity of which Managua forms a significant part, there are aspects of the institutional and organizational reforms required for Managua that overlap with the overall reforms required in ENACAL.

In addition, ENACAL being a service provider within the water sector must interact closely with the regulatory authority IAA under SISEP, and the entity responsible for sector policy and strategy CONAPAS.

Hence the institutional and organizational reforms required for the implementation of improvement works for ENACAL Managua are linked with reforms in the overall water sector and it is important to ensure coordination of legal, institutional and organizational matters in a national context.

The necessary institutional and organizational reforms for ENACAL to integrate with IAA (formerly INAA) and CONAPAS in the water sector, and for ENACAL as a national water service provider have already been detailed in **Sections 8.3.1 and 8.3.2**.

Furthermore, a Service Contract is planned to commence in the near future, and the terms of reference of this contract have been taken into consideration as they cover many of the items of reform required by these improvement works in the modernization of ENACAL's management and the strengthening of its institutional capacity.

However, it is necessary to make recommendations for the reforms required specifically for these improvement works and ENACAL and the Consultant appointed for the Service Contract are urged to ensure that the needs of the improvement works are met by the program for modernization and institutional capacity strengthening wherever possible. It is suggested that the ENACAL Executing Unit to be formed to oversee the Service Contract is used to coordinate these requirements.

The recommendations for the institutional and organizational reforms required to support the implementation of the improvement works proposed by this Study are as follows:

1) Public Relations

ENACAL should reform its Public Relations strategy from a reactive culture to a proactive one and accordingly it is recommended that ENACAL sets up an Ad Hoc committee from existing ENACAL executives and staff. This committee may meet on a regular basis (say once a month), and/or as and when there is an urgent need to address such issues as tariff structure, tariff subsidy, private sector participation, asentamientos, water awareness campaigns etc. The composition of the committee can be varied in accordance with the subject under discussions and specialists on each subject may be drafted in from outside sources and/or from the staff of ENACAL.

In particular there will be a need for ENACAL to obtain the services of a mass media expert (Radio, Television and Newspapers), and a publicity campaign specialist for communications with Civil Society Groups, and eventually Water User Groups and the population in general.

This will be an interim measure until the full program of modernization and institutional strengthening gets underway through the Service Contract. Under the Service Contract, the Consultant is responsible for developing policies on the relationship with the community within an agreed framework to be set by ENACAL and the consultant will offer the necessary training to the personnel of the Customer Care section.

2) Consolidate its efforts on the reduction of leakage and wastage;

- Form a new unit to carry out micro sectoring, leak detection and repairs, and detection of illegal users
- Form a new unit to deal with the illegal connections detected using a persuasive social approach, but following this up appropriate fines, publicizing names of offenders, and disconnecting the supply for none compliance
- Reform the "Mejoras de Barrio" section of the Commercial Department to;
    - Carry out participatory house surveys, create an accurate data base for Customer Registration, form Water Committees (User Groups) and carry out water awareness campaigns
    - Create a unit for improvement to water services where the supply is good to moderate
    - Create a unit for provision of water services where supplies are poor or not provided. Carry out Pilot Projects to establish the most effective system to prevent illegal use and non-paying customers

3) Improve the meter reading, billing and collection system

- Form a new metering and billing unit in the Commercial Department to integrate management of information on meter reading, billing, and collection and introduce networking of this information
- Move towards an integrated system of combining meter reading, bill delivery and collection
- Training of meter readers

4) Reform of Regulations

- Review and revise the Regulations for Services to Users to increase the penalties for illegal use and ensure enforcement of the law
- Review and revise the Regulations for Services to Users on the location of the meter, meter installation and responsibility for maintenance
- Review and recommend revisions to the tariff in terms of structure, cross-subsidy, non-metered connections, and connection costs

5) Strengthening of Protection of Water Sources

Reforms are necessary for the control, protection and monitoring and evaluation of ENACAL's water supply sources particularly within the Managua area:

- The water sector authorities must have full control of the development of water sources particularly within the urban environment of Managua. Private water sources and supplies should not be allowed within the ENACAL Managua service area without the

issuing of a license by the relevant entity in the water sector, after a proper review of each application. The laws should be reviewed and reformed as necessary to protect the interests of ENACAL.

- Water sources must be protected against all forms of contamination and pollution through the legal system. In respect of ENACAL Managua it is essential that the existing sources are protected against possible contamination of ground water by fuel filling stations, petrochemical industries and the like, which pose a threat to water quality. If major sources were to become seriously polluted a very high and unnecessary capital cost would result to develop new sources. All relevant existing laws for the granting of development licenses should be reviewed and reformed as necessary.
- Monitoring and evaluation is the last line of defense against the possible pollution and contamination of existing water sources. Already it is known that some sources are at risk. Responsibility for monitoring and evaluation rests with the ENACAL Environmental Management Department which was recently upgraded with laboratory equipment, financed by PAHO and UNICEF, to extend its analyses capability to carry out all of the testing required by the PAHO standards. Strengthening is required by further training of the personnel on this equipment particularly for the detection of heavy metals and pesticides.

8.4 HUMAN RESOURCES DEVELOPMENT FOR IMPLEMENTATION OF PROPOSED IMPROVEMENT WORKS

The development of human resources within ENACAL will be an important element for the efficient and effective control and implementation of the improvement works proposed by this study. It is also essential that these improvement works are coordinated with other ongoing and proposed projects by other donors, particularly where there are similar components such as the creation of macro and micro-sectors.

8.4.1 Current Situation

Departments closely associated with Human Resources issues for the control, implementation and coordination of improvement projects are; Planning and Human Resources; Projects & Investments; Commercial; and Operations.

Currently the Planning Department deals with applications for loans and grants from the initial application up to the signing of the agreement with the donor. This department is handling the government of Spain project and bids were expected to be received for the consultancy contract towards the end of January 2005. The Service Contract for modernization and strengthening of institutional capacity of ENACAL is also being dealt with in the General Managers office, since this is a sensitive issue in the continuing controversy of alleged privatization.

The Service Contract will mainly affect the Commercial Department since the main elements of the contract are the development of a management modernization plan which includes a plan for institutional strengthening. Emphasis will be placed on modernization in the commercial area and the renovation and development of the computer system. This is essential to address all the elements concerned with the reduction of non-revenue water.

When implementation commences on the physical elements of donor projects responsibility is passed to the Projects & Investments Department who are currently handling ongoing water projects financed by, amongst others, IDB, OPEC and SPAIN. A good proportion of training is

achieved by the transfer of technology and "know how" through the existing ENACAL staff working closely with the consultants on studies and project implementation.

The Operations Department and the Technical Section of the Commercial Department currently provide the resources for leakage surveys in micro sectors.

As regards the Human Resources Department which has the responsibility for training, ENACAL also has its own training school which has in the past carried out successful training schemes for operators, technicians and managers. Other specialist courses which are available in Managua have been utilized included computer training.

Finance for the training programs is available through INATEC but this is withheld when ENACAL fail to pay the statutory levy. This payment default has at times reduced the level of training available. The training school now concentrates its efforts on the general workforce, particularly operators.

Overseas training is available through many donors for example JICA recently provided training courses for five of ENACAL's staff. However, ENACAL are not able to take full advantage of many of the other training courses on offer since a good knowledge of the English language is generally required and many of the young professionals and technicians without this knowledge and who would benefit greatly from these courses are not able to attend. ENACAL has placed priority on training in the English language to alleviate this situation.

8.4.2 Development of Human Resources

This will generally be addressed by the Consultant selected for the Service Contract and will provide advice on all aspects of human resources; the plan for human resources development is as follows:

1) General

The emphasis of the Policies of Improvement of the sector of human resources will be directed to the production of a strategy that minimizes the internal operating problems, the relationship with the unions and the socio-political problems and with appropriate planning it allows in reasonable terms to improve the profile, the training and the numbers of the permanent staff of ENACAL.

The Consultancy Services will make an analysis of the duty stations, a profile of them, establishing the requirements of the stations, recommendations for personnel and systems of evaluation and remuneration.

2) Management of Human Resources

The Consultancy services will advise with regard to the policies of personnel and it will present its proposal of these policies to ENACAL during the course of the first semester period of the Contract. The following are the steps that the Consultancy Services will follow in the production of these policies.

Training will be carried out according to the necessities of ENACAL placing emphasis on Customer Services, installation of services, reading and inspection of meters, in the Operation of the Company and in the Information Systems, including the accounts as well as the managerial systems.

To carry out training, they will hire specialized instructors when it is required and with internal personnel and the hired specialist will develop courses or workshops that allow the transfer of knowledge and operating technologies. The program of training should emphasize:

- Internal Programs to introduce and to develop a new managerial culture
- Technological transfers and "know how" to the personnel for the operating areas
- Managerial processes
- Use of modern technology in the handling of public services
- Prevention of labor accidents

The proposal should describe in detailed form all the aspects related to the execution of the objectives of training, such as: scope, type, duration, cost, organization or the company involved in the exercise etc.

3) Projected Evolution of the Efficiency of Personnel

As for the reduction of the personnel, the Consultancy services will adhere to the time and manner for the indexes of the annual goals specified for the efficiency of personnel. The recommendations for the reduction of personnel should be based on the description and requirements of the position and in the contribution that the specific position has to the processes and the standards of ENACAL.
The Consultancy Services will also propose the approaches with which it will carry out the reduction of the index of efficiency of personnel. Evaluate the performance of each person previously affected by the readjustment with the purpose of maintaining the best elements in the different departments.

4) Criteria for the Promotion and Development of Personnel

The criteria for promotion should be based on qualifications, motivation, performance and efficiency. A system should be set down for periodic evaluations of the individual on the part of their supervisor and subordinates and to include these as part of the criteria for promotion. It will start a program of support to the professional development of the personnel with an assigned budget for courses of continuous training as much singular as collective.

5) Timescales for Implementation

The Consultancy Services will present a timescale with the planned activities for the program of training, the projected development of the programming of personnel, the modification to the programmed flowchart and all those activities relevant to the management of personnel.

- Diagnosis of the sector of human resources. Analysis of necessities, functions and profiles.
- Plan of managerial restructuring
- Organizational proposals
- Revision and proposal for managerial areas including definition of profiles
- Development, with the management of ENACAL, of a program of rationalization of the personnel and the respective scheme of action.

6) Measurement of the Development of the Sector

The indexes and relationships for the items which should measure the progress of the sector would be, without being limited to, the following:

- Labor efficiency in number of Employees / Thousand Connections of Registered potable water users (Productivity in the Human Resources). This approach measures the

productivity of the human resources, the degree of efficiency of the processes of work and the technological incorporation that allows better efficiency of the personnel. It is obtained by dividing the total number of employees and temporary personnel into the number of connections of registered potable water.

- Absenteeism as a % of the man-hours absent from Work (Labor Effectiveness). This approach relates the labor productivity to the quantity of effective time that a person dedicates to carry out his work. The absenteeism, justified or not, impacts negatively on the productivity of the personnel. It is obtained by totaling the absent time for employee throughout the year and dividing it into the labor time that is required if the absence had not occurred.
- Development of Labor Competence by the number of hours of Training / Employee (Training). This approach measures the effort of ENACAL to prepare and to qualify the personnel so that it can indeed carry out its responsibilities. It is obtained by adding the total of hours of training for each fit employee and dividing the sum into the total of existing employees in the company.

Under the Computer Technology and Systems section of the Service Contract, the consultant will computerize all of the Human Resources data and this will be integrated with the commercial system data. The information will be divided into the geographic areas of ENACAL which will be useful for the eventual decentralization of the organization.

8.4.3 Training

Training of personnel also forms an important part of the Service Contract and the consultant will be required to carry out a training program so that all necessary personnel of ENACAL receive training in their respective areas of work. The execution of this program of training will commence with the evaluation of all personnel carried out under the development of human resources element of the consultancy, and will guarantee the sustainability of the improvements by the transfer of knowledge based on the training program.

The training needs listed in the Service Contract are split into three particular areas being:

- Commercial Operations
- Information Systems (Computer Technology)
- Operation and Maintenance

In consideration of the particular training needs associated with these proposed improvement works, it is recommended that the Consultant for the Service Contract takes note of the specific technical, financial, and social & institutional requirements for implementation of the proposed improvement works and ensures that its training program covers all of the institutional and organizational requirements as detailed in **Section 8.3**.

ANNEX 8A

Principal Laws, Decrees and Resolutions for the Provision of Water Services in the Republic of Nicaragua

PRINCIPAL LAWS, DECREES AND RESOLUTIONS FOR THE PROVISION OF WATER SERVICES IN THE REPUBLIC OF NICARAGUA

No. of Law, Decrees (Acts) & Resolutions	Date of approval	Extract of contents
Law No. 275 **(NB. Revoked by Law No. 511 of 20/01/2005)**	28/01/1998	**"Law of Reform to the Constitutional Law of the Nicaraguan Institute of Aqueducts and Sewer systems INAA",** grants powers to the new INAA to regulate, normalize and to control the quality of the provision of services, as well as the economic-financial sustainability via tariffs, for the systems of potable water and sanitary sewers, equally at urban as well as at rural level
Decree 25-98	17/04/1998	**"Regulations to the Law of Reform to the Constitutional Law of INAA"**
Law No. 276	20/01/1998	**"Law of Creation of the Nicaraguan Company of Aqueducts and Sanitary Sewer Systems (ENACAL)"**, creating ENACAL as a state entity of **commercial business**, with its own personnel and property with the objective to provide the service of potable water, collection, treatment and disposal of waste water, for urban and rural areas
Law No. 279	2/07/1998	**"General Law for Services of potable water and Sanitary Sewer systems"**, has for its objects to regulate the activities for the production of potable water, its distribution, the collection of waste water and its final disposal. The new INAA is in charge of applying this law, without prejudice to the powers conferred by its Constitutional Law and of those granted by its respective laws to the Ministries of Health and of the Environment and Natural Resources
Decree 52-98	24/07/1998	**"Regulations to Law No. 297 General Law of the Services of potable water and Sanitary Sewer system"**
Decree 51-98	24/07/1998	**"Creation of the National Commission for potable water and Sanitary Sewer system (CONAPAS)"** whose main function is the formulation of the objectives and strategies of the sector of potable water and sanitary sewer systems to promote the development of these services to the whole population
Decree 51-98 / Reform of Decree 33-2002	3/04/2002	Establishes that CONAPAS is an inter-institutional Organization to the Executive Power whose main function is the formulation of the objectives, policies, strategies and general guidelines for the sector of potable water and sanitation, as well as the indicative planning, with the purpose of promoting the development of these services to the population.
Decree 45-1998		**"Arrangements for Fixing of tariffs in the Sector of potable water and Sanitary Sewer system"** that defines the conceptual framework for the methodology of calculation of the tariff and other arrangements of relevance for the definition of a marginal cost tariff
Decree 45-1998 reforming Decree 42-2003		**Articles 1,2,11,13 and15**
Resolution No. 001	07/08/1998	**"Board of Directors of INAA referring to: Normative of the Ordinance for the fixing of tariffs for potable water and Sanitary Sewer systems".** Published and incorporate in the book *"Legislation as regards the Provision of the Services of potable water and Sanitary Sewer systems"*
Resolution of the ENACAL Board of Directors Nos 55 &82	17/12/1999 to 09/02/2001	Creating the Company for Water and Sanitary Sewer system of the Department of Jinotega (Gazette, Official Newspaper, No 100 of 29/05/00); The Company of Water and Sewer system of the Department of Matagalpa (Gazette, Official Newspaper No. 101 of 30/05/00); the Company for Water and Sewer system of the Department of Managua (Gazette, Official Newspaper No. 73 of 19/04/01) and; the Territorial Company of Aqueducts and Sanitary Sewer system for León and Chinandega (**Gazette, Official Newspaper N° 74 of 20/04/01**). These companies are attributed to the Nicaraguan Company of Aqueducts and Sanitary Sewer system (ENACAL); they enjoy legal standing, and they can acquire rights and contract obligations and, they have for objectives and purpose to dedicate their property, financial resources, technicians and office workers to explore, to develop, produce, treat, distribute, supply and to store potable water and; to explore, develop, produce, distribute, facilitate, and supply, the services of sanitary sewer systems and for the collection and disposal of waste water. During the period of transition that will last until they are transformed into antonymous societies, these companies, as per the arrangement of Law No. 297 (General Law of Services for potable water and Sanitary Sewer system), in its Art. 88, third paragraph and their regulation

		Decree No. 52-98, they will be investigated and audited for ENACAL, by means of an organization created by ENACAL to exercise the functions of inspection and audit in the corresponding Companies that will be denominated "THE GOVERNMENT ATTORNEYS OFFICE". The Office will be in the charge of a District attorney and a Vice-fiscal attorney; named by the Board of Directors of ENACAL; appointments that will be between their officials and workers or professional people that it so chooses. It is necessary to point out that in the case of the Company for Water and Sewer system for the Department of Managua, a reform was made that was published in the Gazette, Official Newspaper N° 104 of 04/06/01 where the name is changed of this company and there is added Art. 28, parenthesis 7 that states: "To transfer monthly to ENACAL in the form agreed in concept, all the funds entered for accounts collection and other revenues after covering the expenditure of the budget approved by ENACAL"
Law 290 **(NB. Amended by Law No. 511 of 20/01/2005)**	1998	**"Law of Organization, Jurisdiction and Procedures of the Executive Power"**. Among the Ministries of State and decentralized Entities referred in the Art. 12 and Art.14 of this Law whose functions and general attributions are contemplated in this Law, those that have implications in the sector of water and sanitation are the Ministries of Health (MINSA); Treasury and Public Credit (MHCP);Development, Industry and Trade (MIFIC); External Relations (MINREX) and; Environment and Natural Resources (MARENA) and among the Decentralized Entities, the Central Bank; the Social Investment Fund for Emergency (FISE); the Nicaraguan Institute for Territorial Studies (INETER); the Nicaraguan Institute of Energy (INE) and the Nicaraguan Institute of Aqueducts and Sewer systems (INAA)
Law 217	1996	**"General Law of Environmental Management and Natural Resources",** sets down as its particular objective, the use and the rational management of basins and hydraulic systems such as the fundamentals for the sustainability of resource and when the national interest requires it, the State will execute contracts for rational development, by means of concession, permission, licenses or quota. It sets down that the water in which ever state, is for the public domain, and that the first use in priority corresponds to human consumption
Law Nos. 40 & 261	17/08/1998	**"Reforms and incorporations to Law N° 40 Law of Municipalities known as Laws N° 40 and 261".** They Establish that the Municipality is the base unit for the administrative policy in the division. It is organized and it works with civic participation. They are essentials of the municipality: the territory, the population and their government (Art. N° 1). Also in Art. N° 7 are defined the jurisdiction of the municipality and among them, one has: to promote Health and communal hygiene, to offer the provision to the population of basic services for potable water, sanitary sewer system and electricity and, to develop, to conserve and to control the rational use of the environment and the natural resources of their territory
Law No. 423	17/05/2002	**"General Law of Health".** Has for its object to guide the rights for all persons to enjoy, to conserve and to recover its health, in harmony with that laid down in the legal arrangements and special standards. For such an effect it will regulate among other things, the environmental drainage and the sanitary control that will be exercised over the products and services related to health
Decree 59-90 Law No. 347	11/08/2003	Creation of **FISE**. Creating **INIFOM** as a Decentralized Institution of the State and the creation of **AMUNIC** as the association of municipalities of Nicaragua
Law No. 440	11/08/2003	**"Law for the suspension of concessions for water use"** Has as its objective to preserve, rationalize the utilization and to secure the permanent sustainability of the country's natural resources. This law suspends the granting of any concession in particular, for the installations and assets of ENACAL and management contracts. It also suspends the granting of concessions in particular that granting the Ministry of Development, Industry & Commerce (MIFIC) the right of water use until a general water law is produced and approved by the National Assembly
Preliminary Design of a Water Law	(Draft issued for consultation 2004)	Promoted in the last months by the Government of Nicaragua through MIFIC and MARENA that would have for its object to establish the institutional juridical framework for the administration and protection of water resources, having as specific objectives to regulate the public domain and national property of water, the juridical régime for the use and sustainable use of the

		resources, the relationships of the public institutions with these matters and, the civic participation in the administration of the resources
Law No. 479	22/12/2003	Reforms the Law 276 of the creation of ENACAL. It exempts it of all tax payment contemplated in the national tributary legislation. The consumption of the tax free companies for the payment of service for water, will be remunerated by ENACAL on behalf of the State. It determines that ENACAL should be considered as a large consumer of goods for enjoying the benefits that the law of the Electric Industry grants to that type of consumers. It will present a plan for development of the services to the Regulatory Entity within 60 days.
Law No. 480	22/12/2003	Establishes the methodology of calculation for the tariff régime established through a tariff ordinance, for a period of 5 years, with terms of revision of 1 year except that the cost increase is more than 10%. The tariff ordinance should also contain a series of concepts of accounting efficiency. In a period of 6 months an agreement will be formalized direct by INAA, for a concession to ENACAL. There will be no increase to the tariff for a period of one year.

Source: IDB documentation

No. of Law, Decrees (Acts) & Resolutions	**Date of approval**	**Extract of contents**
Law No. 511	20/01/2005	**"Creates the Superintendence of Public Services (SISEP)"** an autonomous state organization for the administration, function and finance of three "Intendencias" for former INAA, INE and TELCOR and a fourth "Intendencia" for the Care of Users and Customers of the three. The appointment of the Superintendent and the four "Intendents" to be approved by at least 60% of the Deputies of the National Assembly. Law No. 290, Article 14, clauses "I.d", "I.e", and "I.f" are changed from the presidency to be attributed to SISEP. Law No. 182, Law of Protection of Consumers; a second paragraph is added to Article 39 to correspond with the SISEP "Intendencia" for Care of the Consumers and Users. Law No. 275, "Law of Reform to the Constitutional Law of the Nicaraguan Institute of Aqueducts and Sewer systems INAA", is revoked

Source: Publication of the National Assembly

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.9
Strengthening of ENACAL's Financial Capacity

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.9
Strengthening of ENACAL's Financial Capacity

Table of Contents

ANNEXES

9.1 OBJECTIVES OF THE FINANCIAL STUDY

ENACAL manages water supply and sewerage sanitation services in the entire departments and autonomous districts except Jinotega and Matagalpa Departments. Its financial system is brought under a centralized computer system. At present, ENACAL provides one centralized system of financial statements covering its whole servicing territories. Thus, it is almost impossible to make financial statements for a local water supply system of Managua City.

In order to formulate a financial plan for the water supply improvement project in Managua City, the financial statements of the project service areas are essential information. In this financial study, the study team must to compile these financial statements on the basis of the entire ENACAL's financial statements and other data and information provided by counterparts. Through this formulation activity, the present financial conditions of Managua water supply system are analyzed and its management characteristics are captured by means of management indices. The management is analyzed from the manage components of finance, production, water sales, material purchasing and labor. These analyses investigate the present financial conditions and problems of the Managua water supply system.

For implementation of the proposed Long-term Improvement Plan, the management improvement plan is proposed through the said financial analyses. The planning components are made referring to financial conditions for sound management based on the aforesaid analyses. Applying these components, a financial simulation is conducted and makes necessary financial countermeasures for the proposed project. Finally, several recommendations are proposed for ENACAL to implement and to manage soundly the Long-term Improvement Plan.

9.2 SUMMARY OF THE STUDY RESULTS AND RECOMMENDATIONS

9.2.1 Present Conditions and Problems

(1) Water production cost and water unit price are in negative spread condition.

The production cost of potable water was higher than the average unit price of water in most of years. This means that the more ENACAL sales water to consumers, the more it gets deficit in its management. In the financial position in 2003, ENACAL could not attain an ordinary profit in the present water market. As a result, its revenue can not cover sufficient operation and maintenance works and, of course, execute its capital replacement and new investment.

(2) Excessive account receivable worsens cash flow.

The turnovers of account receivable were nearly 1.0 for the recent three years. It might lead to a cash flow crisis. In general waterworks, the turnover must be between 6 and 8, i.e., collecting the receivables within 45 days to 60days. Thus, ENACAL has a lot of uncollectible receivables at present. These accounts would become obstacles to progress in the future.

(3) Water supply facilities and equipment is becoming obsolete.

As of 2003, the fixed assets for water supply service have already depreciated around 70% of the total book values. This means that their replacement might be delayed or stagnant from standard schedule. Too late replacement could make them impossible to recover their functions.

(4) Labor productivity should be improved.

The number of staff seems to be larger than the Japanese average. For improvement of labor productivity, professional training of staff, high profession-conscious of field workers and introduction of appropriate automation would be necessary in waterworks process.

(5) Operation and maintenance are managed in low-cost principle.
Because of lack of funds for O&M works, the level of facilities and equipment conditions are quite low. Since the water production cost is kept to be low because of low water price, essential works are left behind in the proper level of O&M works. For example, too late replacement of facilities and equipment and too little inventory are found in the financial statements.

(6) Financial statements of Managua City waterworks can not be compiled independently.
ENACAL management covers the whole country except two departments. The financial management is completely centralized by the head office. Therefore, it is impossible to compile the financial statements of Managua City waterworks. The management of this waterworks can not have the financial information for judging the management issues of Managua City Water Supply Service.

9.2.2 Recommendations for Strengthening of Managua Water Supply Services

(1) Lack of fund for carrying out the water supply operation must be dissolved in short time.
There are two focal points of lacking funds for normal operation and maintenance in the present ENACAL. They are the excessive account receivable and the huge accumulated deficit. They bring down rigid financial performance to ENACAL's management. Although some of account receivables are dissolved by the government by 2006, these negative phenomena might be widening at a rapidly accelerating rate in a short period, unless they are eliminated without delay.

(2) ENACAL should earn adequate revenues for normal operation costs in its infancy.
The management has to know the total cost of normal water supply O&M and administration including not only operational direct expenses but also invisible costs such as depreciation and inventory of spare parts, chemicals and equipment. Its revenue must cover the total cost at least. As a result, the management can start to turn around performance from deficit to profit, and eliminates a big and growing structural deficit.

(3) Financial statements must be provided the local service territories.
ENACAL's financial system is completely centralized through financial computer networks covering its whole service territories. Each local territory does not have its own financial information. At least, the central level should prepare and feed back the local financial statements and its comments on local managements to the major local managers. Then, the leading managements in major service territories, such as Managua City, can know their own financial situation, and to manage their local operation and maintenance conditions on the basis of management indices which provides an azimuth to their management. As a result, they could carry out their management at their own risk, and accomplish their self-sufficient operation system reflecting their local management circumstance.

(4) To attain Cost Recovery Level III by 2015, patient efforts of management are necessary.
It will be very difficult for ENACAL to attain the cost-recovery target. For consecutive capital investment until 2015, ENACAL has to keep the following self-help efforts on financial and management issues: (i) to ensure financial resources for capital investment from donors and support from the government; and (ii) to maintain patiently minimum-scale management with efficiency and productivity.

(5) ENACAL must persevere in its efforts for consumers to understand rational water

tariff.

To ensure adequate sales revenue from water services is a key issue for ENACAL to improve its management situation. According to the "Water Consumption and Awareness Survey", willingness-to-pay of water consumers was estimated at C$121 per month on average in 2004. This value accounted for around 1.6% of their total monthly income. ENCAL, however, expects them to share to around 4% of their income for the solid management of ENACAL, which is expected as a benchmark of affordability-to-pay for potable water in the World Bank Report of "Information and Modeling Issues in Designing Water Sanitation Subsidy Scheme, May 2000". Thus, there is still the big gap between ENACAL and water consumers. At the beginning stage of the project implementation, it is quite important for ENACAL to obtain understanding and generosity toward rational water tariff from water consumer and stakeholders through public relation and publicity. ENACAL enhances its transparent financial statements and ensures public acceptance from them.

9.3 PRESENT CONDITIONS AND PROBLEMS OF WATERWORKS MANAGEMENT AND FINANCIAL ASPECTS

9.3.1 Present Conditions of Financial System Structure

The financial system of ENACAL is all brought under one umbrella of the computerized "Administrative and Financial System". Among 16 Departments and two Autonomous Districts in the country, ENACAL manages water supply and sewerage systems in 14 Departments and two Autonomous Districts except Jinotega and Matagalpa Departments.

ENACAL establishes branch offices called as "Sucrusal" in the respective administrative areas concerned, which are located in their capital towns as called "Municipio". Each branch office has a computer expert of the financial system, who sends the following data of the water supply and sewerage sanitation systems in the department every month: billing, receivables, purchasing, check, inventory of fixed assets, payroll, etc. Managua Department among 14 Departments and two Autonomous Districts has the largest water supply and sewerage sanitation system among these Sucrusals. As a matter of course, the water supply and sewerage sanitation system of Managua City in Managua Department is the largest in ENACAL's entire systems.

The central office of ENACAL compiles the financial data and information from the respective Sucrusals into the consolidated financial statements of ENACAL every month. The Departments and Autonomous Districts do not have any crosslink information system among them. In coming few years, the management system including financial system will be modernized through the project of "Program to Modernize the Management of Water and Sewerage Services" by IDB and OPEC.

9.3.2 Financial Statements of Managua Water Supply System

(1) Financial Statements of ENACAL

The financial system of ENACAL is completely centralized in the central office in Managua City. Since any financial statements of branch service systems are not compiled in the computerized financial system, it is impossible to get the respective local department financial data and information at present.

The financial statements of ENACAL in the latest three years between 2001 and 2003 were shown in **Tables 9.3.1** to **9.3.3**. They were based on the external audit documents. **Table 9.3.1** shows balance sheet (B/S). The total assets were aggregated to C$3,070 million in 2003.

Of the total assets, the fixed assets accounted for C$2,697 million or 88%. This structural proportion is reasonable as a water supply and sanitation enterprise.

ENACAL has recorded the huge amount of account receivable as shown in **Table 9.3.1**. The total account receivables of water supply and sanitation services were aggregated to C$469 million at the end of 2003. The central government already decided to subsidize the accumulated accounts receivable privileged to the following obligors: public universities, municipal government offices in Managua, and pensioners. By the end of 2006, the central government will clear off them to ENACAL. The total amount was estimated as around C$48 million as of 2002. In addition, ENACAL itself is planning to collect a half of the rest accounts receivable within 24 months, according to the IDB report, "Plan Empresarial de Desarrollo ENACAL Programa de Modernizacion".

The balance sheet of ENACAL reported C$2.02 billion of capital in 2002. Of the capital, donation and contribution accounted for C$1.95 billion or 96%. Most of them might come from foreign countries and international organizations as grant. In the same balance sheet, the outstanding of fixed liability of ENACAL was C$949 million. It was broken down as follows.

Inter-American Development Bank (IDB)	C$722 million
Nordic Fund	C$95 million
French Government	C$85 million
OPEC	C$73 million
Austrian Government	C$40 million
Others	C$37 million
(Less: Portions of Short-Term Debts	-C$103 million)

As shown in the profit and loss table of **Table 9.3.2**, the operation results of ENACAL have created the deficit for long time. The annual deficits were C$152 million in 2001, C$256 million in 2002 and C$377 million in 2003. At the end of 2003, the accumulated deficit was aggregated to C$697 million, although ENACAL had received subsidies (C$205 million) for losses of previous years.

Table 9.3.1 Balance Sheet of Water Supply and Sewerage Services in ENACAL: 2001-2003 (1/2)

(Unit: C$ Million)

Item	2001[(1)]	2002[(1)]	2003[(2)]
I. Assets	**3,078.01**	**3,328.00**	**3,069.64**
1. Fixed Assets	**2,572.24**	**2,891.07**	**2,696.97**
(1) Land	212.60	213.05	337.22
1) Water Supply Facilities		204.66	
2) General Buildings		8.39	
(2) Plant & Equipment	2,696.16	2,652.22	3,366.06
1) Water Supply Facilities		1,869.29	2,338.16
2) Sewerage Facilities		369.10	736.63
3) General Fixed Assets		413.83	291.26
(3) Construction in Progress	815.09	1,292.73	262.23
1) Water Supply Facilities		90.70	
2) Sewerage Treatment Facilities		108.51	
3) General Buildings		1,093.52	
(4) Accumulated Depreciation	-1,151.61	-1,266.93	-1,268.53
1) Water Supply Facilities		-792.14	
2) Sewerage Treatment Facilities		-183.20	
3) General Buildings		-291.59	
2. Current Assets	**489.05**	**435.49**	**370.16**
(1) Cash & Bank Deposits	73.83	48.07	12.65
1) Cash	1.54	1.26	2.79
2) Bank Deposits	72.29	46.81	9.86
(2) Transitory Investment	2.36	48.13	83.52
(3) Account Receivable	343.88	252.95	205.01
1) Water Supply	323.38	344.65	468.81
2) Sewerage Service	37.14	42.18	
3) Other Account Receivable*1	129.09	71.21	17.10
4) Allowance for Doubtful Account	-145.72	-205.09	-280.89
(4) Inventories	53.54	84.05	66.50
1) Inventory in Warehouse	106.61	125.72	117.79
2) Inventory Written Down	-53.92	-41.70	-51.36
3) Inventory Temporary	0.85	0.03	0.07
(5) Advance Payment	15.43	2.29	2.48
4. Other Assets	**16.73**	**1.43**	**2.50**

Source: (1) Estados Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton
(2) Informe de Auditoria Financiera y de Cumplimientio por los Anos Terminados al 31 Diciembre de 2003 y 2002

Remarks: *1 Consumers given concessionaire due to historical background such as university, retirees, spontaneous, etc. These charges have already decided to be covered by the central governments by the year 2006.

Table 9.3.1 Balance Sheet of Water Supply and Sewerage Services in ENACAL: 2001-2003 (2/2)

(Unit: C$ Million)

Item	2001[(1)]	2002[(1)]	2003[(2)]
II. Liability and Capital	**3,078.01**	**3,328.00**	**3,069.64**
1. Capital	**1,969.40**	**2,023.65**	**1,524.30**
(1) Equity	1,742.27	1,957.76	1,373.47
1) Inheritance	237.28	0.00	0.00
2) Initial Contribution	10.75	10.75	11.73
3) Donation & Contributions	1,494.24	1,947.00	1,361.74
(2) Surplus of Assets Revaluation	590.40	590.40	847.59
(3) Accumulated Surplus/Loss	-363.27	-524.50	-696.76
1) Profit or Loss for the Year	-152.01	-255.60	-172.15
2) Profit or Loss for the Previous Years	-276.10	-363.27	-524.50
3) Adjustment of Loss for the Previous Years	64.85	94.36	-0.10
2. Liability	**1,108.61**	**1,304.34**	**1,545.34**
(1) Fixed Liability	877.83	949.46	1,100.95
1) BID*1	631.42	722.05	814.46
2) French Government	80.38	85.21	90.32
3) Nordico Fund (FND*2)	83.62	95.71	111.29
4) Austrian Government	37.31	39.55	41.93
5) OPEP*3	69.20	73.36	77.76
6) Other Fixed Debts*4	0.13	0.53	44.23
- Less: Portions of Short-Term Debts in items 1	-58.71	-103.31	-153.00
7) Labor Reserve*5	34.47	36.37	73.96
(2) Current Liability	230.78	354.88	444.39
1) Short-term Debt	58.71	103.31	155.95
2) Credit Providers	8.72	32.47	47.79
3) Notes Payable	25.85	21.01	43.61
4) Deposits for Guarantees	14.67	21.90	22.97
(a) Water Supply	14.58	21.43	22.50
(b) Sewerage Treatment	0.07	0.46	0.47
(c) Others	0.01	0.00	0.00
5) Accumulated Interests for Payment	66.66	100.98	148.89
6) Other Account Payable	56.16	75.22	25.18

Source: (1) Estados Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton
(2) Informe de Auditoria Financiera y de Cumplimientio por los Anos Terminados al 31 Diciembre de 2003 y 2002

Remarks: *1 Banco Ineramericano de Desarrollo
*2 Fondo Nordico para el Desarrollo
*3 Organizacion de Paises Exportadores de Petroleo
*4 Including loans from Finland and German Governments and other loans
*5 Obligations related to the labor indemnifications

Table 9.3.2 Profit and Loss Table of Water Supply and Sewerage Services in ENACAL: 2001-2003

(Unit: C$ Million)

Item	2001[(1)]	2002[(1)]	2003[(2)]
I. Revenue	**674.80**	**766.80**	**679.96**
1. Sales Revenues	**671.85**	**671.94**	**695.32**
(1) Water Supply	582.23	583.25	608.02
(2) Sewerage Services	89.63	88.69	87.30
2. Service Reduction	**-36.79**	**-50.56**	**-43.83**
(1) Water Supply			
(2) Sewerage Service			
3. Financial Revenue	**11.15**	**10.32**	**9.24**
4. Other Revenues	**28.58**	**135.10**	**19.22**
(1) Other Sales Revenues			
(2) Sales of Assets			
II. Expenditure	**826.81**	**1,022.40**	**1,056.87**
1. Operating Expenses	**196.76**	**225.00**	**324.56**
(1) Salary & Wages	91.11	81.17	
(2) Electricity	61.16	97.95	
(3) Provision for Uncollectible Charges	0.00	0.00	
(4) Materials & Repair	7.81	4.29	
(5) Transfer to INAA	0.00	0.00	
(6) Other Expenses	36.68	41.59	
2. Maintenance Expenses	**174.02**	**164.03**	**97.58**
(1) Salary & Wages	28.53	18.34	
(2) Electricity	130.61	124.58	
(3) Provision for Uncollectible Charges	0.00	0.00	
(4) Materials & Repair	5.36	3.52	
(5) Transfer to INAA	0.00	0.00	
(6) Other Expenses	9.53	17.60	
3. Expenses of Sales	**135.58**	**135.64**	**175.27**
(1) Salary & Wages	39.12	36.77	
(2) Electricity	0.06	0.15	
(3) Provision for Uncollectible Charges	46.56	57.67	
(4) Materials & Repair	1.02	2.08	
(5) Transfer to INAA	20.96	12.83	
(6) Other Expenses	27.85	26.15	
4. Expenses of Administration	**114.29**	**100.41**	**204.58**
(1) Salary & Wages	68.79	65.37	
(2) Electricity	2.15	3.35	
(3) Provision for Uncollectible Charges	0.00	0.00	
(4) Materials & Repair	17.09	3.22	
(5) Transfer to INAA	0.00	0.00	
(6) Other Expenses	26.26	28.47	
5. Depreciation	**120.75**	**115.34**	**114.20**
6. Financial Expenditures	**75.27**	**91.84**	**137.44**
7. Other Expenses	**10.14**	**190.15**	**3.25**
III. Balance of the Year	**-152.01**	**-255.60**	**-376.91**
IV. Subsidy for Losses of Previous Years			**204.76**
V. Accumulated Deficit			
1. Balance for the Previous Years at Beginning of the Year	**-276.10**	**-363.27**	**-524.50**
2. Adjustment of Loss for the Previous Years	**64.85**	**94.36**	**-0.10**
3. Balance of Accumulated Deficit at End of the Year	**-363.27**	**-524.50**	**-696.76**

Source: (1) Estados Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton
(2) Informe de Auditoria Financiera y de Cumplimientio por los Anos Terminados al 31 Diciembre de 2003 y 2002

Table 9.3.3 Cash Flow Table of Water Supply and Sewerage Services in ENACAL: 2001-2003

(Unit: C$ Million)

Item	2001[1]	2002[1]	2003[2]
I. Net Flow of Operation Activity			
1. Net Losses of the Year	-152.01	-255.60	-172.15
2. Adjustment to Reconcile Net Losses with Actual Operation Activities			
(1) Depreciation	120.75	115.34	114.20
(2) Provision for Account Uncollectible	46.56	59.36	75.81
(3) Loss due to Devaluation of Loans	49.63	55.13	-
(4) Other Adjustments	-	-	403.68
(5) Change in Assets & Liabilities			
1) Increase (Decrease) of Account Receivable	-141.09	31.57	-27.87
2) Increase (Decrease) of Advance Payment	-11.55	13.14	-0.19
3) Increase (Decrease) of Inventory	8.02	-30.51	17.55
4) Increase (Decrease) of Other Assets	-11.61	15.30	-1.07
5) Increase (Decrease) of Credit Providers	-44.69	23.74	15.33
6) Increase of Interest Payment	66.66	34.32	47.90
7) Increase of Deposits for Guarantees	1.51	7.23	1.07
8) Increase (Decrease) of Account Payable	-10.35	19.06	-50.04
9) Increase of Labor Reserve	1.64	1.90	37.59
10) Increase (Decrease) of Notes Payable	17.89	-4.85	22.60
Cash Procurement (Utilization) in Operation Activity	-58.65	85.14	484.41
II. Cash Flow of Investment Activities			
1) Increase of Property, Plants and Equipment	-383.82	-434.16	-3.77
2) Increase (Decrease) of Transitory Investmen	1.85	-45.77	-35.39
Net Cash Utilization in Investment Activities	-381.97	-479.93	-39.16
III. Cash Flow in Financial Activities			
1) Increase of Loans	13.98	69.73	167.52
2) Increase of Equity	400.57	215.49	-585.26
3) Increase of Adjustment for Previous Years	64.85	94.36	-0.10
Cash Flow Procurement for Financial Activities	479.40	379.58	-417.84
Increase (Decrease) of Net Cash Amount	38.77	-15.21	27.41
Balance at the Beginning of the Year	35.11	73.88	58.67
Balance at the End of the Year	73.88	58.67	86.08

Source: (1) Estados Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton
(2) Informe de Auditoria Financiera y de Cumplimientio por los Anos Terminados al 31 Diciembre de 2003 y 2002

Nore: Some figures in the table above were revised on the B/S and P/L.

Table 9.3.3 shows the cash flow statements for the three years. As shown in the table, the actual operation activities in 2001 and 2002 had a comparatively small change like –C$59 million in 2001 and C$85 million in 2002. Most of investment activities were covered by financial activities, particularly by donations and contributions. On the other hand, since the financial activities went down to –C$418 million in 2003, the investment activities shrank suddenly. It was covered by the adjustment to reconcile this reduction with the actual operation activities.

(2) Financial Statement of Managua Water Supply and Sanitation System in Managua City

The JICA study team was given financial statements of Managua City in 2001-2003, by the financial management of ENACAL, although these statements had some problems in accuracy because its centralized system does not have such kind of compiling programs. These problems were almost solved through discussions between the study team and ENACAL's counterparts.

The financial statements of water supply and sewerage sanitation services in Managua City were compiled taking consideration of the following adjustments referring to the discussion above. The financial statements were tabulated in **Table 9.3.4**.

1) The original financial statements presented by ENACAL were used as the original basic financial information.
2) Items of balance sheet (B/S) were settled as follows in accordance with the external audit documents for the entire ENACAL:
   (a) Assets
   - Fixed assets: (i) Land, (ii) Plant and equipment, (iii) Construction in progress, and (iv) Accumulated depreciation
   - Current assets: (i) Cash and bank deposits, (ii) Transitory investment, (iii) Account receivable, (iv) Allowance for doubtful account, (v) Inventory and (vi) Other current assets.
   - Other assets

   (b) Liability and capital
   - Capital: (i) Equity and (ii) Accumulated surplus/loss
   - Liability: (i) Fixed liability and (ii) Current liability
3) Items of profit and loss table (P/L) were settled in the same manner as well:
   (a) Revenue: (i) Sales revenue, (ii) Service reduction, (iii) Financial revenue and (iv) Other revenues
   (b) Expenditure: (i)Operating expense, (ii) Expense of maintenance, (iii) Expense of sales, (iv) Expense of administration, (v) Depreciation and (vi) Financial expenditure
   (c) Balance of the Year
4) The expenses of "Registration & Tariff Collection", and "Cost Center" in the original P/L were brought together into "Sales". The expenses of "Administration" and "Finance and Others" were into "Administration".
5) The depreciation expense figures of fixed assets were distributed into the respective management divisions concerned in the original P/L. In the compiled table, they were put into an independent item of "depreciation".
6) The annual amount of the financial expenditure in the ENACAL's statements was different from the one of the external audit report. In the statements revised, the original figures in the ENACAL's statements were applied from the viewpoint of keeping consistency of the total expenditure figure of the P/L.
7) The special revenue and expenditure, which were not linked to ordinary operation and

which were accounted from an intensive assessment process of cleaning or writing-off of assets and liabilities in previous years, were earmarked in the P/L in 2002. They were C$451 million and C$350 million, respectively. They were reckoned up in extraordinary gains and losses separately from the ordinary profits and losses. The same kind of revenues and expenditures were treated in the same way.

8) In 2001 and 2003, the accumulated deprecation expenses of sewerage treatment facilities in the P/L of Managua City were larger than the total amount of plant and equipment of sewerage facilities. These phenomena were revised in the following steps. (i) The ENACAL's ratio of accumulated depreciation of sewerage facilities to that of the total amount of sewerage plant and equipment was calculated in each fiscal year. (ii) The accumulated depreciation amount was calculated on the basis of the total amount of sewerage facilities applying the ratio calculated in (i).

9) The accumulated depreciation in 2002 was decreased to keep consistency with those before and after the year. After that, the total amount of sewerage plant and equipment was revised in accordance with the accumulated depreciation calculated. Finally, once the total depreciation does not match with the figure in the balance sheet, the figures were adjusted to harmonize between the two.

10) It is said to be impossible in the present financial situation to calculate the capital and liabilities of water supply and sewerage sanitation system for Managua City, because of the centralization. In this study, the ratio of capital and liability in the water supply sewerage treatment services in Managua City was the same as that of the entire ENACAL condition. The structural ratio in the capital, i.e., equity and accumulated surplus/loss, also applied the same assumption. The ratio in the liabilities was applied the same assumption, as well.

Table 9.3.4 Financial Statement of Water Supply and Sewerage Treatment Services in Managua City: 2001-2003

(Unit: C$ Million)

Item	2001	2002	2003
Balance Sheet			
I. Assets	**881.69**	**1,313.20**	**457.95**
1. Fixed Assets	**751.65**	**1,038.74**	**335.37**
(1) Land	10.40	122.72	10.60
(2) Plant & Equipment	743.75	851.69	766.93
(3) Construction in Progress	447.22	552.92	84.56
(4) Accumulated Depreciation	-449.72	-488.60	-526.71
2. Current Assets	**128.56**	**272.46**	**121.85**
(1) Cash & Bank Deposits	17.30	11.68	0.22
(2) Transitory Investment	-1.54	-1.12	0.00
(3) Account Receivable	260.22	319.15	341.42
(4) Allowance for Doubtful Account	-139.46	-123.32	-235.67
(5) Inventory	13.47	13.07	0.00
(6) Other Current Assets	-21.43	52.99	15.87
3. Other Assets	**1.48**	**1.99**	**0.73**
II. Liability and Capital	**881.69**	**1,313.20**	**457.95**
1. Capital	**698.15**	**955.91**	**326.26**
(1) Equity	772.27	1,002.70	448.16
(2) Accumulated Surplus/Loss	-74.12	-46.80	-121.90
1) Profit or Loss for the Year	22.59	27.33	-75.10
2) Profit or Loss for the Previous Years	-96.72	-74.12	-46.80
2. Liability	**183.54**	**357.29**	**131.69**
(1) Fixed Liability	145.33	260.08	93.82
(2) Current Liability	38.21	97.21	37.87
Profit and Loss Table			
I. Revenue	**363.80**	**345.43**	**358.78**
1. Sales Revenues	382.54	379.94	388.92
2. Service Reduction	-28.87	-41.77	-32.84
3. Financial Revenue	8.15	4.91	0.09
4. Other Revenues	1.98	2.35	2.61
II. Expenditure	**341.57**	**298.42**	**411.63**
1. Operating Expense	57.06	68.63	148.50
2. Expense of Maintenance	146.66	144.33	82.31
3. Expenses of Sales	95.77	36.99	126.62
4. Expenses of Administration	1.51	8.60	17.54
5. Depreciation	38.97	37.67	36.64
6. Financial Expenditure	1.60	2.20	0.03
III. Balance of Ordinary Gains and Losses	**22.23**	**47.01**	**-52.84**
IV. Extraordinary Gains and Losses	**0.36**	**-19.69**	**-22.26**
V. Balance of the Year	**22.59**	**27.33**	**-75.10**
VI. Accumulated Deficit			
1. Balance for Previous Years at Beginning of the Year	-96.72	-74.12	-46.80
2. Balance of the year	22.59	27.33	-75.10
3. **Balance of Accumulated Deficit at End of the Yea**	**-74.12**	**-46.80**	**-121.90**

The sales amount of water supply and sewerage services in Managua City in 2003 was C$359 million as shown in **Table 9.3.4**. It accounted for 53% of the total amount (C$680 million) of ENACAL in the same year. These ratios shifted to 54% in 2001 and 45% in 2002. That is to

say, the sales scale of water supply and sewerage services in Managua City accounted for around 50% of the total ENACAL's revenue from its business.

(3) Financial Statement of Managua Water Supply System

In order to compile financial statements of water supply service in Managua City, the study team set up the following given conditions and assumptions.

1) Financial statements of Managua City compiled in the previous section are used as basic data, which including both water supply and sewerage services. Basically, these statements were made to subtract sewerage treatment services and their related incomes and expenditures from **Table 9.3.4**.
2) Financial statements of water supply were compiled as differences of the total service figures and the sewerage figures. The general figures were allocated in proportion to ratios of water supply and sewerage services in the respective management divisions.
3) The capital and liabilities of water supply in Managua City were also constituted to be proportionate to ENACAL's composition, in the same way mentioned in the previous section.
4) Financial revenue and other revenue were counted for the revenues for water supply, because these revenues were not generated in the sewerage services.
5) Since the extraordinary gains and losses occurred in relation to assets and liabilities, these figures were divided proportionally based on the ratio (84%:16%) of asset values between water supply and sewerage treatment in 2002.
6) The expenses of "Registration and Tariff Collection" and "Cost Center" in the original P/L table were together brought into the expenses of "Sales" in the P/L revised. In the same manner, the expenses of "Administration" and "Finance and Others" were brought into those of "Administration".

The financial statements of water supply services only in Managua City were compiled as shown in **Table 9.3.5**, based on the given conditions and assumptions mentioned above.

Table 9.3.5 Financial Statement of Water Supply Services in Managua City: 2001-2003

(Unit: C$ Million)

Item	2001	2002	2003
Balance Sheet			
I. Assets	**797.66**	**1,043.92**	**339.38**
1. Fixed Assets	**638.89**	**811.69**	**218.87**
(1) Land	10.40	10.50	10.60
(2) Plant & Equipment	565.86	680.21	621.54
(3) Construction in Progress	425.00	516.43	15.79
(4) Accumulated Depreciation	-362.37	-395.45	-429.06
2. Current Assets	**158.04**	**231.50**	**119.78**
(1) Cash & Bank Deposits	15.08	10.18	0.19
(2) Transitory Investment	-1.34	-0.97	0.00
(3) Account Receivable	225.02	278.23	341.42
(5) Allowance for Doubtful Account	-131.33	-115.19	-235.67
(6) Inventory	13.47	13.07	0.00
(7) Other Current Assets	37.15	46.18	13.83
4. Other Assets	**0.73**	**0.73**	**0.73**
II. Liability and Capital	**797.66**	**1,043.92**	**339.38**
1. Equity	**631.61**	**759.89**	**241.78**
(1) Equity	762.02	899.94	484.61
(2) Accumulated Surplus/Loss	-130.41	-140.05	-242.83
1) Profit or Loss for the Year	-15.11	-9.64	-102.78
2) Profit or Loss for the Previous Years	-115.30	-130.41	-140.05
2. Liability	**166.05**	**284.03**	**97.59**
(1) Fixed Liability	131.48	206.75	69.53
(2) Current Liability	34.57	77.28	28.06
Profit and Loss Table			
I. Revenue	**302.63**	**288.56**	**318.42**
1. Sales Revenues	317.31	316.77	342.66
2. Service Reduction	-24.81	-35.47	-26.94
3. Financial Revenue	8.15	4.91	0.09
4. Other Revenues	1.98	2.35	2.61
II. Expenditure	**317.99**	**284.17**	**405.34**
1. Operating Expense	52.29	62.69	146.13
2. Expense of Maintenance	143.52	140.93	81.81
3. Expenses of Sales	85.93	36.98	126.62
4. Expenses of Administration	1.42	8.29	17.16
5. Depreciation	33.23	33.08	33.61
6. Financial Expenditure	1.60	2.20	0.03
III. Balance of Ordinary Gains and Losses	**-15.36**	**4.39**	**-86.92**
IV. Extraordinary Gains and Losses	0.26	-14.03	-15.86
V. Balance of the Year	**-15.11**	**-9.64**	**-102.78**
VI. Accumulated Deficit			
1. Balance for Previous Years at Beginning of the Year	-115.30	-130.41	-140.05
2. Balance of the year	-15.11	-9.64	-102.78
3. **Balance of Accumulated Deficit at End of the Year**	**-130.41**	**-140.05**	**-242.83**

The sales amount of water supply and sewerage sanitation services in Managua City in 2003 was C$359 million. That of water supply services was C$318 in the same year, accounting for 89% of the total service revenue in Managua City. In the same manner, its percentages were 83% in 2001 and 84% in 2002. Then, the percentage was around 85% as an average of the fiscal years 2001 to 2003. Furthermore, the operational performance of water supply service in Managua city accounted for 47% of that of the entire ENACAL in 2003. These ratios shifted to 45% in 2001 and 38% in 2002. Then, the sales scale of water supply service only in Managua City accounted for 43% of the total ENACAL's revenue.

ENACAL had a deficit of C$377 million in 2003, as shown in **Figure 9.3.1**. In the same way, Managua City recorded deficit of C$53 million in the same year. Furthermore, the water supply service of Managua City also recorded deficit of C$87 million, which was larger than the performance of water supply and sewerage services of Managua City. This means that the water supply service had deficit on its performance but that the sewerage services could have surplus in 2003.

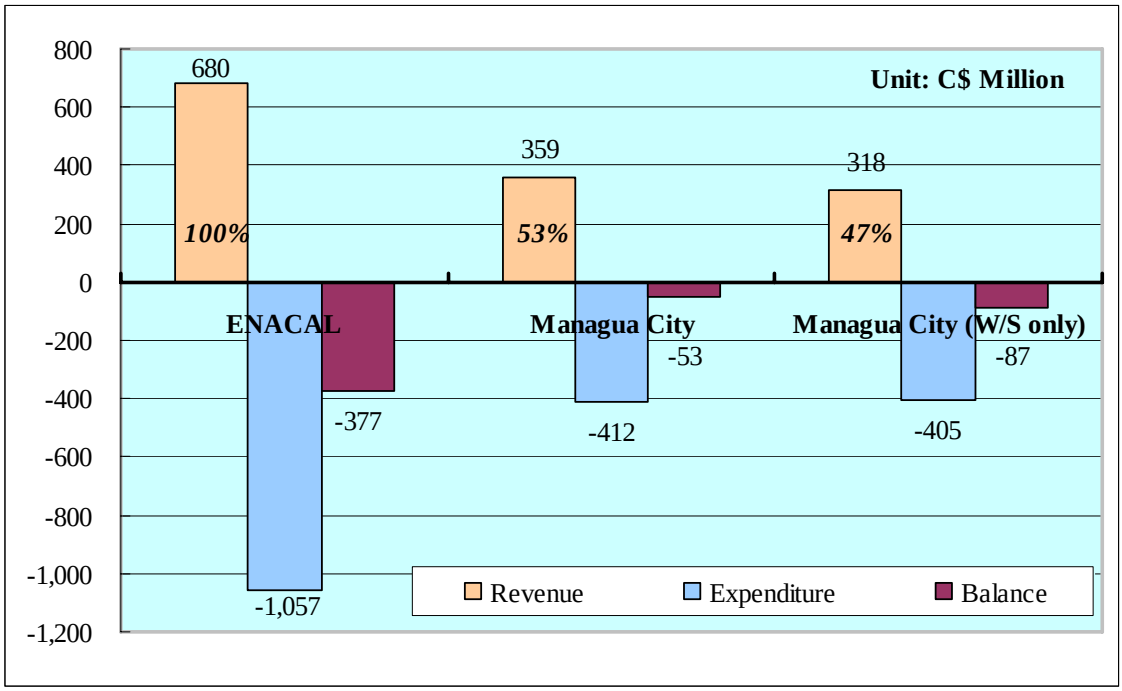


Figure 9.3.1 Business Performance of ENACAL, Managua City and Water Supply Services in Managua City: 2003

As mentioned above, although the water supply service of Managua City recorded deficit in 2003, it had some surplus on its ordinary performance in 2002, as shown in **Figure 9.3.2**. The increment of surplus in 2002 was attributed to cost savings of the sales division as shown in **Table 9.3.5**. On the other hand, the deficit in 2003 was attributed to cost increase of the both divisions of operation and sales. Thus, ENACAL is not stable on financial performance not only in Managua City but also in the entire ENACAL. This was because ENACAL itself is still under the way of organizational reform since taking over water supply and sewerage treatment services from INAA.

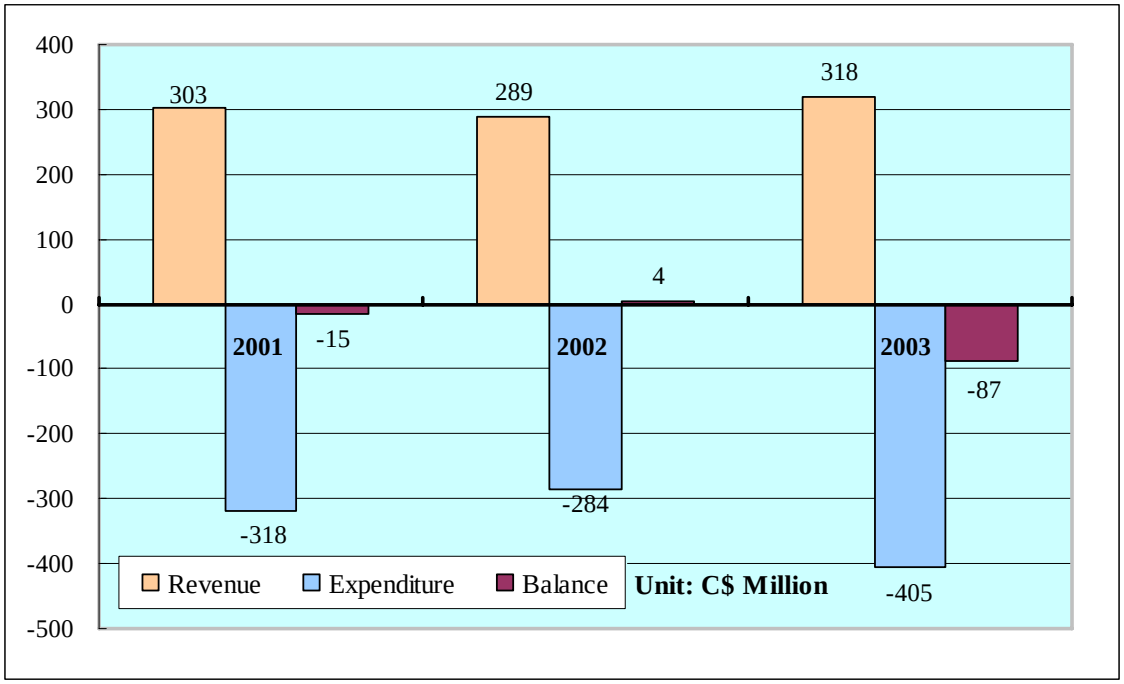


Figure 9.3.2 Transition of Operational Performance of Water Supply Service in Managua City: 2001-2003

9.3.3 Management Characteristics

On the basis of the financial statements of the water supply system in Managua City, the financial analysis was conducted to characterize the water supply service in Managua City. As a result of the analysis, several management indices show the management characteristics for improvement of the water supply service. **Table 9.3.6** shows management indices calculated through the analysis. Referring to these indices, the management conditions in 2001 to 2003 were discussed from the following points of view: profitability, safety, productivity and soundness.

The water supply service of ENACAL has to be managed in the same rational and effective manner as a private business is managed in competitive market. Thus, the management should introduce a private management system and establish management targets based on objectively quantitative data and information. Management indices of water supply service are one of the most effective sources with compiled with authentic sources. In the table, the indices of Japanese case of water supply service are listed as statistical standard data of the water supply business in Japan.

The profitability was evaluated through the indices of No.1 index of "ratio of net operation profit to total capital" and No.2 of "turnover of total capital" in the table. The first index was worse than the Japanese index. The second index was better than the Japanese one. This is because the total capital is small as compared with that of the Japanese case. One of the main reasons of the small capital is the accumulated deficit which resulted in the scale-down of the capital. No.3 index of "ratio of net expense to net sales amount" was much worse than the Japanese index. The index of more than 100 means that the net expense is more than the net sales amount, i.e., a negative spread condition. The more sales of water, the more ENACAL increases deficit.

The safety was judged from the indices of No.4 to No.8 in the table. The ratios of fixed assets

were checked through No.4 of “fixed asset ratio” and No.5 of “ratio of fixed assets to long-term capital”. The former ratio is desirable to be less than 100%. Even if the former ratio were in worse condition but if the latter ratio were less than 100%, the safety might be fair within the permissible range of safety. As shown in the table, the index of No4 was not in good condition, but the index of No.5 was less than 100%. Thus, the management of fixed assets is in the fair condition. Although the index shows better condition in terms of fixed assets, the total amount of the fixed assets seems to be too small because of little investment for replacement and reproduction.

Yet, No.7 index of “turnover of account receivable” was quite worse as compared with the Japanese index. It indicates speed of bill collection. A period of bill collection is calculated applying the following formula: Period of Bill Collection = 365 days / Turnover of Account Receivable. Applying this formula, the index of 1.0 means that it takes one year to collect the whole account receivable. Thus, the ratio should be improved as soon as possible for keeping the financial conditions in safety. Incidentally, the index of 7.9 of Japanese case means almost 1.5 months for collection.

The ratio of depreciation to fixed assts (No.8) shows a size of depreciation against a book value of fixed assets depreciable. An inverse number of the ratio, then, shows an average economic life of fixed assets. For instance, 5.4% in 2003 indicates around 19 years of economic life. Furthermore, the fixed assets have already depreciated around 70% of the total value in 2003, although this percentage in Japan was around 32% on average in 2002. This is proof that new investment and replacement works might be delayed or stagnant from the standard schedule.

The productivity was evaluated through the indices of No.9 to No.15. The index of No.10 “Unit Price” was C$4.8/$m^3$ in 2001, C$4.6/$m^3$ in 2002 and C$5.1/$m^3$ in 2003, which was obviously smaller than the ENACAL’s public announcement price of C$5.8/$m^3$ in 2004, even if annual inflation rates were considered. This means that the average water price in Managua City was set in lower level. Furthermore, the index of No.11 “Unit Production Cost” shows larger than the unit prices in the respective years. This is again another evidence of the negative spread condition in water supply service in Managua City.

Table 9.3.6 Management Indices of Water Supply Service in Managua City: 2001 to 2003

No.	Item	Unit	2001	2002	2003	Index in Japan*4
1.	Ratio of Net Operating Profit to Total Capital	%	-	0.58	-	0.67
2.	Turnover of Total Capital		0.46	0.37	1.31	0.13
3.	Ratio of Net Expense to Net Sales Amount	%	109	101	128	95
4.	Fixed Assets Ratio	%	101.2	106.8	90.5	182.6
5.	Ratio of Fixed Assets to Long-Term Capital	%	83.7	84.0	70.3	94.5
6.	Current Ratio	%	457	297	427	302
7.	Turnover of Account Receivable		1.3	1.0	0.9	7.9
8.	Ratio of Depreciation to Fixed Assets	%	5.9	4.9	5.4	3.4
9.	Annual Production per Employee	*1	454	462	571	5,706
10.	Unit Price	C$/$m^3$	4.8	4.6	5.1	19.7
11.	Unit Production Cost	C$/$m^3$	5.2	4.6	6.6	18.8
12.	Utilization Ratio of Fixed Assets	*2	205	166	663	1.0
13.	Monthly Compensation per Employee	*1	6.1	6.4	8.0	-
14.	Ratio of Compensation to Net Sales Amount	%	16.1	16.5	16.9	19.3
15.	Number of Employees per Water Supplied	*3	1.8	1.6	1.4	1.2

Note: *1 C$1000/Person
*2 m^3/C$1000
*3 Persons/1000m^3/day
*4 In 2001 except No.10 and 11 in 2002

As shown in the number of employees per water volume supplied in No.15 index, the number of staff for water supply seems to be large as compared with the Japanese average. As shown in the table, it decreased from 1.8 persons per 1,000 m^3 per day in 2001 to 1.4 persons per 1,000 m^3 per day in 2004, but it was still more than the Japanese average. Thus, the number of employees should be reduced taking into account of the Japanese standard.

The soundness of financial system is assessed through the indices of profitability, safety and productivity. The sound financial conditions are not only for these indices to attain in good results but also to be in good balance among these indices. Since the indices were analyzed taking account of the Japanese ones, the evaluation results may not always be pertinent to ENACAL's conditions. The management principle is something common in the business world. These indices should be utilized properly to manage soundly the water supply business.

ENACAL is said to carry out reasonable high-scores of bill-collection rate, i.e., 88% to 91% in recent years. In spite of that, ENACAL's water supply service in Managua City recorded the total amount C$341 million of account receivable in 2003 as shown in **Table 9.3.5**. ENACAL has already announced for improvement of financial condition as follows. Among the total account receivable, some amounts (around C$48 million) of the diverse receivable account were already decided to be paid by the central government. Other portions were still doubtful in terms of collection. C$170 million or 37% of the total amount was reported as those uncollected before 2000. Furthermore, it is said that 45% of the total amount might be uncollectible, according to the IDB report of "Management Development Report". In terms of Managua City, the detail segregated figures of account receivable are not clear in its financial statements. However, the situation of outstanding account receivables might be almost the

same as the total ENACAL. The large amount of accounts receivable always gives problems of cash flow to the management.

CVP Analysis

CVP analysis is one of the management tools, which is used for short-term profit planning. CVP stands for cost, volume (of sales) and profit. Break-even analysis is one of the CVP analyses. The break-even point (BEP) is a point that revenue equals to cost, i.e., the point of no net profit. It is illustrated in **Figure 9.3.3**. **Table 9.3.7** shows the break-even points in Managua City, based on the financial statements of water supply service. The BEPs were calculated at around C$390 million, referring the figures of C$335 million in 2001, C$279 million in 2002 and C$560 million in 2003. Once the BEP was estimated, the sales amount to get target profit could be estimated through the following formula.

Table 9.3.7 Break-Even Point and Management Safety

Item		2001 (C$ Million)	2002 (C$ Million)	2002 Ratio to Preceding Term	2003 (C$ Million)	2003 Ratio to Preceding Term
Fixed Expenses	Compensation	47.07	46.38	0.99	53.25	1.15
	Depreciation	33.23	33.08	1.00	33.61	1.02
	Management	2.66	9.18	3.45	14.93	1.63
	Other Expenses	75.23	34.44	0.46	99.88	2.90
	Sub-total	158.20	123.08	0.78	201.67	1.64
Variable Expenses	Operation	24.84	37.37	1.50	126.59	3.39
	Maintenance	120.81	118.72	0.98	55.12	0.46
	Other Expenses	14.15	5.00	0.35	21.97	4.39
	Sub-total	159.80	161.09	1.01	203.68	1.26
Sales Amount		302.63	288.56	0.95	318.42	1.10
Marginal Revenue Ratio *1		0.472	0.442	-	0.360	-
Break Even Point *2		335	279	0.83	560	2.01
Ratio of Break Even Point *3		1.11	0.97	-	1.76	-
Management Safety Ratio *4		0.90	1.04	-	0.57	-

Note: *1 (Sales Amount - Variable Expenses)/Sales Amount
*2 Fixed Expenses/Marginal Revenue Ratio
*3 Break Even Point/Sales Amount
*4 Reciprocal of Break Even Point Ratio (= 1/Ratio of Break Even Point)

$$S = \frac{(F + P)}{M}$$

Where, S : Sales amount to attain target profit
F : Fixed Expenditure
P : Target Profit
M : Marginal Revenue Ratio

For example, if *F* and *M* were applied with the figures in 2003, i.e., F=C$202 million, M=0.360, and P was assumed at around C$32 million, around 15% of sales amount in 2003, the sales amount should be C$650 million or 100% more than the sales amount in 2003. This is one of the management plans to develop sound financial condition in the future.

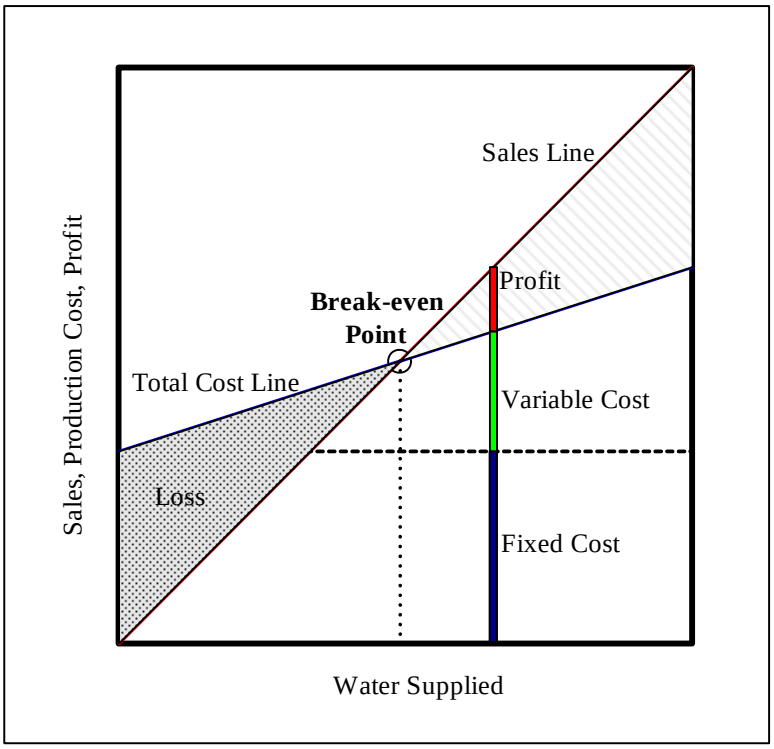


Figure 9.3.3 Break-even Point

9.3.4 Water Production Costs

Water production costs of ENACAL were estimated in **Table 9.3.8**, which were based on the total production volume of water and operation and maintenance costs. Unit production costs during three years from 2001 to 2003 in the table were larger than the average unit prices, as mentioned before. The average unit prices were much smaller than the corresponding unit production costs, except 2002. In particular, ENACAL recorded the heavy deficit in 2003.

In 2003, the water production cost was C$7.2/m^3 and the unit price was C$5.1/m^3, as shown in the table. These figures were based on water volume of 61.5 million m^3 per annum, which were sold to the consumers. In the production base, ENACAL produced 145.0 million m^3 per annum. Around 57% of the production was lost as non-revenue water. Its production cost was calculated as C$3.1/m^3 at the plant side. Its cost was recalculated at C$2.9/m^3 as an average for the recent three years. If ENACAL expected to attain a net profit of 15% under the present management conditions, it might increase the total sales' amount of C$650 million from C$316 million in 2003 as discussed in the BEP analysis, corresponding to 127 million m^3 of annual volume or 100% more than 61.5 million m^3 sold in 2003. It might be impossible for ENACALL to attain this target at the present water market.

Table 9.3.8 Unit Price and Production Cost of Water in Managua City: 2001-2003

Item	Unit	2001	2002	2003
1. Management Data				
Production	Million m^3	131.11	134.72	145.06
Sold Volume	Million m^3	61.25	61.45	61.54
Non-Revenue Water	Million m^3	69.87	73.28	83.51
Effective Ratio	%	46.71	45.61	42.43
Employees	Persons	758	713	650
Active Connection	Nos	155,905	164,865	169,843
No. of Employees per Connection	Nos	4.86	4.32	3.83
2. Sales	C$ Million	292.50	281.30	315.72
Water Sales	C$ Million	317.31	316.77	342.66
Service Reduction	C$ Million	-24.81	-35.47	-26.94
3. Average Unit Price				
(1) Unit Price per Sold Water	C/m^3$	**4.78**	**4.58**	**5.13**
(2) Unit Price per Production	C/m^3$	2.23	2.09	2.18
4. Production Costs	C$ Million	368.40	327.25	445.49
(1) Direct Costs of Water Production	C$ Million	228.46	236.14	260.98
1) Operation	C$ Million	145.03	139.95	183.82
a) Water Production	C$ Million	120.39	118.43	55.03
a) Water Distribution	C$ Million	0.45	0.28	0.11
a) Operation	C$ Million	24.19	21.24	128.67
2) Maintenance	C$ Million	22.40	21.76	23.65
3) Depreciation	C$ Million	32.65	32.52	33.06
4) Others	C$ Million	28.38	41.90	20.46
(2) Managerial Expenditure	C$ Million	139.94	91.12	184.51
1) Sales	C$ Million	85.93	36.98	126.62
2) Administration	C$ Million	1.42	8.29	17.16
3) Depreciation	C$ Million	0.59	0.56	0.55
4) Financial Expenditure	C$ Million	1.60	2.20	0.03
5) Transfer to Central Level*1	C$ Million	50.41	43.09	40.16
5. Unit Production Cost				
(1) Unit Production Cost per Sold Water				
1) Direct Cost Only	C/m^3$	3.73	3.84	4.24
2) Direct Cost without Depreciation	C/m^3$	3.20	3.31	3.70
3) Total Cost	C/m^3$	**6.02**	**5.33**	**7.24**
(2) Unit Production Cost per Produced Water				
1) Direct Cost Only	C/m^3$	1.74	1.75	1.80
2) Direct Cost without Depreciation	C/m^3$	1.49	1.51	1.57
3) Total Cost	C/m^3$	2.81	2.43	3.07

Note: *1 Transfer payment was added to the ordinary expenses in the production cost, which was assumed as 47% of the total expenditure of the Central Level. 47% was the ratio of the number of connections in Managua City to the ENACAL Total.

9.3.5 Water Tariff System

(1) Current Water Tariff in Managua City

In principle, ENACAL collects water charges on the basis of meter-rate system. The present water tariff consists of two lines, i.e., standing and variable charges, as shown in **Table 9.3.9**. The tariff is classified into four categories: (a) domestic users' group subsidized internally, (b) general residence, (c) residence along trunk roads, and (d) other users such as industrial, commercial and institutional users. The unit rates are set by the categories above and by water volume consumed. **Figure 9.3.4** shows the monthly water charges by category and by water consumed.

The tariff was set up into four categories mentioned above through modification of the average prices of C$5.58/$m^3$, equivalent to around US$0.36/$m^3$. The tariff rates are so low that the water charges can not cover the full costs of water production.

Yet, a domestic user, who is not classified in the four categories due to no water-meter installed, is charged in a fixed rate of C$55.86/month/connection equivalent to water consumption of 26 m^3/month. These users might consume domestic water of much more than 26 m^3/month because of no metering condition. This condition is said to cause one of the most serious water waste for ENACAL.

Table 9.3.9 Water Tariff in Managua City: 2004

Category	Standing Charge (C$/Connection/month)	Variable Charge (C$/m3) Range of Water Consumption		Water Rate	Sewerage Rate
Domestic Users					
1. Subsidized Group	1.06	Less than	20 m^3/month	1.99	0.77
		More than	21 m^3/month	2.50	0.99
2. General Residence	4.24	Less than	20 m^3/month	3.54	1.06
		Between	21-50 m^3/month	5.88	1.46
		More than	51 m^3/month	10.48	3.45
3. Residence along	8.56	Less than	20 m^3/month	5.88	1.69
Trunk Roads		Between	21-50 m^3/month	5.88	1.69
		More than	51 m^3/month	13.20	4.27
Non-domestic Users					
4. Other Users	Industrial, Commercial and Institutional Users				
	8.56	Less than	50 m^3/month	6.76	1.69
		More than	51 m^3/month	14.49	4.27

Source: ENACAL

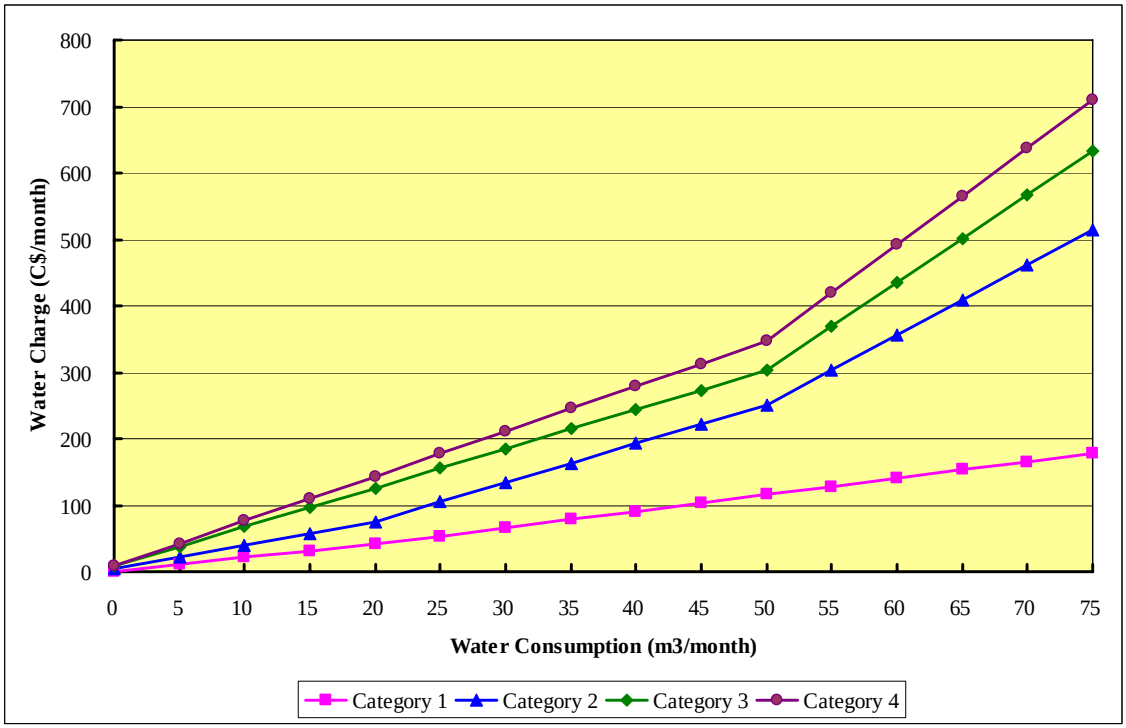


Figure 9.3.4 Present Water Charge by Tariff Category

The present tariff made ENACAL a small net profit in 2002, but brought about again a large deficit in 2003. The profit was too small to solve the accumulated deficit for the previous years. The ENACAL is planning to revise the water tariff. In order to revise the tariff, ENACAL has to get permissions from the Parliament and President Office as well as INAA. The procedure for revision of the tariff requires a long time.

Water meters reading is conducted by meter readers once a month for the respective consumers. The bills of water volume metered are prepared with a computer system and distributed to the respective consumers. The consumers can pay the water charge through banking network, directly to the water reader, or pay at a cashier's window of ENACAL's branch offices. Some of consumers, however, seem not to pay their water charge without delay. This causes that ENACAL's account receivable was considerably large as discussed in the previous sections. Considerable percentage of account receivable is said to be attributed to arrearages of public agencies of the government.

In addition, most water consumers install a water meter to connect to the water distribution piping network of ENACAL. After signing a contract with ENACAL, a new consumer has to pay for an installation charge for water meter. ENACAL installs connection pipes including the water meter based on the contract. In 2004, an average rate of new 13mmø connection installment was around C$400 per unit plus C$50 for guarantee. Its actual cost depends on the site conditions of the new consumer. As a result, a larger diameter connection needs higher installation cost. The meter installation charge rate is tabulated in **Table 9.3.10**.

Yet, the water meter installation includes the laying down of water meter with piping and valves for connection, in addition to a water meter itself. Thus, its total cost is said to be around US$125 on average, which is much larger than the water meter installation charge. Nevertheless, this installation charge would be heavy burden for low-income families. This is one of reasons why the metered tariff system does not penetrate into low-income areas. For the low-income people, thus, a counter-measure for alleviating financial burden might be

essential to promote the metered tariff system in Managua City.

Table 9.3.10 Water Meter Installation Charge: 2004

	Connection Diameter	Connection Charge (C$)	Deposit for Guarantee (C$)
1.	13 mmø	400	50
2.	20 mmø	550	100
3.	25 mmø	750	150
4.	40 mmø	3,500	700
5.	50 mmø	5,000	1,000

Source: ENACAL
Note: *1 A consumer is charged C$30 for each transfer of the title.
*2 Aconsumer is charged C$50 for each reconection.

(2) Trend of Average Water Rate

According to the Financial Department ENACAL, the trend of national average water rate based on tariff of ENACAL is shown in **Table 9.3.11**. In 1997, the average water rate was set at C$2.78/$m^3$. As of 2004, the average water rate was C$5.58 kip/$m^3$ or around two times more than that in 1997.

On the other hand, a consumer price index (CPI) in 1997 was 79.5 (base: 1999=100) and rose up to 124.5 in 2003, as shown in **Table 9.3.11**. Then, an inflation rate during the period was around 1.56 times. Thus, the increase rate (2 times for 6 years from 1997 to 2003) of the average water rate was higher than the inflation rate (1.56 times for the same period). The water rate is going ahead of the inflation rate. **Figure 9.3.5** illustrates this relation between water rates and inflation rates. Although the water consumers might be disaffected toward water price comparatively increasing in price, the water rates are still low at present.

Table 9.3.11 National Average Water Rate

Year	National Average Water Rate		CPI
	C$/$m^3$	US$/$m^3$	(1999=100)
1997	2.78	0.29	79.5
1998	3.44	0.33	89.9
1999	4.31	0.36	100.0
2000	5.14	0.41	111.5
2001	5.18	0.37	113.8
2002	5.45	0.37	118.4
2003	5.58	0.36	124.5

Source: ENACAL and CBN

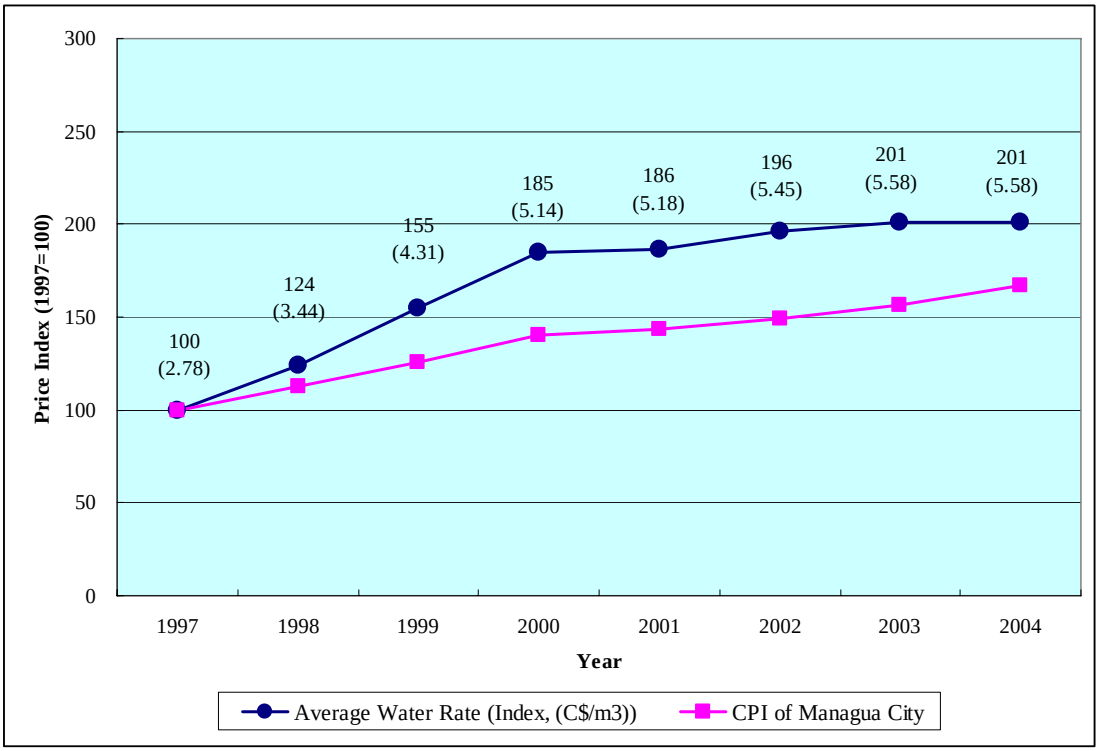


Figure 9.3.5 Trend of Average Water Rate and CPI

According to the sales records, a household in middle-income class consumes in Managua City around 26m^3/month on average in 2004. That household is charged C$110.32/month for potable water based on the present tariff. INEC-EMNV shows that an average household income was C$77,450/annum on average in 2001, according to the "Informe General 2001, INEC". In 2004, the household income was converted to C$92,200 per month, applying the inflation rate of 1.19 calculated through price indices between 113.8 in 2001 and 135.0 of 2004 as shown in **Table 11A-12** of **Annex 11A**. This is equivalent to C$7,685/month in 2004. Accordingly, the water expense of the typical household accounted for 1.4% of the monthly expenditure. This rate was slightly lower than that in the said survey, which was calculated as 1.6%, i.e., C$1,214 of water over C$77,450 of the total expenditure. This percentage is much lower than the benchmark of the upper limit supported by many donors. The benchmark is proposed as 3 ~ 5% of the range of disposable income. Thus, the water rate itself is considered to be at lower level than other commodity prices.

(3) Comparison of Water Tariff in Managua City with Other Waterworks

The water rates in Managua City are known to be cheaper than those in other service areas. **Figure 9.3.6** shows water charges for an average household consuming up to 75 m^3/month in the cities and service areas. The monthly charge of the typical household consuming 26 m^3/month in the respective cities and departments was calculated at C$90.04/month by ENACAL in Managua City, C$138.44/month by ENACAL in Departments, C$182.62/month by Local Government in Matagalpa City and C$142.73/month by Local Government in Jinotega City. Thus, the water consumers in Managua City can enjoy the lowest water charge in the country. An average water rate of the respective areas was C$3.46/m^3 in Managua City, C$5.32/m^3 in Departments, C$7.02/m^3 in Matagalpa City and C$5.49/m^3 in Jinotega City.

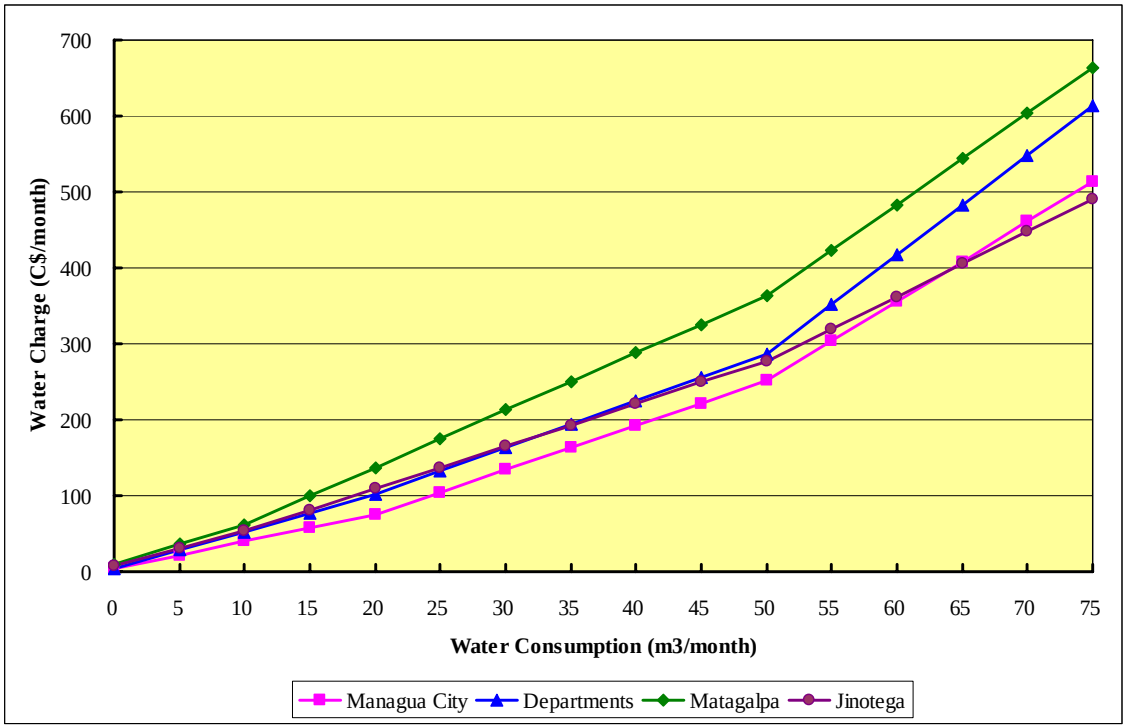


Figure 9.3.6 Water Charges of Medium Class Household by Service Area: 2004

9.3.6 Financial Constraints for Future Development

Through the discussions in the previous sections, the following constraints of financial aspects were observed for the future development of ENACAL. In order to formulate the current plan, it would be essential that counter measures for these constraints could be promoted in the financial plan.

- *Water production cost and water unit price are in negative spread condition.* As discussed in **Section 9.3.3**, the production cost of potable water was higher than the average unit price of water in most of years. This means that the more ENACAL sales water to consumer, the more it gets deficit in its management. In the financial position in 2003, ENACAL could not attain an ordinary profit in the present water market, as mentioned before. As a result, its revenue can not cover sufficient operation and maintenance works and, of course, execute its capital replacement and new investment.
- *Excessive account receivable worsens cash flow.* The turnovers of account receivable were nearly 1.0 for the recent three years. This means that it takes almost one year to collect the whole account receivable. It might lead to a cash flow crisis. In general waterworks, the turnover must be between 6 and 8, i.e., collecting the receivables within 45 days to 60days. It is said that the recent tariff collection performance is improved from the former conditions. However, ENACAL has still a lot of uncollectible receivables. These accounts would become obstacles to progress in the future.
- *Water supply facilities and equipment is becoming obsolete.* As of 2003, the fixed assets for water supply service have already depreciated around 70% of the total book values. This means that their replacement might be delayed or stagnant from standard schedule. Too late replacement could make them impossible to recover their functions.
- *Labor productivity should be improved.* The number of staff seems to be larger than

the Japanese average, as examined from the index of the number of employees per water volume supplied. For improvement of labor productivity, professional training of staff, high profession-conscious of field workers and introduction of appropriate automation might be necessary in waterworks process.

- *O&M are managed in low-cost principle.* Because of lack of funds for O&M works, the level of facilities and equipment conditions are quite low. Since the water production cost is kept to be low because of low water price, essential works are left behind in the proper level of O&M works. For example, too late replacement of facilities and equipment and too little inventory of spare parts and raw materials are found in the financial statements.
- *Financial statements of Managua City waterworks can not be compiled independently.* At present, the ENACAL management covers the whole country except two departments. The financial management is completely centralized by the head office. Therefore, it is impossible to compile the financial statements of Managua City waterworks. The management of this waterworks can not have the financial information for judging the management conditions of Managua City Water Supply Service.

9.4 MANAGEMENT IMPROVEMENT PLAN FOR IMPLEMENTING THE PROPOSED LONG-TERM PROJECT

9.4.1 Management of Managua Water Supply by ENACAL

Water supply service in Managua City is managed by ENACAL as a part of the national water supply and sewerage sanitation services. In this financial study, however, the water supply service in Managua City is assumed as a single independent entity in ENACAL. Under this assumption, the management issues of Managua City water supply business are discussed in terms of financial problems and challenges for implementing the Long-term Improvement Plan from the point of financial view.

In this study, water supply service would be managed on a full cost recovery basis to ensure the sustainability of the service by the target year 2015. In this financial study, the management could attain Cost Recovery Level II by the year 2010 and Cost Recovery Level III by the year 2015. Level II indicates that the revenue from water supply service could completely recover O&M expenses and depreciation expenses of the water supply equipment and facilities. Therefore, the management has to keep the standard operating and maintenance service quality by its own funds. However, it must depend on the support from the government with regard to payment for interest accruing from long-term loans for capital investment in this stage. Furthermore, it must depend on external financial sources for expansion due to its increasing water demand in the future, as well.

By the target year 2015, it would attain the independent autonomous management level. It could procure financial sources from donors for expanding its water supply system on its own risk. In this stage, the management will not need any financial support from the government for system expansion. In this study, its sales revenue could be proposed for the management to attain the Cost Recovery Level III by the target year 2015.

9.4.2 Revenue from Water Supply Services

The revenue of water supply services accrues from water sales and water meter installation charges. The water sales are based on the water tariff of ENACAL. The present water tariff is constituted of four categories: water charges by type of water consumer, i.e., Category 1 to 3 or

domestic consumers such as residential users and Category 4 or non-domestic consumers. In addition, the installation fee for new consumers is charged to the consumer registered to water supply system. The water tariff is set-up as shown in **Tables 9.3.9** and **9.3.10**.

As discussed in the previous section 9.3, an average unit price of piped domestic water in 2003 is lower than the unit production cost in Managua City. Thus, it would be impossible to turn around performance from loss to profit as far as the present tariff is applied for the Managua City's service territory. The raising water rate is indispensable to attain the management target for the planning 11 years until the target year 2015.

In this study, the new tariff system is tentatively proposed to attain at promoting water conservation and at giving preferential treatment of tariff advantage to extremely low-income people. This new tariff is tabulated in **Table 9.4.1** and also drawn out in **Figure 9.4.1**. The new tariff system should be introduced after the pilot empirical study in asentamientos and also after the discussion of stakeholders regarding the new tariff system.

Table 9.4.1 New Water Tariff Proposed as Tentative Plan

Category	Standing Charge (C$/Connection/month)	Variable Charge (C$/m3) Range of Water Consumption		Water Rate
Domestic Users				
1. General Domestic User	9.18	Less than	10 m^3/month	5.28
(General Residence Class)		Between	11-30 m^3/month	7.54
		Between	31-50 m^3/month	9.84
		More than	51 m^3/month	12.00
2. Subsidized User	0.00	Less than	10 m^3/month	0.00
(Low-Income Class)		Between	11-30 m^3/month	3.50
		Between	31-50 m^3/month	5.25
		More than	51 m^3/month	9.00
Non-domestic Users				
3. Other Users	Industrial, Commercial and Institutional Users			
	8.56	Less than	50 m^3/month	6.76
		More than	51 m^3/month	14.49

The new tariff was assumed to be effective after 2007 forward. To attain the target of the Cost Recovery Level III, the water rate of the new tariff was assumed to be raised at the rate of 3.5% per annum. Incidentally, 3.5% per annum was quoted form an average growth rate of GDP in Nicaragua for the recent five years between1998 and 2003. The possibilities of these measures will be examined in the financial simulation analysis in the following sections.

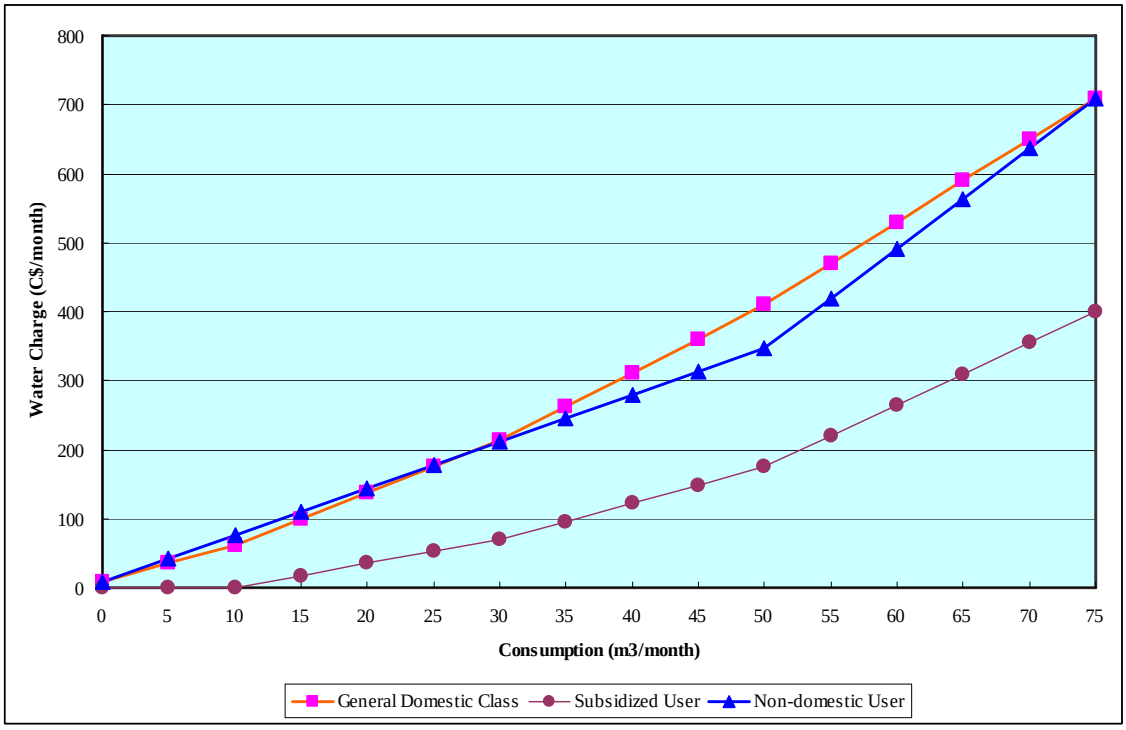


Figure 9.4.1 New Water Tariff Proposed as Tentative Plan

9.4.3 Costs of Capital Investment and O&M

The capital investment of the long-term improvement plan was explained in **Supporting Report No.7**. The foreign portion of the investment is mainly financed by the foreign donors and international agencies. ENACAL portion is assumed to be financed by ENACAL itself with support of the central government. The investment costs in cordobas and time schedule was tabulated in **Table 9.4.2.** At present, the O&M costs of water supply system are restrained due to a reduced budget of ENACAL. This retrenchment of the O&M budgets causes to lower the water service level and to shorten lives of equipment and facilities. Thus, the O&M costs are assumed to be increased to the standard level by 2008 from the present reduced budget level. The incremental appropriation for the respective sections was set as follows: 100% increase for Operation sections except electric power cost and 50% increase for administration sections except transfer payment to central level. The estimated O&M costs were enumerated in the P/L in **Table 9.4.3**.

Table 9.4.2 Schedule of Capital Investment by Financial Sources

(Unit: C$ Million at 2004 constant price)

Item	First Stage					Sub-total ('06-'10)
	2006	2007	2008	2009	2010	
Total	31.7	176.8	388.3	197.0	262.8	1,056.7
Donors	0.0	121.8	314.1	116.4	171.1	723.4
ENACAL	31.7	55.0	74.2	80.6	91.7	333.3

Item	Second Stage					Total ('06-'15)
	2011	2012	2013	2014	2015	
Total	244.9	161.3	188.8	161.7	74.7	1,888.0
Donors	171.1	0.0	0.0	0.0	0.0	894.5
ENACAL	73.8	161.3	188.8	161.7	74.7	993.5

Note: The costs excluded the price contingencies based on the no inflation assumption.

9.4.4 Financial Plan for Long-term Improvement Plan

In this financial plan study, the revenue from the water supply services and the expenditure for operation and maintenance as well as capital investment are estimated on the basis of the proposed water supply improvement plan. Besides these data, the following conditions and assumptions are set-up for the financial simulation.

1) Projection period: 10 years, from 2006 as the start year of consulting services and then construction works of the proposed project, and its operation through 2015.

2) Prices and cost escalation: Projections of both revenue and expenditure were made without escalation to simplify and to make the simulation clearly understandable.

3) Currency and exchange rate: Capital costs, revenues and expenditures are evaluated in Cordoba. Exchange rates of C$16.2834 to US$ 1.00 are applied in this study.

4) Finances for Implementation: Finances for the financial plans are set as shown below. The management of Managua City Water Supply Services has already a long-term loan of around C$70 million as of 2003. This liability was assumed to be repaid within 10 years with the same terms mentioned in the note 1 above.

	Financial Source	Amount (C$ Million)
1.	Loan*1 (International Agency)	894.5
2.	Central Government*2	993.5
3.	Short-term Borrowing for Liquidity*3	-

Note: *1 Terms of loan by international agency are as follows: 2.0% of annual interest rate, and 35 years of repayment period with 10 years of grace period.

*2 ENACAL is assumed borrow local portion of the capital investment from the central government under the following terms: no interest, and 10 years of repayment period with 5 years of grace period.

*3 When ENACAL faces a serious cash flow crisis, it was assumed to borrow short-term funds from local creditors with 5% of annual interest rate.

5) Taxes: All revenues, expenses and profits of ENACAL are exempt from taxation such as VAT and profit tax.

6) Water Tariff: At the beginning stage of the simulation, the present tariff in 2004 was applied for the all water consumers of both domestic and non-domestic consumers. In 2007, the new water tariff was assumed to be introduced for all users, which was discussed in Section 9.4.2.

7) Revenues: The revenues of the water supply services accrue form water sales and water meter installation charges. In addition, an interest revenue accrues from the bank deposit as non-operating income.

6) Procurement for Liquidity: The management has already had two major negative components for financial operation: account receivables and accumulated deficit. Account receivables are planned to be resolved to the normal condition by 2006. However, the huge accumulated deficit will be still remained to the future. It will cause for the management to be short on the working capital. Then, it makes emergency resources to the external finances for liquidity. In this simulation, these sources were assumed to be

financed by the government as short-term borrowing for liquidity. The terms of borrowing was mentioned in the item 4) above.

7) Depreciation: Fixed assets such as water supply plant and distribution piping network are depreciated using straight-line method over 30 years. The engineering services are depreciated in also 30 years and some machinery such as pumps and power generator are depreciated in 15 years. In this simulation, however, the overall water supply system was assumed to be depreciated in 25 years on average for simplification of the simulation.

8) Target of Simulation: In 2010 the financial management attains to turn the operating balance into profitable, that is, Cost Recovery Level II. In 2015, the management has the ordinary balance surplus, that is, Cost Recovery Level III.

9.4.5 Financial Simulation of Long-term Improvement Plan

This section presents a financial simulation of waterworks for the Long-term Improvement Plan. The financial simulation is based on information about "existing financial system of water supply service" and the basic conditions and assumptions discussed in the previous section. The output of the financial statements is tabulated applying an integrated financial simulation model. The analysis will throw light on the financial problems on the proposed project and fund requirement for the water supply management.

The simulation result was tabulated in **Tables 9.4.3** to **9.4.5**. The trend of the profit and loss during the simulation period between 2005 and 2015 was drawn up in **Figure 9.4.2**. As shown in the figure, the management almost attains the cost recovery level II in 2010. The ordinary balance moves toward surplus in 2011. In 2015, the management attains the cost recovery level III.

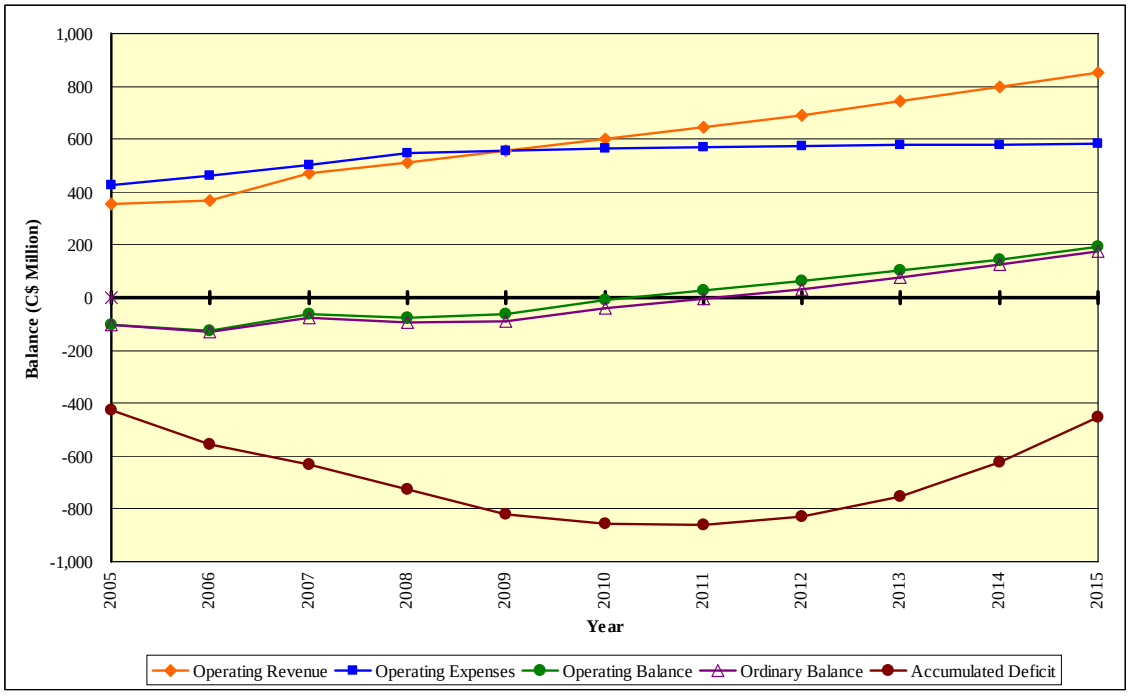


Figure 9.4.2 Profit and Loss of Water Supply Services: 2005 – 2015

Table 9.4.3 Profit and Loss Table: 2005 - 2015

(C$ Million)

Item	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Operating Revenue	**356.2**	**369.6**	**471.9**	**511.9**	**555.1**	**601.7**	**645.6**	**692.6**	**742.8**	**796.5**	**853.9**
1. Water Sales	354.4	367.8	470.1	509.9	553.0	599.5	643.3	690.1	740.1	793.6	850.9
(1) Domestic	241.3	250.7	348.7	378.5	410.8	445.6	478.4	513.5	551.0	591.2	634.1
(2) Non-domestic	113.1	117.2	121.4	131.4	142.2	153.9	164.9	176.6	189.1	202.5	216.7
2. New Connection	1.8	1.8	1.8	2.0	2.1	2.2	2.3	2.5	2.6	2.8	3.0
II. Operating Expenses	**424.9**	**460.5**	**501.7**	**549.2**	**557.5**	**566.1**	**569.5**	**573.1**	**576.8**	**580.6**	**584.7**
1. Operation Costs	235.4	250.7	268.9	290.6	290.9	291.1	288.8	286.5	284.3	282.0	279.8
(1) Opeation	177.7	182.4	187.9	194.7	194.8	195.0	193.5	191.9	190.4	188.9	187.4
1) Electricity	149.7	149.2	148.6	148.1	148.2	148.3	147.1	146.0	144.8	143.7	142.5
2) Others	28.0	33.2	39.3	46.6	46.7	46.7	46.3	46.0	45.6	45.2	44.9
(2) Maintenance	33.0	39.1	46.3	54.8	54.9	54.9	54.5	54.1	53.6	53.2	52.8
(3) Miscellaneous	24.7	29.3	34.7	41.1	41.2	41.2	40.9	40.5	40.2	39.9	39.6
2. Sales & Administration	189.5	209.8	232.7	258.6	266.6	274.9	280.7	286.5	292.5	298.6	304.9
(1) Sales	130.0	147.2	166.8	188.9	194.8	200.9	205.0	209.3	213.7	218.1	222.7
(2) Administration	15.6	17.7	20.0	22.7	23.4	24.1	24.6	25.1	25.6	26.2	26.7
(3) Tansfer to Central Level	43.9	44.9	45.9	47.0	48.5	50.0	51.0	52.1	53.2	54.3	55.4
III. Running Profit/Loss	**-68.7**	**-90.9**	**-29.8**	**-37.3**	**-2.4**	**35.6**	**76.1**	**119.5**	**166.0**	**215.8**	**269.2**
IV. Depreciation	**33.6**	**33.6**	**34.9**	**38.0**	**62.4**	**44.0**	**47.2**	**57.1**	**63.0**	**70.8**	**77.7**
V. Operating Profit/Loss	**-102.3**	**-124.5**	**-64.6**	**-75.3**	**-64.8**	**-8.3**	**28.9**	**62.4**	**103.0**	**145.0**	**191.5**
VI. Non-operating Profit/Loss	**-2.8**	**-3.9**	**-10.2**	**-20.3**	**-26.8**	**-30.7**	**-33.7**	**-30.4**	**-25.2**	**-18.1**	**-17.9**
1. Non-operating Income	0.0	0.5	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0
(1) Other Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(2) Interest Revenue	0.0	0.5	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0
2. Non-operating Expense	2.8	4.4	10.2	20.5	27.3	30.7	33.7	30.4	25.2	18.1	17.9
(1) Long-term Interest (Existing)	1.4	1.3	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.1	0.0
(2) Long-term Interest (New Loans)	0.0	0.0	2.4	8.7	11.0	14.5	17.9	17.9	17.9	17.9	17.9
(3) Short-term Interest	1.4	3.1	6.7	10.8	15.4	15.5	15.2	12.1	7.1	0.1	0.0
VII. Ordinary Profit/Loss	**-105.1**	**-128.4**	**-74.8**	**-95.6**	**-91.7**	**-39.0**	**-4.8**	**32.1**	**77.8**	**126.9**	**173.6**
VIII Extraordinary Items	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
1. Subsidy (Central Government)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Extraordinary Losses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IX. Net Profit/Loss	**-105.1**	**-128.4**	**-74.8**	**-95.6**	**-91.7**	**-39.0**	**-4.8**	**32.1**	**77.8**	**126.9**	**173.6**
1. Balance for Previous Years at Beginning of t	-322.9	-428.0	-556.4	-631.2	-726.8	-818.5	-857.5	-862.3	-830.2	-752.5	-625.5
2. Balance of Accumulated Deficit at End of the	-428.0	-556.4	-631.2	-726.8	-818.5	-857.5	-862.3	-830.2	-752.5	-625.5	-451.9

Table 9.4.4 Cash Flow Statement: 2005 - 2015

(C$ Million)

Item	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Procurement											
1. Operating Profit/Loss	-102.3	-124.5	-64.6	-75.3	-64.8	-8.3	28.9	62.4	103.0	145.0	191.5
2. Non-operating Profit/Loss*1	-1.4	-0.8	-3.5	-9.5	-11.4	-15.2	-18.4	-18.3	-18.2	-18.0	-17.9
3. Depreciation	33.6	33.6	34.9	38.0	62.4	44.0	47.2	57.1	63.0	70.8	77.7
4. Account Receivable	157.4	3.5	-15.6	-0.4	-0.4	-0.4	-0.9	-0.9	-0.9	-0.9	-0.9
Gross Internal Cash Position	87.3	-88.2	-48.9	-47.2	-14.3	20.1	56.7	100.3	146.9	196.9	250.5
5. Foreign Loan (Existing)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. Foreign Loan (New Loans)	0.0	0.0	121.8	314.1	116.4	171.1	171.1	0.0	0.0	0.0	0.0
7. Government Assistance	0.0	31.7	55.0	74.2	80.6	91.7	73.8	161.2	188.8	161.7	74.7
8. Short-term Borrowing	28.1	62.1	133.1	215.8	307.9	310.2	304.5	241.2	141.4	1.1	0.0
Total Sources	115.3	5.6	261.1	556.9	490.6	593.2	606.2	502.8	477.1	359.7	325.2
II. Disburesement											
1. Investment	0.0	31.7	176.8	388.3	197.0	262.8	244.9	161.3	188.8	161.7	74.7
(1) New Construction	0.0	31.7	176.8	388.3	197.0	262.8	244.9	161.3	188.8	161.7	74.7
(2) Replacement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Debt Services	8.1	7.9	10.2	16.4	18.6	21.8	31.5	42.3	50.1	66.2	113.5
(1) Principal Repayment (Existing)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.0	0.0	0.0
(2) Principal Repayment (New Loans)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.9
(3) Interest Charges (Existing)	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.1	0.0	0.0	0.0
(4) Interest Charges (New Loans)	0.0	0.0	2.4	8.7	11.0	14.5	17.9	17.9	17.9	17.9	17.9
(5) Government Assistance	0.0	0.0	0.0	0.0	0.0	0.0	6.3	17.4	32.2	48.3	66.7
3. Debt Services for Short Financing	1.4	31.2	68.7	143.9	231.2	323.4	325.5	316.6	248.3	141.5	1.1
(1) Principal Repayment	0.0	28.1	62.1	133.1	215.8	307.9	310.2	304.5	241.2	141.4	1.1
(2) Interest Charges	1.4	3.1	6.7	10.8	15.4	15.5	15.2	12.1	7.1	0.1	0.0
4. Inventory Stock	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
5. Other Assets	0.0	0.0	0.1	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0
Total of Disbursement	9.5	70.8	256.0	549.1	447.1	608.3	602.2	520.4	487.4	369.5	189.3
Net Cash Flow	105.8	-65.2	5.1	7.8	43.5	-15.2	4.0	-17.6	-10.3	-9.8	135.9
Opening Cash Balance	0.0	105.8	40.7	45.7	53.6	97.0	81.9	85.9	68.3	58.1	48.2
Accumulated Cash Position	105.8	40.7	45.7	53.6	97.0	81.9	85.9	68.3	58.1	48.2	184.1

Note: *1 Excluding the interest of short-term debts. The interest of short-term debt is payable in advance.

Table 9.4.5 Balance Sheet: 2005 - 2015

(C$ Million)

Item	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Assets	295.7	226.1	392.2	760.6	951.1	1,170.3	1,391.4	1,497.1	1,624.6	1,724.6	1,905.2
1. Fixed Assets	141.7	139.9	262.6	600.1	849.1	1,068.9	1,288.7	1,394.5	1,522.3	1,615.4	1,615.0
(1) Fixed Assets	638.0	669.8	722.1	1,175.5	1,514.4	1,778.1	2,045.1	2,192.7	2,361.2	2,560.0	2,639.9
(2) Accumulated Depreciation	-496.3	-529.9	-564.8	-602.8	-665.2	-709.2	-756.4	-813.4	-876.4	-947.2	-1,025.0
(3) Works in Progress	0.0	0.0	105.2	27.4	0.0	0.0	0.0	15.3	37.5	2.7	0.0
2. Current Assets	154.0	86.3	129.6	160.5	101.9	101.4	102.7	102.6	102.4	109.2	290.2
(1) Cash	10.4	4.8	10.0	10.0	3.8	2.6	2.7	1.6	0.4	6.2	28.0
(2) Bank Deposit	58.8	0.0	23.2	53.1	0.0	0.0	0.0	0.0	0.0	0.0	158.4
(3) Account Receivable	89.0	85.5	101.1	101.5	101.9	102.3	103.2	104.1	105.0	105.9	106.7
(4) Allowance for Doubtful Account	-4.5	-4.3	-5.1	-5.1	-5.1	-5.1	-5.2	-5.2	-5.2	-5.3	-5.3
(5) Inventory Stock	0.1	0.1	0.1	0.3	0.4	0.5	0.6	0.7	0.8	0.8	0.8
(6) Other Assets	0.1	0.1	0.3	0.6	0.8	1.1	1.3	1.4	1.5	1.6	1.6
II. Equity and Liabilities	295.7	226.1	392.2	760.6	951.1	1,170.3	1,391.4	1,497.1	1,624.6	1,724.6	1,905.2
1. Equity	212.0	83.6	8.8	-86.8	-178.5	-217.5	-222.3	-190.2	-112.4	14.5	188.1
(1) Equity	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0
(2) Accumulated Profit/Loss	-428.0	-556.4	-631.2	-726.8	-818.5	-857.5	-862.3	-830.2	-752.5	-625.5	-451.9
1) Profit or Loss for the Year	-105.1	-128.4	-74.8	-95.6	-91.7	-39.0	-4.8	32.1	77.8	126.9	173.6
2) Profit or Loss for the Previous Years	-322.9	-428.0	-556.4	-631.2	-726.8	-818.5	-857.5	-862.3	-830.2	-752.5	-625.5
2. Long-term Liabilities	55.6	80.4	250.3	631.7	821.7	1,077.5	1,309.1	1,446.1	1,595.7	1,709.0	1,717.1
(1) Foreign Loan (Existing)	55.6	48.7	41.7	34.8	27.8	20.9	13.9	7.0	0.0	0.0	0.0
(2) Foreign Loan (New Loans)	0.0	0.0	121.8	435.9	552.2	723.4	894.5	894.5	894.5	894.5	894.5
(3) Government Assistance	0.0	31.7	86.8	161.0	241.6	333.3	400.7	544.6	701.2	814.5	822.6
3. Short-term Liabilities	28.1	62.1	133.1	215.8	307.9	310.2	304.5	241.2	141.4	1.1	0.0
(1) Short-term Borrowing	28.1	62.1	133.1	215.8	307.9	310.2	304.5	241.2	141.4	1.1	0.0

As shown in **Table 9.4.3**, the operating profit/loss attains almost zero balance in 2010. After 2011, the operating balance exhibits a structural surplus. Then, the management attains the cost recovery level III by the target year 2015, completely.

The terms of the short-term borrowing for liquidity was set as the 5% per annum of interest rate. Accordingly, the peak borrowing reaches upward of C$310 million in 2010, as shown in **Table 9.4.4**. Since the management has a huge accumulated deficit already at the start line of the simulation, the accumulated deficit increases to C$862 million at the peak year 2011. Thus, the accumulated deficit bottoms out in 2011, and decreases year by year. In 2015, the accumulated deficit reaches back to the start line level of C$452 million, as shown in **Tables 9.4.3** and **9.4.5**.

The annual principal repayment of the loans from foreign donors and the government reaches to the amounts of C$29 million and C$67 million in 2015, respectively. At that time, the management already turns into the black and attains the net profit of C$174 million in 2015 as shown in **Table 9.4.3**, so there is no problem on cash flow, although the accumulated deficit remains at C$452 million in 2015. In fact, however, the short-term borrowing goes into zero level in 2015, as shown in **Table 9.4.4**. Yet, it may be said to be difficult that the increasing water rate, which was set at 3.5% p.a. in real term, reach accord with the stakeholders because of high rate for the consumers. As a reference, the simulation result (Case 2) applying the increasing rate of 1.5% p.a. instead of 3.5% p.a. is shown in **Figure 9.4.3**. Other conditions and assumptions are the same as set in the Section 9.4.4. The simulation result of Case2 was tabulated in the following tables: P/L in **Table 9.4.6**, Cash Flow Statement in **Table 9.4.7** and B/S in **Table 9.4.8**.

In this Case 2, ENACAL will have some accumulated deficit even after the year when the economic life of the water supply facilities is over in the year 2045. Then, ENACAL will not carry on the water supply services in Managua City, unless the foreign donors give the same economic assistance at that time as present. From this point of view, the increasing water rate as much as possible. is recommended for ENACAL to maintain the sound management on water supply services in the future.

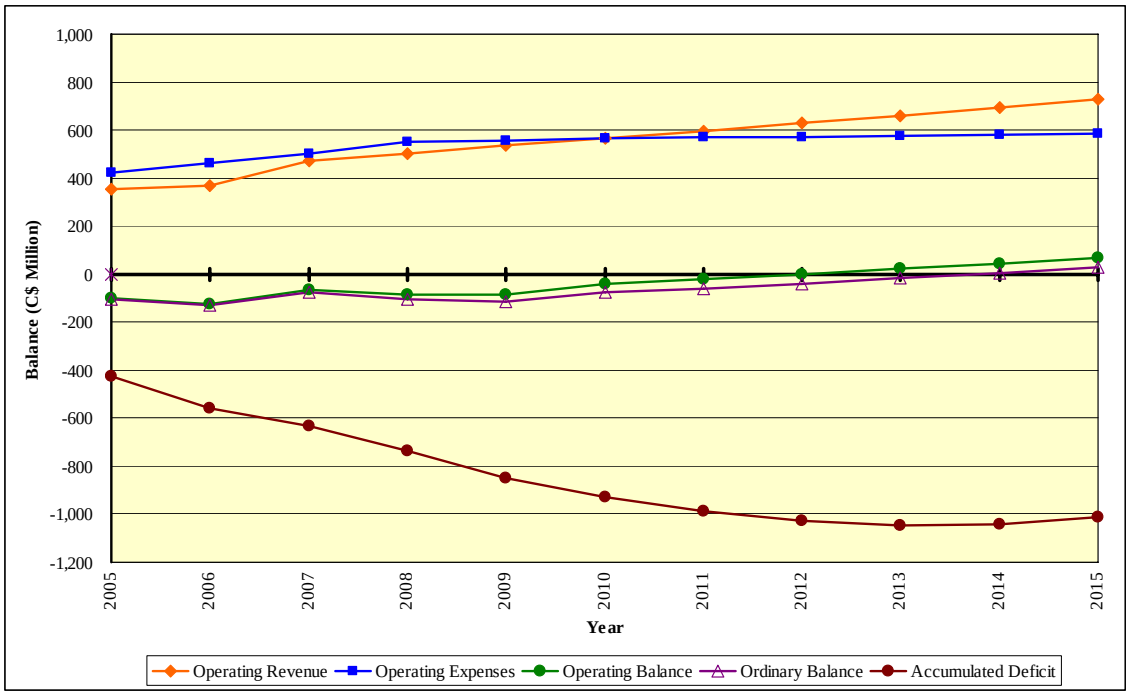


Figure 9.4.3 Profit and Loss of Water Supply Services (Case 2): 2005 – 2015

Table 9.4.6 Profit and Loss Table: 2005 – 2015 (Case 2)

(C$ Million)

Item	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Operating Revenue	**356.2**	**369.6**	**471.9**	**502.1**	**533.9**	**567.6**	**597.3**	**628.4**	**661.0**	**695.1**	**730.8**
1. Water Sales	354.4	367.8	470.1	500.1	531.9	565.5	595.1	626.1	658.6	692.6	728.3
(1) Domestic	241.3	250.7	348.7	371.2	395.1	420.3	442.6	465.9	490.3	515.9	542.8
(2) Non-domestic	113.1	117.2	121.4	128.9	136.8	145.2	152.6	160.2	168.3	176.7	185.5
2. New Connection	1.8	1.8	1.8	2.0	2.0	2.1	2.2	2.3	2.4	2.5	2.6
II. Operating Expenses	**424.9**	**460.5**	**501.7**	**549.2**	**557.5**	**566.1**	**569.5**	**573.1**	**576.8**	**580.6**	**584.7**
1. Operation Costs	235.4	250.7	268.9	290.6	290.9	291.1	288.8	286.5	284.3	282.0	279.8
(1) Opeation	177.7	182.4	187.9	194.7	194.8	195.0	193.5	191.9	190.4	188.9	187.4
1) Electricity	149.7	149.2	148.6	148.1	148.2	148.3	147.1	146.0	144.8	143.7	142.5
2) Others	28.0	33.2	39.3	46.6	46.7	46.7	46.3	46.0	45.6	45.2	44.9
(2) Maintenance	33.0	39.1	46.3	54.8	54.9	54.9	54.5	54.1	53.6	53.2	52.8
(3) Miscellaneous	24.7	29.3	34.7	41.1	41.2	41.2	40.9	40.5	40.2	39.9	39.6
2. Sales & Administration	189.5	209.8	232.7	258.6	266.6	274.9	280.7	286.5	292.5	298.6	304.9
(1) Sales	130.0	147.2	166.8	188.9	194.8	200.9	205.0	209.3	213.7	218.1	222.7
(2) Administration	15.6	17.7	20.0	22.7	23.4	24.1	24.6	25.1	25.6	26.2	26.7
(3) Tansfer to Central Level	43.9	44.9	45.9	47.0	48.5	50.0	51.0	52.1	53.2	54.3	55.4
III. Running Profit/Loss	**-68.7**	**-90.9**	**-29.8**	**-47.1**	**-23.6**	**1.5**	**27.8**	**55.3**	**84.2**	**114.5**	**146.2**
IV. Depreciation	**33.6**	**33.6**	**34.9**	**38.0**	**62.4**	**44.0**	**47.2**	**57.1**	**63.0**	**70.8**	**77.7**
V. Operating Profit/Loss	**-102.3**	**-124.5**	**-64.6**	**-85.2**	**-86.0**	**-42.4**	**-19.4**	**-1.7**	**21.2**	**43.6**	**68.5**
VI. Non-operating Profit/Loss	**-2.8**	**-3.9**	**-10.2**	**-20.7**	**-28.3**	**-33.9**	**-39.5**	**-39.7**	**-39.8**	**-39.1**	**-39.0**
1. Non-operating Income	0.0	0.5	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.1
(1) Other Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(2) Interest Revenue	0.0	0.5	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.1
2. Non-operating Expense	2.8	4.4	10.2	20.9	28.7	33.9	39.5	39.7	39.8	39.1	39.1
(1) Long-term Interest (Existing)	1.4	1.3	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.1	0.0
(2) Long-term Interest (New Loans)	0.0	0.0	2.4	8.7	11.0	14.5	17.9	17.9	17.9	17.9	17.9
(3) Short-term Interest	1.4	3.1	6.7	11.2	16.9	18.7	21.0	21.4	21.6	21.0	21.3
VII. Ordinary Profit/Loss	**-105.1**	**-128.4**	**-74.8**	**-105.9**	**-114.3**	**-76.3**	**-58.9**	**-41.5**	**-18.6**	**4.6**	**29.4**
VIII Extraordinary Items	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
1. Subsidy (Central Government)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Extraordinary Losses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IX. Net Profit/Loss	**-105.1**	**-128.4**	**-74.8**	**-105.9**	**-114.3**	**-76.3**	**-58.9**	**-41.5**	**-18.6**	**4.6**	**29.4**
1. Balance for Previous Years at Beginning of t	-322.9	-428.0	-556.4	-631.2	-737.1	-851.4	-927.7	-986.6	-1,028.1	-1,046.7	-1,042.1
2. Balance of Accumulated Deficit at End of the	-428.0	-556.4	-631.2	-737.1	-851.4	-927.7	-986.6	-1,028.1	-1,046.7	-1,042.1	-1,012.7

Table 9.4.7 Cash Flow Statement: 2005 – 2015 (Case 2)

(C$ Million)

Item	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Procurement											
1. Operating Profit/Loss	-102.3	-124.5	-64.6	-85.2	-86.0	-42.4	-19.4	-1.7	21.2	43.6	68.5
2. Non-operating Profit/Loss*1	-1.4	-0.8	-3.5	-9.5	-11.4	-15.2	-18.4	-18.3	-18.2	-18.0	-17.8
3. Depreciation	33.6	33.6	34.9	38.0	62.4	44.0	47.2	57.1	63.0	70.8	77.7
4. Account Receivable	157.4	3.5	-15.6	1.5	1.5	1.5	1.0	1.0	1.0	1.0	1.0
Gross Internal Cash Position	87.3	-88.2	-48.9	-55.1	-33.5	-12.1	10.4	38.0	67.1	97.5	129.4
5. Foreign Loan (Existing)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. Foreign Loan (New Loans)	0.0	0.0	121.8	314.1	116.4	171.1	171.1	0.0	0.0	0.0	0.0
7. Government Assistance	0.0	31.7	55.0	74.2	80.6	91.7	73.8	161.2	188.8	161.7	74.7
8. Short-term Borrowing	28.1	62.1	133.1	224.5	337.1	374.2	420.9	428.7	432.2	420.8	425.1
Total Sources	115.3	5.6	261.1	557.7	500.6	624.9	676.2	628.0	688.0	680.0	629.3
II. Disburesement											
1. Investment	0.0	31.7	176.8	388.3	197.0	262.8	244.9	161.3	188.8	161.7	74.7
(1) New Construction	0.0	31.7	176.8	388.3	197.0	262.8	244.9	161.3	188.8	161.7	74.7
(2) Replacement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Debt Services	8.1	7.9	10.2	16.4	18.6	21.8	31.5	42.3	50.1	66.2	113.5
(1) Principal Repayment (Existing)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.0	0.0	0.0
(2) Principal Repayment (New Loans)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.9
(3) Interest Charges (Existing)	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.1	0.0	0.0	0.0
(4) Interest Charges (New Loans)	0.0	0.0	2.4	8.7	11.0	14.5	17.9	17.9	17.9	17.9	17.9
(5) Government Assistance	0.0	0.0	0.0	0.0	0.0	0.0	6.3	17.4	32.2	48.3	66.7
3. Debt Services for Short Financing	1.4	31.2	68.7	144.3	241.3	355.8	395.2	442.3	450.3	453.2	442.1
(1) Principal Repayment	0.0	28.1	62.1	133.1	224.5	337.1	374.2	420.9	428.7	432.2	420.8
(2) Interest Charges	1.4	3.1	6.7	11.2	16.9	18.7	21.0	21.4	21.6	21.0	21.3
4. Inventory Stock	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
5. Other Assets	0.0	0.0	0.1	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0
Total of Disbursement	9.5	70.8	256.0	549.5	457.2	640.8	671.9	646.1	689.4	681.2	630.3
Net Cash Flow	105.8	-65.2	5.1	8.2	43.3	-15.9	4.2	-18.1	-1.4	-1.3	-1.0
Opening Cash Balance	0.0	105.8	40.7	45.7	53.9	97.2	81.4	85.6	67.5	66.1	64.8
Accumulated Cash Position	105.8	40.7	45.7	53.9	97.2	81.4	85.6	67.5	66.1	64.8	63.8

Note: *1 Excluding the interest of short-term debts. The interest of short-term debt is payable in advance.

Table 9.4.8 Balance Sheet: 2005 – 2015 (Case 2)

(C$ Million)

Item	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Assets	295.7	226.1	392.2	759.0	947.4	1,164.0	1,383.4	1,486.7	1,621.1	1,727.7	1,769.5
1. Fixed Assets	141.7	139.9	262.6	600.1	849.1	1,068.9	1,288.7	1,394.5	1,522.3	1,615.4	1,615.0
(1) Fixed Assets	638.0	669.8	722.1	1,175.5	1,514.4	1,778.1	2,045.1	2,192.7	2,361.2	2,560.0	2,639.9
(2) Accumulated Depreciation	-496.3	-529.9	-564.8	-602.8	-665.2	-709.2	-756.4	-813.4	-876.4	-947.2	-1,025.0
(3) Works in Progress	0.0	0.0	105.2	27.4	0.0	0.0	0.0	15.3	37.5	2.7	0.0
2. Current Assets	154.0	86.3	129.6	158.9	98.2	95.0	94.7	92.1	98.9	112.3	154.5
(1) Cash	10.4	4.8	10.0	10.0	3.8	1.8	2.1	0.3	7.8	10.0	10.0
(2) Bank Deposit	58.8	0.0	23.2	53.4	0.0	0.0	0.0	0.0	0.0	12.1	55.3
(3) Account Receivable	89.0	85.5	101.1	99.6	98.0	96.5	95.5	94.5	93.4	92.4	91.4
(4) Allowance for Doubtful Account	-4.5	-4.3	-5.1	-5.0	-4.9	-4.8	-4.8	-4.7	-4.7	-4.6	-4.6
(5) Inventory Stock	0.1	0.1	0.1	0.3	0.4	0.5	0.6	0.7	0.8	0.8	0.8
(6) Other Assets	0.1	0.1	0.3	0.6	0.8	1.1	1.3	1.4	1.5	1.6	1.6
II. Equity and Liabilities	295.7	226.1	392.2	759.0	947.4	1,164.0	1,383.4	1,486.7	1,621.1	1,727.7	1,769.5
1. Equity	212.0	83.6	8.8	-97.1	-211.4	-287.7	-346.6	-388.1	-406.7	-402.1	-372.7
(1) Equity	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0
(2) Accumulated Profit/Loss	-428.0	-556.4	-631.2	-737.1	-851.4	-927.7	-986.6	-1,028.1	-1,046.7	-1,042.1	-1,012.7
1) Profit or Loss for the Year	-105.1	-128.4	-74.8	-105.9	-114.3	-76.3	-58.9	-41.5	-18.6	4.6	29.4
2) Profit or Loss for the Previous Years	-322.9	-428.0	-556.4	-631.2	-737.1	-851.4	-927.7	-986.6	-1,028.1	-1,046.7	-1,042.1
2. Long-term Liabilities	55.6	80.4	250.3	631.7	821.7	1,077.5	1,309.1	1,446.1	1,595.7	1,709.0	1,717.1
(1) Foreign Loan (Existing)	55.6	48.7	41.7	34.8	27.8	20.9	13.9	7.0	0.0	0.0	0.0
(2) Foreign Loan (New Loans)	0.0	0.0	121.8	435.9	552.2	723.4	894.5	894.5	894.5	894.5	894.5
(3) Government Assistance	0.0	31.7	86.8	161.0	241.6	333.3	400.7	544.6	701.2	814.5	822.6
3. Short-term Liabilities	28.1	62.1	133.1	224.5	337.1	374.2	420.9	428.7	432.2	420.8	425.1
(1) Short-term Borrowing	28.1	62.1	133.1	224.5	337.1	374.2	420.9	428.7	432.2	420.8	425.1

9.4.6 Affordability of Domestic Consumers

According to INEC-EMNV 2001, a household income in urban areas of Managua was estimated at C$77,449 per month on average in the survey year 2001. An expense for water was C$1,214 per month on average, accounting for 1.6% of its income. In 2004, the household income was converted to D$92,200 per month, applying the inflation rate of 1.19 calculated through price indices between 113.8 in 2001 and 135.0 in 2004, as shown in **Table 11A-12** of **Annex 11A**. In the same manner, expense for water was converted to C$1,440 per month.

In the "Water Consumption and Awareness Survey" conducted by the JICA study team in September 2004, willingness-to-pay for water charge was questioned to interviewees. The willingness-to-pay was estimated at around C$121 per month on average. It was equal to C$1,450 per annum, i.e., almost equal to the results of INEC-EMNV above. As mentioned above, the family income was estimated at C$92,200 per annum on average in 2004. Then, the willingness-to-pay accounted for 1.6% of the average family income.

It should be remembered that the World Bank report of "Information and Modeling Issues in Designing Water Sanitation Subsidy Scheme, May 2000" insisted that the price of the minimum block of water is commonly set at 3 ~ 5 percent (4% on average) of household income, which experience suggests it affordable. This insistence is still persistent among the agencies concerned. Once these ratios were applied to the people in Managua City, the affordability-to-pay of water could be estimated at C$2,770 to C$4,610 per annum (C$3,690 per annum on average) for their average annual income of C$92,200 per annum.

According to the simulation, water unit prices were set as C$4.00/$m^3$ in 2005, C$6.31/$m^3$ in 2010 and C$7.91/$m^3$ in 2015. Based on these unit prices, the water charges for an average family were calculated at C$1,380/annum in 2005, C$2,210/annum in 2010 and C$2,610/annum in 2015, respectively. On the other hand, the average family is expected to receive the following annual income: C$93,000 in 2005, C$96,700 in 2010 and C$100,670 in 2015. These income projections were assumed to grow at a growth rate (0.8% per annum) of GDP per capita in Nicaragua, which was based on an average GDP of the country between 1998 and 2003 (refer to **Table 11A-3** of **Annex 11A**). As a result, percentages of water charge to family income were 1.5% in 2005, 2.3% in 2010 and 2.6% in 2015. These percentages were less than the affordability-to-pay. These figures were enumerated in **Table 9.4.9**.

Table 9.4.9 Affordability of Water Charge Corresponding to Household Income at 2004 Constant Price

Year	Water Unit Price	Water Charge	Average Household Income	Percentage of Water Charge to Income	Affordability*1
	(C$/$m^3$)	(C$/Year)	(C$/Household)	(%)	
2005	4.00	1,380	93,000	1.5	○
2010	6.31	2,210	96,700	2.3	○
2015	7.91	2,610	100,670	2.6	○

Note: *1 Signs mean: ○ - Affordable, and × -Unaffordable

As mentioned before, the water consumption and awareness survey brought that their willingness-to-pay accounted for around 1.6% of their income. If ENACAL improves the service level such as water quality and elimination of water supply stoppage, water consumers might accept the increase of water charge. Although the percentages in 2010 and 2015 were higher than the willingness-to-pay of 1.6%, most of water consumers might accept these water prices in the future.

Their affordability-to-pay is considered to be higher than the present water charge level, so the price increase of water rate could be negotiable for them. Thus, ENACAL has to manage a campaign to educate the water consumers on the need for rational water costs and to set up a reasonable water tariff through a consultation with them. It is said that the installation charges are burden for a new registrant of water supply services. A new water consumer has to pay for C$450 to C$900 for connection installations at the time of application. In particular, the connection charge seems to be serious for low-income earners. Thus, it would be recommendable that a system of lending and/or subsiding to new connection fee is established with some regulations such as a loan program in accordance with household income. The system could make lower-income families accessible to the water supply system more easily than the present.

9.4.7 Strengthening of ENACAL's Financial Capacity

Through the discussions in the previous sections, the following issues for strengthening of ENACAL's Financial Capacity were recommended for the future development of ENACAL. In order to formulate the current plan, it would be essential that counter measures for these issues could be promoted in the ENACAL's financial plan.

- *Lack of fund for carrying out the water supply operation must be dissolved as soon as possible.* There are two focal points of lacking funds for normal operation and maintenance in the present ENACAL. They are the excessive account receivable (C$341 million or more than the annual sales in 2003) and the huge accumulated deficit (C$243 million or 50% of the equity in 2003). They bring down rigid financial performance to ENACAL's management. Although some of account receivables are dissolved by the government by 2006, these negative phenomena might be widening at a rapidly accelerating rate in a short period, unless they are eliminated without delay.
- *ENACAL should keep solid management by means of adequate revenues for normal operation costs in its infancy*. The management has to know the total cost of normal water supply O&M and administration including not only operational direct expenses but also invisible costs such as depreciation and inventory of spare parts, chemicals and equipment. Its revenue must cover the total cost at least. As a result, the management can start to turn around performance from deficit to profit, and eliminates a big and growing structural deficit. In addition, the government's support for solving the accumulated deficit is indispensable at early stage of the project implementation.
- *ENACAL ensures financial sources of working capital for providing cash flow crisis in the infant stage of the proposed project*. The peak borrowing of working capital will reach to around C$310 million in 2010, as discussed in the management simulation. It will be hard for the management to procure this huge amount of borrowing from a creditor. The creditor may ask higher interest rate for risky lending business or request a mortgage even for short-term loan. Anyhow, the management must ensure reliable financial sources of working capital. The government co-operation for this activity would be requisite, so the management should establish close rapport with the creditors and the government in terms of financial situation of waterworks.
- *ENACAL's financial management should provide the local financial statements for the major service territories*. ENACAL's financial system is completely centralized through financial computer networks covering its whole service territories. Each local territory does not have its own financial information. At least, the central level should prepare and feed back the local financial statements and its comments on local managements to the major local managers. Then, the leading managements in major

service territories, such as Managua City, can know their own financial situation, and to manage their local operation and maintenance conditions on the basis of management indices which provides an azimuth to their management. In fact, Managua City water supply service has quite different financial structure from the entire ENCAL. For instance, the expenses of "wage and salary" and "electricity" accounted for 15% and 37% of the total expense in Managua City waterworks, respectively. On the other hand, those of the entire ENACAL accounted for 26% and 26%, respectively. Thus, some local areas can be aware to their own special features in their services. Accordingly, they should carry out their management at their own risk, and accomplish their self-sufficient operation system reflecting their local management circumstance.

- *For attaining to cost-recovery Level III by the target year 2015, patient efforts of management are absolutely necessary.* It will be very difficult for ENACAL to attain the cost-recovery target. For consecutive capital investment until 2015, ENACAL has to keep the following self-help efforts on financial and management issues: (i) to ensure financial resources for capital investment from donors and support from the government; and (ii) to maintain patiently minimum-scale management with efficiency and productivity.
- *For stable sales revenue, ENACAL perseveres in its efforts for consumers to understand rational water tariff.* To ensure adequate sales revenue from water service is a key issue for ENACAL to improve its management situation. According to the "Water Consumption and Awareness Survey", willingness-to-pay of water consumers was estimated at C$121 per month (C$1,450 per annum) on average in 2004. This value accounted for around 1.6% of their total monthly income. ENCAL, however, expects them to share to around 4% of their disposable income for the solid management of ENACAL, which is expected as a benchmark of affordability-to-pay for potable water in the World Bank Report of "Information and Modeling Issues in Designing Water Sanitation Subsidy Scheme, May 2000". Thus, there is still the big gap between ENACAL and water consumers. At the beginning stage of the project implementation, it is quite important for ENACAL to obtain understanding and generosity toward rational water tariff from water consumers and stakeholders through public relation and publicity. ENACAL enhances its transparent financial statements and ensures public acceptance from them.

ANNEX 9A

Financial Statements of ENACAL

Table 9A-1 Balance Sheet of Water Supply and Sewerage Services in ENACAL: 2001-2003 (1/2)

(Unit: C$ Million)

Item	2001	2002	2003
I. Assets	**3,078.01**	**3,328.00**	**3,069.64**
1. Fixed Assets	**2,572.24**	**2,891.07**	**2,696.97**
(1) Land	212.60	213.05	337.22
1) Water Supply Facilities		204.66	
2) General Buildings		8.39	
(2) Plant & Equipment	2,696.16	2,652.22	3,366.06
1) Water Supply Facilities		1,869.29	2,338.16
2) Sewerage Facilities		369.10	736.63
3) General Fixed Assets		413.83	291.26
(3) Construction in Progress	815.09	1,292.73	262.23
1) Water Supply Facilities		90.70	
2) Sewerage Treatment Facilities		108.51	
3) General Buildings		1,093.52	
(4) Accumulated Depreciation	-1,151.61	-1,266.93	-1,268.53
1) Water Supply Facilities		-792.14	
2) Sewerage Treatment Facilities		-183.20	
3) General Buildings		-291.59	
2. Current Assets	**489.05**	**435.49**	**370.16**
(1) Cash & Bank Deposits	73.83	48.07	12.65
1) Cash	1.54	1.26	2.79
2) Bank Deposits	72.29	46.81	9.86
(2) Transitory Investment	2.36	48.13	83.52
(3) Account Receivable	343.88	252.95	205.01
1) Water Supply	323.38	344.65	468.81
2) Sewerage Service-Private Sector	37.14	42.18	
3) Other Account Receivable*1	129.09	71.21	17.10
4) Allowance for Doubtful Account	-145.72	-205.09	-280.89
(4) Inventories	53.54	84.05	66.50
1) Inventory in Warehouse	106.61	125.72	117.79
2) Inventory Written Down	-53.92	-41.70	-51.36
3) Inventory Temporary	0.85	0.03	0.07
(5) Advance Payment	15.43	2.29	2.48
4. Other Assets	**16.73**	**1.43**	**2.50**

Source: Estados Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton

Remarks: *1 Consumers given concessionaire due to historical background such as university, retirees, spontaneous, etc. These charges have already decided to be covered by the central governments by the year 2006.

Table 9A-1 Balance Sheet of Water Supply and Sewerage Services in ENACAL: 2001-2003 (2/2)

(Unit: C$ Million)

Item	2001	2002	2003
II. Liability and Capital	**3,078.01**	**3,328.00**	**3,069.64**
1. Capital	**1,969.40**	**2,023.65**	**1,524.30**
(1) Equity	1,742.27	1,957.76	1,373.47
1) Inheritance	237.28	0.00	0.00
2) Initial Contribution	10.75	10.75	11.73
3) Donation & Contributions	1,494.24	1,947.00	1,361.74
(2) Surplus of Assets Revaluation	590.40	590.40	847.59
(3) Accumulated Surplus/Loss	-363.27	-524.50	-696.76
1) Profit or Loss for the Year	-152.01	-255.60	-172.15
2) Profit or Loss for the Previous Years	-276.10	-363.27	-524.50
3) Adjustment of Loss for the Previous Years	64.85	94.36	-0.10
2. Liability	**1,108.61**	**1,304.34**	**1,545.34**
(1) Fixed Liability	877.83	949.46	1,100.95
1) IDB*1	631.42	722.05	814.46
2) French Government	80.38	85.21	90.32
3) NDF*2	83.62	95.71	111.29
4) Austrian Government	37.31	39.55	41.93
5) OPEC*3	69.20	73.36	77.76
6) Other Fixed Debts*4	0.13	0.53	44.23
- Less: Portions of Short-Term Debts in items 1	-58.71	-103.31	-153.00
7) Labor Reserve*5	34.47	36.37	73.96
(2) Current Liability	230.78	354.88	444.39
1) Short-term Debt	58.71	103.31	155.95
2) Credit Providers	8.72	32.47	47.79
3) Notes Payable	25.85	21.01	43.61
4) Deposits for Guarantees	14.67	21.90	22.97
(a) Water Supply	14.58	21.43	22.50
(b) Sewerage Treatment	0.07	0.46	0.47
(c) Others	0.01	0.00	0.00
5) Accumulated Interests for Payment	66.66	100.98	148.89
6) Other Account Payable	56.16	75.22	25.18

Source: (1) Estados Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton
(2) Informe de Auditoria Financiera y de Cumplimientio por los Anos Terminados al 31 Diciembre de 2003 y 2002

Remarks: *1 Banco Ineramericano de Desarrollo (BID; IDB)
*2 Fondo Nordico para el Desarrollo (FND; NDF)
*3 Organizacion de Paises Exportadores de Petroleo (OPEP; OPEC)
*4 Including loans from Finland and German Governments and other loans
*5 Obligations related to the labor indemnifications

Table 9A-2 Profit & Loss Table of Water Supply and Sewerage Services in ENACAL: 2001-2003

(Unit: C$ Million)

Item	2001	2002	2003
I. Revenue	**674.80**	**766.80**	**679.96**
1. Sales Revenues	**671.85**	**671.94**	**695.32**
(1) Water Supply	582.23	583.25	608.02
(2) Sewerage Services	89.63	88.69	87.30
2. Service Reduction	**-36.79**	**-50.56**	**-43.83**
(1) Water Supply			
(2) Sewerage Service			
3. Financial Revenue	**11.15**	**10.32**	**9.24**
4. Other Revenues	**28.58**	**135.10**	**19.22**
(1) Other Sales Revenues			
(2) Sales of Assets			
II. Expenditure	**826.81**	**1,022.40**	**1,056.87**
1. Operating Expenses	**196.76**	**225.00**	**324.56**
(1) Salary & Wages	91.11	81.17	
(2) Electricity	61.16	97.95	
(3) Provision for Uncollectible Charges	0.00	0.00	
(4) Materials & Repair	7.81	4.29	
(5) Transfer to INAA	0.00	0.00	
(6) Other Expenses	36.68	41.59	
2. Maintenance Expenses	**174.02**	**164.03**	**97.58**
(1) Salary & Wages	28.53	18.34	
(2) Electricity	130.61	124.58	
(3) Provision for Uncollectible Charges	0.00	0.00	
(4) Materials & Repair	5.36	3.52	
(5) Transfer to INAA	0.00	0.00	
(6) Other Expenses	9.53	17.60	
3. Expenses of Sales	**135.58**	**135.64**	**175.27**
(1) Salary & Wages	39.12	36.77	
(2) Electricity	0.06	0.15	
(3) Provision for Uncollectible Charges	46.56	57.67	
(4) Materials & Repair	1.02	2.08	
(5) Transfer to INAA	20.96	12.83	
(6) Other Expenses	27.85	26.15	
4. Expenses of Administration	**114.29**	**100.41**	**204.58**
(1) Salary & Wages	68.79	65.37	
(2) Electricity	2.15	3.35	
(3) Provision for Uncollectible Charges	0.00	0.00	
(4) Materials & Repair	17.09	3.22	
(5) Transfer to INAA	0.00	0.00	
(6) Other Expenses	26.26	28.47	
5. Depreciation	**120.75**	**115.34**	**114.20**
6. Financial Expenditures	**75.27**	**91.84**	**137.44**
7. Other Expenses	**10.14**	**190.15**	**3.25**
III. Balance of the Year	**-152.01**	**-255.60**	**-376.91**
Subsidy for Losses of Previous Years			**204.76**
IV. Accumulated Deficit			
1. Balance for the Previous Years at Beginning of the Year	**-276.10**	**-363.27**	**-524.50**
2. Adjustment of Loss for the Previous Years	**64.85**	**94.36**	**-0.10**
3. Balance of Accumulated Deficit at End of the Year	**-363.27**	**-524.50**	**-696.76**

Source: Estates Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton

Table 9A-3 Notes for Annual Expenditure by Expenditure Items by Managing Division: 2001 and 2002

(Unit: C$ Million)

Item	Operation	Maintenance	Sales	Administration	Total
Year 2001					
1. Salary & Wages	91.11	28.53	39.12	68.79	227.55
2. Electricity	61.16	130.61	0.06	2.15	193.97
3. Security Service	8.74	0.15	0.42	0.79	10.10
4. Fuel & Lubricant	4.37	1.15	1.03	2.71	9.26
5. Chemical Products	2.90	0.29	0.09	0.80	4.08
6. Equipment Maintenance	2.77	0.76	0.73	2.39	6.65
7. Stationary &Office Furniture	1.23	0.07	2.92	1.70	5.91
8. Materials & Repair	7.81	5.36	1.02	17.09	31.29
9. Pipes & Spare Parts	2.75	3.99	0.77	1.21	8.72
10. Measuring Instrument	0.06	0.10	0.00	0.06	0.23
11. Provision for Uncollectible Charges	0.00	0.00	46.56	0.00	46.56
12. Publicity & Propaganda	1.03	0.03	2.32	0.82	4.19
13. External Donation	0.09	0.00	0.02	0.06	0.17
14. Transfer to INAA	0.00	0.00	20.96	0.00	20.96
15. Transportation	4.69	1.99	3.86	3.50	14.04
16. Incentives	1.66	0.06	0.24	1.91	3.88
17. Telecommunication & Postage	1.26	0.03	0.50	1.62	3.40
18. Others	5.12	0.91	14.97	8.69	29.69
Total	196.76	174.02	135.58	114.29	620.65
Year 2002					
1. Salary & Wages	81.17	18.34	36.77	65.37	201.65
2. Electricity	97.95	124.58	0.15	3.35	226.02
3. Security Service	9.57	0.38	0.06	1.45	11.46
4. Fuel & Lubricant	2.46	1.40	0.93	1.88	6.68
5. Chemical Products	4.15	0.01	0.18	0.11	4.46
6. Equipment Maintenance	0.86	0.30	0.35	1.74	3.24
7. Stationary &Office Furniture	0.71	0.08	0.83	1.59	3.20
8. Materials & Repair	4.29	3.52	2.08	3.22	13.10
9. Pipes & Spare Parts	0.72	3.06	0.61	1.39	5.78
10. Measuring Instrument	0.01	0.10	0.01	0.00	0.12
11. Provision for Uncollectible Charges	0.00	0.00	57.67	0.00	57.67
12. Publicity & Propaganda	0.60	0.00	0.65	1.18	2.42
13. External Donation	0.00	0.00	0.02	0.09	0.12
14. Transfer to INAA	0.00	0.00	12.83	0.00	12.83
15. Transportation	0.81	0.01	0.14	1.04	2.01
16. Incentives	5.76	2.09	4.50	3.86	16.21
17. Telecommunication & Postage	2.46	0.00	0.49	1.99	4.95
18. Others	13.47	10.16	17.36	12.15	53.15
Total	225.00	164.03	135.64	100.41	625.08

Source: Estates Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton

Table 9A-4 Cash Flow Table of Water Supply and Sewerage Services in ENACAL: 2001-2003

(Unit: C$ Million)

Item	2001	2002	2003
I. Net Flow of Operation Activity			
1. Net Losses of the Year	-152.01	-255.60	-172.15
2. Adjustment to Reconcile Net Losses with Actual Operation Activities			
(1) Depreciation	120.75	115.34	114.20
(2) Provision for Account Uncollectible	46.56	59.36	75.81
(3) Loss due to Devaluation of Loans	49.63	55.13	
(4) Change in Assets & Liabilities			
1) Increase (Decrease) of Account Receivable	-141.09	31.57	-27.87
2) Increase (Decrease) of Advance Payment	-11.55	13.14	-0.19
3) Increase (Decrease) of Inventory	8.02	-30.51	17.55
4) Increase (Decrease) of Other Assets	-11.61	15.30	-1.07
5) Increase (Decrease) of Credit Providers	-44.69	23.74	15.33
6) Increase of Interest Payment	66.66	34.32	47.90
7) Increase of Deposits for Guarantees	1.51	7.23	1.07
8) Increase (Decrease) of Account Payable	-10.35	19.06	-50.04
9) Increase of Labor Reserve	1.64	1.90	37.59
10) Increase (Decrease) of Notes Payable	17.89	-4.85	22.60
Cash Procurement (Utilization) in Operation Activity	-58.65	85.14	80.72
II. Cash Flow of Investment Activities			
1) Increase of Property, Plants and Equipment	-383.82	-434.16	192.50
2) Increase (Decrease) of Transitory Investmen	1.85	-45.77	-35.39
Net Cash Utilization in Investment Activities	-381.97	-479.93	157.11
III. Cash Flow in Financial Activities			
1) Increase of Loans	13.98	69.73	
2) Increase of Equity	400.57	215.49	
3) Increase of Adjustment for Previous Years	64.85	94.36	
Cash Flow Procurement for Financial Activities	479.40	379.58	0.00
Increase (Decrease) of Net Cash Amount	38.77	-15.21	237.83
Balance at the Beginning of the Year	35.11	73.88	58.67
Balance at the End of the Year	73.88	58.67	

Source: (1) Estados Financieros al 31 de diciembre del 2002 y 2001, June 2003, Grant Thornton
(2) Informe de Auditoria Financiera y de Cumplimientio por los Anos Terminados al 31 Diciembre de 2003 y 2002

ANNEX 9B

Financial Statements of Waterworks of Managua City-1 (Water Supply and Sewerage Services)

Table 9B-1 Original Balance Sheet of Water Supply and Sewerage Services in Managua City: 2001-2003 (1/2)

(Unit: C$ Million)

Item	2001	2002	2003
I. Assets	**814.84**	**1,350.44**	**393.80**
1. Fixed Assets	**684.80**	**1,075.98**	**271.23**
(1) Land	10.40	122.72	10.60
(2) Water Supply Facilities	431.16	534.55	436.89
(3) Sewerage Facilities	86.73	215.61	102.19
(4) General Fixed Assets	225.75	203.67	227.10
(5) Construction in Progress	447.22	552.92	84.56
1) Water Supply Facilities	10.74	8.91	1.31
2) Sewerage Treatment Facilities	0.56	0.63	5.70
3) General Buildings	435.92	543.38	77.55
(6) Accumulated Depreciation	-516.57	-554.24	-590.86
1) Water Supply Facilities	-259.01	-285.23	-311.51
2) Sewerage Treatment Facilities	-110.22	-112.87	-115.24
3) General Buildings	-147.35	-156.14	-164.11
(7) Other Fixed Assets	0.12	0.74	0.74
2. Current Assets	**256.69**	**272.46**	**121.85**
(1) Cash & Bank Deposits	17.30	11.68	0.22
1) Cash	0.18	0.16	0.14
2) Bank Deposits	17.12	11.52	0.08
(2) Transitory Investment	-1.54	-1.12	0.00
(3) Account Receivable	260.22	319.15	341.42
1) Water Supply-Private Sector	214.88	258.21	320.40
2) Water Supply-Governments	10.13	17.54	6.41
3) Sewerage Service-Private Sector	29.83	33.91	0.00
4) Sewerage Service-Government	5.37	6.64	0.00
5) Others	0.00	2.85	14.62
(4) Loans Receivable	106.72	53.49	16.30
1) Faltantes	16.58	0.43	0.54
2) Investment in Advance	3.60	4.69	13.06
3) Supplies in Advance	86.03	48.25	2.38
4) Others	0.52	0.11	0.32
(5) Allowance for Doubtful Account	-139.46	-123.32	-235.67
1) Allowance to WS of Private Sector	-125.93	-109.79	-235.67
2) Allowance to WS of Government	-5.40	-5.40	0.00
3) Allowance to SS of Private Sector	-6.94	-6.94	0.00
4) Allowance to SS of Government	-1.19	-1.19	0.00
(6) Inventory Temporary	11.63	1.26	0.00
(7) Inventory in Warehouse	1.85	11.81	0.00
(8) Other Current Assets	-0.02	-0.49	-0.42
3. Deferred Assets	**1.48**	**1.27**	**0.00**
4. Other Assets	**-128.13**	**0.73**	**0.73**

(To be Continued)

Table 9B-1 Original Balance Sheet of Water Supply and Sewerage Services in Managua City: 2001-2003 (2/2)

(Conclusion) (Unit: C$ Million)

Item	2001	2002	2003
II. Liability and Capital	**1,158.57**	**798.23**	**161.12**
1. Equity	**1,090.95**	**724.41**	**72.34**
(1) ENACAL Funds	1,165.07	771.20	194.24
1) Subsidy, Investment, Contribution, etc.	288.80	518.82	19.68
(a) Investment of Buildings	42.27	55.02	0.00
(b) International Loans	30.06	-16.35	0.00
(c) Pianillas de Salarios	11.90	18.75	18.75
(d) Other Contribution	204.15	460.45	0.00
(e) Others	0.43	0.96	0.93
2) Equity Transfer from INAA	0.08	1.08	1.08
3) Donation	251.29	251.30	173.47
(a) Water Supply	251.30	251.30	173.47
(b) Sewerage Treatment	-0.01	0.00	0.00
(c) General Donation	0.00	0.00	0.00
4) Equity	624.91	0.01	0.01
(2) Accumulated Surplus/Loss	-74.12	-46.80	-121.90
1) Profit or Loss for the Year	22.59	27.33	-75.10
2) Profit or Loss for the Previous Years	-96.72	-74.12	-46.80
2. Liability	**67.62**	**73.82**	**88.78**
(1) Fixed Liability	0.00		0.00
(2) Current Liability	38.69	51.79	58.29
1) Short-term Debt	5.33	25.69	34.91
2) Notes Payable	17.89	0.00	0.00
3) Advance Receipt	7.67	8.84	9.56
(a) Water Supply	7.60	8.77	9.48
(b) Sewerage Treatment	0.07	0.08	0.08
(c) Others	0.00	0.00	0.00
4) Costs Received in Advance	7.43	8.41	4.26
5) Interests Received in Advance	0.37	0.00	0.00
(3) Deferred Liability	7.48	0.00	1.53
(4) Other Liabilities	21.46	22.04	28.96
1) Allowance for Suspension	3.30	6.28	5.04
2) Allowance for Treceavo Month	7.49	7.38	7.42
3) Allowance for Indemnity	10.21	8.36	16.48
4) Repayment for Outstanding	0.46	0.02	0.02
5) Transfer Payment for Central Level	0.00	0.00	0.00

Source: ENACAL, Financial Department

Table 9B-2 Original Profit and Loss Table of Water Supply and Sewerage Services in Managua City: 2001-2003 (1/3)

(Unit: C$ Million)

Item	2001	2002	2003
I. Revenue	**363.80**	**345.43**	**358.78**
1. Sales Revenues	**382.54**	**379.94**	**388.92**
(1) Water Supply	317.31	316.77	342.66
1) Private Sectors	273.56	274.44	300.61
2) Governments	43.75	42.33	42.05
(2) Sewerage Services	65.23	63.17	46.26
1) Private Sectors	54.61	52.66	36.78
2) Governments	10.62	10.51	9.48
2. Service Reduction	**-28.87**	**-41.77**	**-32.84**
(1) Water Supply	-24.80	-35.47	-26.89
(2) Sewerage Services	-4.06	-6.30	-5.90
(3) Discount of Water Supply	-0.01	0.00	-0.05
3. Financial Revenue	**8.15**	**4.91**	**0.09**
(1) Water Supply	0.39	0.38	0.04
(2) Sewerage Services	0.00	0.00	0.00
(3) General Usage	7.76	4.52	0.05
4. Other Revenues	**1.98**	**2.35**	**2.61**
(1) Other Sales Revenues	1.98	2.35	2.60
(2) Sales of Assets	0.00	0.00	0.01
(3) Adjustment of Previous Sales	0.00	0.00	0.00
II. Expenditure	**341.57**	**298.42**	**411.63**
1. Operating Expense	**94.77**	**104.61**	**183.18**
(1) Costs of Water Production	0.00	0.00	0.02
(2) Costs of Water Distribution	0.03	0.00	0.00
(3) Costs of Operation	94.74	104.61	183.16
1) Costs of Water Supply	40.63	36.94	144.15
(a) Salary and Labors	11.93	12.76	13.10
(b) Electricity	0.01	1.05	101.06
(c) Security Services	3.37	1.69	6.21
(d) Chemical Products	0.40	1.66	3.53
(e) Depreciation	16.44	15.70	15.48
(f) Other Expenses	8.47	4.08	4.77
2) Costs of Sewerage Treatment	5.02	4.09	4.30
(a) Salary and Labors	1.13	1.12	1.12
(b) Electricity	0.01	0.00	0.00
(c) Security Services	0.00	0.00	0.02
(d) Chemical Products	0.00	0.00	0.00
(e) Depreciation	3.72	2.75	2.46
(f) Other Expenses	0.16	0.22	0.70
3) Costs of Administration for WA & ST	49.09	63.57	34.70
(a) Salary and Labors	18.25	14.77	7.58
(b) Electricity	1.86	19.08	1.27
(c) Security Services	4.21	6.41	3.25
(d) Chemical Products	0.15	0.06	0.00
(e) Depreciation	17.55	17.53	16.74
(f) Other Expenses	7.06	5.73	5.86

(To be Continued)

Table 9B-2 Original Profit and Loss Table of Water Supply and Sewerage Services in Managua City: 2001-2003 (2/3)

(Continuation) (Unit: C$ Million)

Item	2001	2002	2003
2. Maintenance	**147.33**	**145.45**	**83.71**
(1) Production of Water Supply	120.39	118.43	55.01
1) Electricity	120.39	118.39	55.01
2) Other Costs	0.00	0.05	0.00
(2) Distribution of Water Supply (Electricity)	0.42	0.28	0.11
(3) Maintenance Costs of Sewerage Treatment (Electricity	0.00	0.00	0.01
(4) Maintenance Costs of WS & ST	26.52	26.74	28.57
1) Maintenance of Water Supply	22.98	22.80	24.96
(a) Salary and Labors	8.58	10.07	10.14
(b) Depreciation	0.58	1.04	1.31
(c) Other Expenses	13.81	11.69	13.51
2) Maintenance of Sewerage Treatment	3.18	3.42	3.44
(a) Salary and Labors	2.38	2.59	2.48
(b) Depreciation	0.09	0.09	0.09
(c) Other Expenses	0.71	0.74	0.86
3) Maintenance of Administration	0.36	0.52	3.44
3. Expenses of Registration and Tariff Collection	**86.78**	**37.14**	**127.15**
(1) Expenses of Water Supply Service	65.25	23.78	125.74
(a) Salary and Labors	13.09	12.72	14.98
(b) Electricity	0.00	0.00	1.28
(c) Publicity & Propaganda	1.04	0.06	2.43
(d) Transfer to INAA	3.33	0.00	7.71
(e) Depreciation	0.56	0.52	0.53
(f) Provision for Tariff Collection	35.17	0.00	83.98
(g) Other Expenses	12.06	10.48	14.83
(2) Expenses of Sewerage Service	7.80	0.00	0.00
(3) General Expenses	13.73	13.36	1.40
4. Expenses of Cost Center	**9.56**	**0.41**	**0.02**
(1) Expenses of Vehicle Operation	0.00	0.08	0.01
(2) Expenses of ENACAL North Unit	1.26	0.04	0.01
(3) Costs of Well Drilling	8.30	0.29	0.00
5. Expenses of Administration	**0.09**	**4.42**	**17.52**
(1) Expenses of Administration for Center and Departmer	0.01	0.01	0.05
(2) Expenses of Administration for WS Subsidiaries	0.08	4.42	17.47
(a) Salary and Labors	0.01	0.53	13.24
(b) Other Expenses	0.07	3.89	4.23

(To be Continued)

Table 9B-2 Original Profit and Loss Table of Water Supply and Sewerage Services in Managua City: 2001-2003 (3/3)

(Conclusion) (Unit: C$ Million)

Item	2001	2002	2003
6. Expenses of Finance and Others	**3.04**	**6.38**	**0.05**
(1) Expenses of Finances	1.60	2.20	0.03
(2) Indirect Expenses	1.42	4.09	0.01
1) Indirect Expenses of Water Supply	0.00	0.04	0.00
2) Indirect Expenses of Sewerage Treatment	0.00	0.00	0.00
3) Indirect General Expenses	1.42	4.05	0.01
(3) Extraordinary Expenses	0.00	0.05	0.00
(4) Other Indirect Expenses	0.02	0.04	0.01
1) Indirect Expenses of Water Supply	0.00	0.02	0.00
2) Indirect Expenses of Sewerage Treatment	0.02	0.02	0.00
(5) Adjustment Expenses for Previous Years	0.00	0.00	0.00
1) Adjustment of Water Supply	0.00	1.56	79.40
(a) Salary and Labors	0.00	0.01	0.36
(b) Electricity	0.00	0.00	38.62
(c) Tariff Collection	0.00	0.00	36.53
(d) Expenses of Previous Years	0.00	1.41	3.36
(e) Other Adjustments	0.00	0.14	0.53
2) Adjustment of Sewerage Treatment	0.00	0.00	0.26
3) Adjustment of General Usage	0.00	359.23	-20.24
(a) Salary and Labors	0.00	2.16	0.00
(b) Electricity	0.00	0.00	7.00
(c) Expenses of Previous Years	0.00	356.63	-24.65
(d) Other Adjustments	0.00	0.44	-2.59
4) Other Expenses	0.06	0.08	0.68
III. Balance	**22.23**	**47.01**	**-52.84**
IV. Extraordinary Gains and Losses	**0.36**	**-19.69**	**-22.26**
1. Adjustment of assets revaluation	0.42	341.18	37.84
2. Adjustment of liabilities revaluation	0.06	360.86	60.10
V. Balance of the Year	**22.59**	**27.33**	**-75.10**
VI. Subsidy for Losses of Previous Years			
VII. Accumulated Deficit			
1. Balance for the Previous Years at Beginning of the Yea	**-96.72**	**-74.12**	**-46.80**
2. Adjustment of Loss for the Previous Years	**0.00**	**0.00**	**0.00**
3. Balance of Accumulated Deficit at End of the Year	**-74.12**	**-46.80**	**-121.90**

Source: ENACAL, Financial Department

Table 9B-3 Revised Financial Statement of Water Supply and Sanitation Services in Managua City: 2001-2003

(Unit: C$ Million)

Item	2001	2002	2003
Balance Sheet			
I. Assets	**881.69**	**1,313.20**	**457.95**
1. Fixed Assets	**687.59**	**1,038.74**	**335.37**
(1) Land	10.40	122.72	10.60
(2) Plant & Equipment	679.69	851.69	766.93
(3) Construction in Progress	447.22	552.92	84.56
(4) Accumulated Depreciation	-449.72	-487.39	-524.03
2. Current Assets	**192.62**	**272.46**	**121.85**
(1) Cash & Bank Deposits	17.30	11.68	0.22
(2) Transitory Investment	-1.54	-1.12	0.00
(3) Account Receivable	260.22	319.15	341.42
(4) Allowance for Doubtful Account	-139.46	-123.32	-235.67
(5) Inventory	13.47	13.07	0.00
(6) Other Current Assets	42.63	52.99	15.87
3. Other Assets	**1.48**	**1.99**	**0.73**
II. Liability and Capital	**881.69**	**1,313.20**	**457.95**
1. Equity	**698.15**	**955.91**	**326.26**
(1) Equity	772.27	1,002.70	448.16
(2) Accumulated Surplus/Loss	-74.12	-46.80	-121.90
1) Profit or Loss for the Year	22.59	27.33	-75.10
2) Profit or Loss for the Previous Years	-96.72	-74.12	-46.80
2. Liability	**183.54**	**357.29**	**131.69**
(1) Fixed Liability	145.33	260.08	93.82
(2) Current Liability	38.21	97.21	37.87
Profit and Loss Table			
I. Revenue	**363.80**	**345.43**	**358.78**
1. Sales Revenues	382.54	379.94	388.92
2. Service Reduction	-28.87	-41.77	-32.84
3. Financial Revenue	8.15	4.91	0.09
4. Other Revenues	1.98	2.35	2.61
II. Expenditure	**341.57**	**298.42**	**411.63**
1. Operating Expense	57.06	68.63	148.50
2. Expense of Maintenance	146.66	144.33	82.31
3. Expenses of Sales	95.77	36.99	126.62
4. Expenses of Administration	1.51	8.60	17.54
5. Depreciation	38.97	37.67	36.64
6. Financial Expenditure	1.60	2.20	0.03
III. Balance of Ordinary Gains and Losses	**22.23**	**47.01**	**-52.84**
IV. Extraordinary Gains and Losses	**0.36**	**-19.69**	**-22.26**
V. Balance of the Year	**22.59**	**27.33**	**-75.10**
VI. Accumulated Deficit			
1. Balance for Previous Years at Beginning of the Year	-96.72	-74.12	-46.80
2. Balance of the year	22.59	27.33	-75.10
3. **Balance of Accumulated Deficit at End of the Yea**	**-74.12**	**-46.80**	**-121.90**

ANNEX 9C

Financial Statements of Waterworks of Managua City-2 (Water Supply Services)

Table 9C-1 Estimated Financial Statement of Water Supply Services in Managua City: 2001-2003

(Unit: C$ Million)

Item	2001	2002	2003
Balance Sheet			
I. Assets	**797.66**	**1,043.92**	**339.38**
1. Fixed Assets	**638.89**	**811.69**	**218.87**
(1) Land	10.40	10.50	10.60
(2) Plant & Equipment	565.86	680.21	621.54
(3) Construction in Progress	425.00	516.43	15.79
(4) Accumulated Depreciation	-362.37	-395.45	-429.06
2. Current Assets	**158.04**	**231.50**	**119.78**
(1) Cash & Bank Deposits	15.08	10.18	0.19
(2) Transitory Investment	-1.34	-0.97	0.00
(3) Account Receivable	225.02	278.23	341.42
(5) Allowance for Doubtful Account	-131.33	-115.19	-235.67
(6) Inventory	13.47	13.07	0.00
(7) Other Current Assets	37.15	46.18	13.83
4. Other Assets	**0.73**	**0.73**	**0.73**
II. Liability and Capital	**797.66**	**1,043.92**	**339.38**
1. Equity	**631.61**	**759.89**	**241.78**
(1) Equity	762.02	899.94	484.61
(2) Accumulated Surplus/Loss	-130.41	-140.05	-242.83
1) Profit or Loss for the Year	-15.11	-9.64	-102.78
2) Profit or Loss for the Previous Years	-115.30	-130.41	-140.05
2. Liability	**166.05**	**284.03**	**97.59**
(1) Fixed Liability	131.48	206.75	69.53
(2) Current Liability	34.57	77.28	28.06
Profit and Loss Table			
I. Revenue	**302.63**	**288.56**	**318.42**
1. Sales Revenues	317.31	316.77	342.66
2. Service Reduction	-24.81	-35.47	-26.94
3. Financial Revenue	8.15	4.91	0.09
4. Other Revenues	1.98	2.35	2.61
II. Expenditure	**317.99**	**284.17**	**405.34**
1. Operating Expense	52.29	62.69	146.13
2. Expense of Maintenance	143.52	140.93	81.81
3. Expenses of Sales	85.93	36.98	126.62
4. Expenses of Administration	1.42	8.29	17.16
5. Depreciation	33.23	33.08	33.61
6. Financial Expenditure	1.60	2.20	0.03
III. Balance of Ordinary Gains and Losses	**-15.36**	**4.39**	**-86.92**
IV. Extraordinary Gains and Losses	0.26	-14.03	-15.86
V. Balance of the Year	**-15.11**	**-9.64**	**-102.78**
VI. Accumulated Deficit			
1. Balance for Previous Years at Beginning of the Year	-115.30	-130.41	-140.05
2. Balance of the year	-15.11	-9.64	-102.78
3. **Balance of Accumulated Deficit at End of the Year**	**-130.41**	**-140.05**	**-242.83**

ANNEX 9D

Water Production Costs

Table 9D-1 Unit Price and Production Cost of Water in Managua City: 2001-2003

Item	Unit	2001	2002	2003
1. Management Data				
Production	Million m^3	131.11	134.72	145.06
Sold Volume	Million m^3	61.25	61.45	61.54
Non-Revenue Water	Million m^3	69.87	73.28	83.51
Effective Ratio	%	46.71	45.61	42.43
Employees	Persons	758	713	650
Active Connection	Nos	155,905	164,865	169,843
No. of Employees per Connection	Nos	4.86	4.32	3.83
2. Sales	C$ Million	292.50	281.30	315.72
Water Sales	C$ Million	317.31	316.77	342.66
Service Reduction	C$ Million	-24.81	-35.47	-26.94
3. Average Unit Price				
(1) Unit Price per Sold Water	C/m^3$	**4.78**	**4.58**	**5.13**
(2) Unit Price per Production	C/m^3$	2.23	2.09	2.18
4. Production Costs	C$ Million	368.40	327.25	445.49
(1) Direct Costs of Water Production	C$ Million	228.46	236.14	260.98
1) Operation	C$ Million	145.03	139.95	183.82
a) Water Production	C$ Million	120.39	118.43	55.03
a) Water Distribution	C$ Million	0.45	0.28	0.11
a) Operation	C$ Million	24.19	21.24	128.67
2) Maintenance	C$ Million	22.40	21.76	23.65
3) Depreciation	C$ Million	32.65	32.52	33.06
4) Others	C$ Million	28.38	41.90	20.46
(2) Managerial Expenditure	C$ Million	139.94	91.12	184.51
1) Sales	C$ Million	85.93	36.98	126.62
2) Administration	C$ Million	1.42	8.29	17.16
3) Depreciation	C$ Million	0.59	0.56	0.55
4) Financial Expenditure	C$ Million	1.60	2.20	0.03
5) Transfer to Central Level*1	C$ Million	50.41	43.09	40.16
5. Unit Production Cost				
(1) Unit Production Cost per Sold Water				
1) Direct Cost Only	C/m^3$	3.73	3.84	4.24
2) Direct Cost without Depreciation	C/m^3$	3.20	3.31	3.70
3) Total Cost	C/m^3$	**6.02**	**5.33**	**7.24**
(2) Unit Production Cost per Produced Water				
1) Direct Cost Only	C/m^3$	1.74	1.75	1.80
2) Direct Cost without Depreciation	C/m^3$	1.49	1.51	1.57
3) Total Cost	C/m^3$	2.81	2.43	3.07

Note: *1 Transfer payment was added to the ordinary expenses in the production cost, which was assumed as 47% of the total expenditure of the Central Level. 47% was the ratio of the number of connections in Managua City to the ENACAL Total.

ANNEX 9E

Information and Data for Financial Simulation

Table 9E-1 Annual Disbursement of Capital Investment, and Accounts of Fixed Assets and Depreciation (1/3)

Investment & Construction Schedule of Total Cost — Financial Cost (C$1000)

			Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Entire Projects		('06 - '10)	('06 - '15)	1,056,680						831,343						
	Investment	1,056,680	1,888,024	0	31,739	176,834	388,316	196,991	262,800	244,892	161,264	188,758	161,689	74,741		
	Donors	723,361	894,486	0	0	121,786	314,097	116,352	171,126	171,126	0	0	0	0		
	ENACAL	333,320	993,519	0	31,739	55,048	74,220	80,639	91,674	73,766	161,245	188,758	161,689	74,741		
	Works in Progress		188,023	0	0	105,176	27,384	0	0	0	15,303	37,509	2,652	0		
	Fixed Assets		0	0	31,739	84,114	537,534	876,340	1,140,107	1,407,044	1,554,678	1,723,167	1,921,968	2,001,918	1,888,024	0
	Depreciation		386,942	0	0	1,271	4,439	28,807	36,642	47,208	57,071	62,987	70,812	77,706	75,262	
					0	1,271	5,709	34,516	71,158	118,366	175,437	238,424	309,236	386,942	462,204	

Investment & Construction Schedule of Direct Construction Cost — Financial Cost (C$1000)

		Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Entire Projects															
	Investment	1,630,408	0	27,535	153,259	336,203	170,373	227,039	211,326	138,995	162,492	139,011	64,173		
	Works in Progress	162,622	0	0	91,154	23,709	0	0	0	13,190	32,290	2,280	0		
	Fixed Assets	1,740,402	0	27,535	72,901	465,396	757,927	984,967	1,214,188	1,339,994	1,483,385	1,652,407	1,718,859	1,740,402	1,740,402
	Depreciation	333,264	0	0	1,101	3,843	24,915	31,656	40,737	49,190	54,222	60,881	66,719		

Entire Projects — Financial Cost (US$1000)

		Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
	Investment	100,127	0	1,691	9,412	20,647	10,463	13,943	12,978	8,536	9,979	8,537	3,941	367	
	Donors		0	0	6,657	17,169	6,360	9,354	9,354	0	0	0	0		
	ENACAL		0	1,691	1,691	3,478	4,103	4,589	3,624	8,535	9,979	8,537	3,941		
	Works in Progress	9,987	0	0	5,598	1,456	0	0	0	810	1,983	140	0	0	
	Fixed Assets	106,882	0	1,691	4,477	28,581	46,546	60,489	74,566	82,292	91,098	101,478	105,559	106,882	106,882
	Depreciation	24,727	0	0	68	236	1,530	1,944	2,502	3,021	3,330	3,739	4,097	4,261	4,261

Investment & Construction Schedule — Financial Cost (C$1000)

		Project Components	Depr. Period	Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1.	A.	Investment	25	1,080			324	756									
		Works in Progress					324										
		Fixed Assets						1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	
		Depreciation							43	43	43	43	43	43	43	43	
	B.	Investment	25	710			213	497									
		Works in Progress					213										
		Fixed Assets						710	710	710	710	710	710	710	710	710	
		Depreciation							28	28	28	28	28	28	28	28	
	Ca	Investment	25	1,400			420	980									
		Works in Progress					420										
		Fixed Assets						1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	
		Depreciation							56	56	56	56	56	56	56	56	
	Cb-c	Investment	25	11,631			1,028	1,713	2,055	2,055	956	956	956	956	956		
		Works in Progress															
		Fixed Assets						1,028	2,741	4,796	6,851	7,807	8,763	9,719	10,675	11,631	
		Depreciation						41	110	192	274	312	351	389	427	465	

Table 9E-1 Annual Disbursement of Capital Investment, and Accounts of Fixed Assets and Depreciation (2/3)

Investment & Construction Schedule Financial Cost (C$1000)

				Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	Da.	Investment	25	1,186			356	830									
		Works in Progress					356										
		Fixed Assets						1,186	1,186	1,186	1,186	1,186	1,186	1,186	1,186	1,186	
		Depreciation							47	47	47	47	47	47	47	47	
	Db.	Investment	25	809								243	566				
		Works in Progress										243					
		Fixed Assets											809	809	809	809	
		Depreciation												32	32	32	
	Ea.	Investment	25	3,842			1,153	2,689									
		Works in Progress					1,153										
		Fixed Assets						3,842	3,842	3,842	3,842	3,842	3,842	3,842	3,842	3,842	
		Depreciation							154	154	154	154	154	154	154	154	
	Eb.	Investment	25	467										140	327		
		Works in Progress												140			
		Fixed Assets													467	467	
		Depreciation														19	
2.	Aa.	Investment	25	1,960			392	1,176	392								
		Works in Progress															
		Fixed Assets					392	1,568	1,960	1,960	1,960	1,960	1,960	1,960	1,960	1,960	
		Depreciation						16	71	78	78	78	78	78	78	78	
	Ab.	Investment	25	2,118						325	418	186	416	535	238		
		Works in Progress															
		Fixed Assets								325	743	929	1,345	1,880	2,118	2,118	
		Depreciation									13	30	37	54	75	85	
	B.	Investment	25	3,336			667	2,002	667								
		Works in Progress															
		Fixed Assets					667	2,669	3,336	3,336	3,336	3,336	3,336	3,336	3,336	3,336	
		Depreciation						27	120	133	133	133	133	133	133	133	
	Ha.	Investment	25	790			395	395									
		Works in Progress					395										
		Fixed Assets						790	790	790	790	790	790	790	790	790	
		Depreciation						16	32	32	32	32	32	32	32	32	
	Hb.	Investment	25	2,080				1,456	624								
		Works in Progress						1,456									
		Fixed Assets							2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	
		Depreciation							42	83	83	83	83	83	83	83	
	Hc-c	Investment	25	23,385					4,677	9,354	9,354						
		Works in Progress															
		Fixed Assets							4,677	14,031	23,385	23,385	23,385	23,385	23,385	23,385	
		Depreciation								187	561	935	935	935	935	935	
	He.	Investment	25	12,266								4,293	4,293	3,680			
		Works in Progress															
		Fixed Assets										4,293	8,586	12,266	12,266	12,266	
		Depreciation											172	343	491	491	
	i.	Investment	25	0													
		Works in Progress															
		Fixed Assets															
		Depreciation															

Table 9E-1 Annual Disbursement of Capital Investment, and Accounts of Fixed Assets and Depreciation (3/3)

Investment & Construction Schedule Financial Cost (C$1000)

				Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	j.	Investment	25	0													
		Works in Progress															
		Fixed Assets															
		Depreciation															
	k.	Investment	25	0													
		Works in Progress															
		Fixed Assets															
		Depreciation															
	l.	Investment	25	0													
		Works in Progress															
		Fixed Assets															
		Depreciation															
3.	A.	Investment	25	1,341			402	939									
		Works in Progress					402										
		Fixed Assets						1,341	2,280	2,280	2,280	2,280	2,280	2,280	2,280	2,280	
		Depreciation							91	91	91	91	91	91	91	91	
	B.	Investment	25	4,950			1,485	3,465									
		Works in Progress					1,485										
		Fixed Assets						4,950	8,415	8,415	8,415	8,415	8,415	8,415	8,415	8,415	
		Depreciation							337	337	337	337	337	337	337	337	
	C.	Investment	25	1,680			504	1,176									
		Works in Progress					504										
		Fixed Assets						1,680	2,856	2,856	2,856	2,856	2,856	2,856	2,856	2,856	
		Depreciation							114	114	114	114	114	114	114	114	
	D.	Investment	25	1,154			346	808									
		Works in Progress					346										
		Fixed Assets						1,154	1,962	1,962	1,962	1,962	1,962	1,962	1,962	1,962	
		Depreciation							78	78	78	78	78	78	78	78	
	E.	Investment	25	2,833								567	1,416	850			
		Works in Progress										567	1,983				
		Fixed Assets												2,833	2,833	2,833	
		Depreciation												57	113	113	
	F.	Investment	25	2,447					245	367	367	367	367	367	367	367	
		Works in Progress															
		Fixed Assets							245	612	979	1,346	1,713	2,080	2,447	2,814	
		Depreciation								10	24	39	54	69	83	98	
	G.	Investment	25	18,662		1,691	1,727	1,765	1,803	1,842	1,883	1,924	1,965	2,009	2,053		
		Works in Progress															
		Fixed Assets				1,691	3,418	5,183	6,986	8,828	10,711	12,635	14,600	16,609	18,662	18,662	
		Depreciation					68	137	207	279	353	428	505	584	664	746	
4.	A.	Investment	25	0													
		Works in Progress															
		Fixed Assets															
		Depreciation															
	B.	Investment	25	0													
		Works in Progress															
		Fixed Assets															
		Depreciation															

Table 9E-2 Terms of Loans and Annual payment of Debt Services (1/2)

1. Terms of Loans

		Repayment Period (Year)	Grace Period (Year)	Interest Rate (%/year)	(%/year)	
(1)	Foreign	35	10	2.0		
(2)	Government	10	5	0.0	<== Infusion as Equity	
(3)	Bank	10	2	8.0		
(4)	Existing	10	0	2.0		
(5)	Short-term	1	0	5.0	**12.5**	

Average interest rate of 12 months loan in Home Page of CBN

Deposit

		Interest Rate (%/year)	
Saving	Daily	3.28%	0.8% <== Actual rate, because of not-constant saving deposits
	3 months	3.61%	
	6 months	4.88%	Home Page of Central Bank of Nicaragua
	12 months	5.62%	

2. Capital Investment 1 (Unit: C$ Million)

		Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Loan	Foreign Principle			723														
Loan	Investment (Beginning)		0	0	122	314	116	171	0	0	0							
	Outstanding (Beginni		0	0	122	436	552	723	723	723	723	723	723	694	665	637	608	579
	Repayment (Term-en		0	0	0	0	0	0	0	0	0	0	29	29	29	29	29	29
Debt Services			0	0	2	9	11	14	14	14	14	14	43	43	42	42	41	41
	Interest		0	0	2	9	11	14	14	14	14	14	14	14	13	13	12	12
	Repayment												29	29	29	29	29	29

3. Capital Investment 2 (Unit: C$ Million)

		Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Loan	Foreign Principle								171									
Loan	Investment (Beginning)								171	0	0	0	0					
	Outstanding (Beginning)								171	171	171	171	171	171	171	171	171	171
	Repayment (Term-end)								0	0	0	0	0	0	0	0	0	0
Debt Services									3	3	3	3	3	3	3	3	3	3
	Interest								3	3	3	3	3	3	3	3	3	3
	Repayment								0	0	0	0	0	0	0	0	0	0
Grand Total of Outstandings			**0**	**0**	**122**	**436**	**552**	**723**	**894**	**894**	**894**	**894**	**894**	**866**	**837**	**808**	**779**	**750**
Grand Total of Debt Service			0	0	2	9	11	14	18	18	18	18	47	46	46	45	45	44
	Interest		**0**	**0**	**2**	**9**	**11**	**14**	**18**	**18**	**18**	**18**	**18**	**17**	**17**	**16**	**16**	**15**
	Repayment		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**29**	**29**	**29**	**29**	**29**

Table 9E-2 Terms of Loans and Annual payment of Debt Services (2/2)

4. Capital Investment by Government Assistance (C$ Million)

		Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Loan	Government Assistance		0	32	87	161	242	333	407	568	757	919	994					
	Investment (Beginning)		0	32	55	74	81	92	74	161	189	162	75					
	Outstanding (Beginni		0	32	87	161	242	333	401	545	701	815	823	748	651	532	397	265
	Repayment (Term-end)							0	0	0	0	0						
									6	6	6	6	6					
										11	11	11	11	11				
											15	15	15	15	15			
												16	16	16	16	16		
													18	18	18	18	18	
														15	15	15	15	15
															32	32	32	32
																38	38	38
																	32	32
																		15
Debt Servi	Repaymer	994	0	0	0	0	0	0	6	17	32	48	67	75	96	119	135	132

5. Existing Loans

		Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Loan	Foreign Principle		69.5												
Loan	Investment (Beginning)														
	Outstanding (Beginni		69.5	62.6	55.6	48.7	41.7	34.8	27.8	20.9	13.9	7.0			
	Repayment (Term-enc		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0			
Debt Services			8.3	8.2	8.1	7.9	7.8	7.6	7.5	7.4	7.2	7.1			
	Interest		1.4	1.3	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.1			
	Repayment		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0			

6. Miscellanies

Account Receivable

Decrease from 25% in 2002 to 12.5% in 2010.

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
100.0%	50.0%	25.0%	23.1%	21.4%	19.8%	18.4%	17.0%	16.0%	15.0%	14.1%	13.3%	12.5%

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.10
Supports on Environmental and Social Considerations

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.10
Supports on Environmental and Social Considerations

Table of Contents

ANNEXES

10.1 OBJECTIVES OF SUPPORTS AND JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

10.1.1 Objectives of Supports

In collaboration with ENACAL and in accordance with the "JICA Guidelines for Environmental and Social Considerations", the Study team undertook an Initial Environmental Evaluation (IEE) level study on the potential impacts of the proposed project on the environment and society. This IEE study included the identification of stakeholders and a consultation meeting with identified stakeholders.

10.1.2 Procedures for Environmental and Social Considerations

(1) Review Stage of Proposed Projects

In response to the request of the Government of the Republic of Nicaragua, the Government of Japan has decided to conduct the "Study on Improvement of Water Supply System in Managua" within the general framework of technical cooperation between Japan and Nicaragua, which is set forth in the Agreement on Technical Cooperation between Japan and Nicaragua signed on May 30, 2001.

In this review stage, the guidelines require the following:

1. JICA reviews proposed projects submitted to the Ministry of Foreign Affairs (MOFA), by confirming a project and site description, environmental impact assessment process in the recipient governments and other information, and categorizes it through first screening. After that, JICA makes decisions on proposed projects from the viewpoint of environmental and social considerations and makes recommendations to MOFA;
2. JICA discloses information of Category A projects, such as a country, an area and project description, for a certain period on its website before making its recommendation to MOFA, and collects external information and opinions to incorporate them in the recommendation;
3. If there is not sufficient information for category classification, JICA makes inquiries to the recipient governments through the Embassies of Japan, JICA overseas offices and other institutions. If information obtained through inquiries is considered insufficient, JICA dispatches teams, etc., to collect information regarding environmental and social aspects through consultations with persons concerned and field visits in recipient countries and other methods. JICA promptly discloses study reports; and
4. Soon after the conclusion of international agreements by MOFA, JICA discloses names, countries, locations, outlines and sectors of projects, and their categorization together with their reasons on its website. For Category A and B projects, JICA discloses recommendations to MOFA on its website.

(2) Preparatory Study Stage

During the preparatory study conducted from February 23 to March 5, 2004, JICA explained ENACL about the Draft Guidelines for Environmental and Social Considerations. JICA Preparatory Study Team conducted information gathering, field surveys and consultations with Government of Nicaragua. On the basis of collected information and consultations, the Preparatory Study Team categorized this project as "Type B".

Existing Nicaraguan laws do not require environmental considerations for water supply projects, unless they include the construction of a dam/s. For this reason, the proposed project is not

subjected to the Environmental Laws in Nicaragua.

(3) Signing of S/W Stage

When the S/W of the Study was signed in March 2004, the Preparatory Study Team explained the background and the concept of JICA's New Guidelines for Environmental and Social Considerations to be effective from April 1, 2004. The Team emphasized ENACAL's responsibility in conducting environmental and social considerations and ENACAL agreed in principle to fulfill its responsibility.

(4) Full-scale Study Stage

The Study team collected relevant information, conducted field surveys, held consultations with ENACAL, and prepared drafts of scoping. When the Study team considered scoping and categorization of the proposed project, the team asked ENACAL to fill in "Appendix 3. Screening Format" of the guidelines. **Annex 10A** shows the details of "Appendix 3 Screening Format". The team conducted IEE-level environmental and social considerations studies and also evaluated the "without project" scenario. As a result, both ENACAL and the Study team agreed to rank the proposed project as "Category B".

Although existing regulations in Nicaragua do not require environmental considerations for water supply projects, the Study team and ENACAL agreed to make consultation with stakeholders in pursuit of international practices for the formulation of projects.

10.2 SCOPING OF ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT

10.2.1 Project Scoping

After screening of the project, JICA Study Team assisted ENACAL to identified potential impacts of the project. This identification was made utilizing tables format prepared by the Study Team. These tables correspond to Description of Proposed Project, Description of Project Site, Matrix for Scoping, Checklist for Scoping and Summary of Potential Impacts (See **Tables 10.B.1** to **10.B.5** of **Annex 10B**). The first evaluation of impact considered by ENACAL and JICA Study Team, categorized the proposed project as "Type B". This project scooping tables was used for the stakeholder consultation.

10.2.2 Selection of Stakeholders

For public consultation of this initial evaluation of summary of impacts, the Study Team assisted ENACAL in selecting stakeholders. As a result, ENACAL and Study Team selected a total of 56 stakeholders as shown in **Table 10.2.1**.

Table 10.2.1 Selected Stakeholders

Group Category	Number
Governmental Offices	18
Municipal Offices	9
Universities/Colleges	4
NGOs	25
Total	**56**

10.2.3 Stakeholders Meeting

A stakeholders meeting was organized and convened by ENACAL with the assistance of the Study team at the Holiday Inn Hotel in Managua on February 16, 2005. ENACAL issued its invitation letters to the 56 organizations listed in **Annex 10C** and 44 organizations participated in the meeting.

At the beginning of the meeting, ENACAL explained the scope of work of the JICA Study, which was then followed by the explanation by the Study team of the proposed long-term improvement project. The Director of the ENACAL's Environment Department explained about the "JICA Guidelines for Environmental and Social Considerations", the objectives of the stakeholders meeting, and the methodologies to be used for the evaluation of social and environment impacts of the proposed long-term improvement project. Following the orientation session, each and every participant was assigned to one of the following 3 working groups.

Working Group No.1: Social Environment
Working Group No.2: Natural Environment
Working Group No.3: Contamination

The members assigned to each working group are shown in **Annex 10D**. In each working group, a "Moderator-cum-Facilitator" and a "Secretary" were selected by consensus among the group members. Each working group discussed and completed a checklist while ranking potential impacts of the proposed long-term improvement project on a scale of "A" to "D". The outcome of each group sessions is presented in **Annex 10D**

Upon completion of the three separate working group sessions, all the participants were reunited and the Secretary to each working group presented the outcome of its group session. The minutes of the stakeholders meeting were prepared by ENACAL and distributed to all the participants in the meeting (See **Annex 10D** for the minutes). The minutes were publicized in ENACAL's website.

Main expected impacts appointed by stakeholders are summarized in following categories.

1) Impacts to be considered in the planning phase:
   Impact 1 (Involuntary Resettlement), and Impact 3 (Land use):
   Some urban areas, without urban plan, specially in low income areas, doesn't have planned streets and or common communal spaces, these areas need urban reordering of the community. This situation may cause same involuntary resettlement and creation of green areas.

   Impact 4 (Social Institution) and Impact 7 (Misdistribution of benefits and damage):
   Some projects were planned without close coordination of central government, local government and communal organizations. Proposed project may cause misdistribution between direct and indirect improvement water supply service areas.

   Impact 9 (Conflict of Local Interest):
   Some major water sources (Managua I and Managua II wells fields) of Managua water supply system are located in Ticuantepe and Nindiri municipalities. Water supply conditions in these municipalities are generally poor and the local residents wish to use these sources for improvement of their water services.

   Impact 11 (Sanitations), Impact 23 (Water Contamination) and Impact 24 (Soil Contamination): More usage of water cause mores wastewater and may cause sanitation

problems, water and soil contaminations.

Impact 15 (Groundwater) and impact 16 (Hydrology):
Over exploitation of groundwater may causes lowering of groundwater level, problems in water balance and contamination problems.

2) Impacts to be considered in construction phase:
Impact 2 (Local economy), Impact 5 (Existing social infrastructure), Impact 12 (Risks of diseases), Impact 14 (Soil Erosion), Impact 22 (Air Pollution), Impact 25 (Waste), Impact 26 (Noise and Vibration), Impact 27 (Ground Subsidence), Impact 29 (Accidents):
Construction works in urban areas affect the local economy, existing infrastructure, resident health and live condition, and may causes ground subsidence or accidents for a inadequate construction methods or no practice of technical construction methods.

Impact 8 (Cultural heritage):
Asososca Lake ancient picture is identified, but there is a possibility of another cultural heritage currently unknown.

3) Impacts to be considered in operation phase:
Impact 8 (Cultural Heritage):
In identified cultural heritage of Asososca Lake, actual and future exploitation of water may cause deterioration of the rock picture, and must be evaluated.

Impact 15 (Groundwater conservation) and Impact 23 (Water pollution):
Same as in planning phase continuous exploitation of groundwater affect to the groundwater conservation and may cause water pollutions.

Impact 28 (Offensive odor):
Sewerage treatment plant operation and leakage of waters from tanks and wells may cause offensive odor..

4) Recommendation to Government of Nicaragua
Impact 10 (water uses):
There aren't control or monitoring of groundwater exploitation and uses. The different uses of groundwater must be regulated by the law and the government of Nicaragua.

10.3 EVALUATION OF STAKEHOLDERS' PROPOSALS

The proposals of the stakeholder were evaluated by ENACAL and JICA Study Team, and most of this proposal were included in the planning of the proposed project, and in future stage of this project implementation. The evaluation results are summarized in **Table 10.3**.

Table 10.3 Measures Considered in The Proposed Project

Name of the Project		**The Project for Improvement of Water Supply System in Managua in the Republic of Nicaragua**		
Likely Impact	Rating	Impacts	Methods used to predict	Recommended Mitigation Measures
1. INVOLUNTARY RESETTLEMENT	C	Design and location of pipelines and other facilities may affect same residents	Pipelines and other facilities in design analysis	Adequate compensation program, in concordance with other related institutions
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	The proposed project consider small scale tanks, wells and pumps stations in disperse areas. Resettlement of population is not planned. If some isolated properties is affected, adequate negotiation will be done by ENACAL with the affected owners.			
2. LOCAL ECONOMY (employment, livelihood, etc)	B	Temporal impacts in some business and service in the construction stage	Design and construction plan analysis	Information of works to the community and their organizations. Publishing of works areas, period and temporary deviation of circulation
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	Detailed Design: ENACAL will select the construction methodology for mitigate the negative impact in local economy and all kind of pollution cause by the construction. The mitigation methodology will be included in technical specification of the construction of facilities. **Construction Stage: ENACAL will determinate in construction contract, the selection of adequate methods for mitigation of all kind of pollution, prevention of contamination, prevention of accidents to workers, pedestrian, cars and others. Specification of type of temporary works, including local transport modifications. ENACAL will organize strict construction supervision for the mitigation of any impacts in the community and assure a smooth communication with the communities and local government.**			
3. LAND USE AND UTILIZATION OF LOCAL RESOURCES	C	Same little land use changes is predicted. Impacts may became clear in basic design stage	Design analysis	Depend of magnitude of impacts
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	Basic and Detailed Design Stage: The proposed project considers small scale tanks, wells and pumps stations in disperse areas. Small scale of land use change is foreseen in same areas. This minor change will be coordinated with local government and affected population.			
4. SOCIAL INSTITUTIONS (social infrastructure, local decision making institutions)	C	Conflict between local government and central government	Establishment of coordination committee for resources uses	Monitoring of coordination committee decisions
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	ENACAL will promote coordination committee for all stages of this project with participation of all related organization. This committee will coordinate a general consensus for the smooth implementation of the project and prevent interest conflicts.			
5. EXISTING SOCIAL INFRASTRUCTURE AND SERVICES	B	Pipeline construction and other facilities may impact to existent social facilities	Design Plan analysis. Adequate supervision of construction of facilities	Efficient organization of works and restoration measures
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			
7. MISDISTRIBUTION OF BENEFITS AND DAMAGE	C	Misdistribution of benefits if there aren't equilibrium in water supply service.	Participation of population, local government, NGO and central government	Plan of protection and uses of resources. Review and participation in all stages of the project
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	The project propose creation of Water Sanitation Committee (WSC) for the implementation of the project			

Name of the Project		**The Project for Improvement of Water Supply System in Managua in the Republic of Nicaragua**		
Likely Impact	Rating	Impacts	Methods used to predict	Recommended Mitigation Measures
8. CULTURAL HERITAGE		Over pumping of Asososca Lake may drop water level. Water drop in lake may impact in rocks of Asososca caldera	Caldera rocks inspection. Monitoring of Lake water level	Control of Lake Asososca pumping
		Risk in destruction of cultural heritage (discover of unknown heritages)	ENACAL must prepare related cultural heritage impact study	Cultural Heritage Impact Study
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	Basic and Detailed Design Stage: ENACAL will confirm the reduction of pumping rate proposed in the present Study (See Supporting Report No.3). ENACAL will coordinate with National Culture Institute (INC) for the best conservation measures of rocks of Asososca caldera. **Construction Stage: ENACAL will take appropriated coordination with INC in land excavation works. And consider a appropriate change in construction if any cultural heritage is discovered in construction process.** **Operation Stage: ENACAL will continue monitoring of water level in Lake Asososca**			
9. LOCAL CONFLICT OF INTERESTS	B	Possible conflict with local residents near water resources, specially in deficient water supply service	Monitoring of water supply service condition in population near water resources areas	Elaboration of improvement of water supply service in populations near water resources. Guarantee of improvement of water supply service in that areas (Ticuantepe and Nindiri)
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	This project proposes improvement in water supply services in Ticuantepe and Nindiri areas. Areas near important water sources of the Managua supply system			
10. WATER USAGE OF WATER RIGHTS AND RIGHS OF COMMON	B	Over-pumping of groundwater may affect the distribution of water in different water users	Monitoring of groundwater uses in different sectors, including private companies	Groundwater uses regulation law implementation. Convenient and equilibrate uses of groundwater.
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	The Study recommend to Government of Nicaragua for the rapid approve of "Water Law", in discussion in the Congress, and the implementation of the National Water Administration Office (ANA), proposed in that law. **Otherwise, this project proposed a appropriated extraction of groundwater for their sustainability and groundwater level and quality monitoring in the Project Area (See Supporting Report No3)**			
11 SANITATION	B	Water supply service improvement cause more wastewater	Waste water and sanitation coverage monitoring	Education of users in water use. Construction of waste water treatment plant. Education in individual wastewater disposition
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	Objective of component 3 is reduction of Leakage and Wastage, including a education in water uses. **Objective of component 4 is improvement in water supply system and sanitation in low income settlements, with major service problems in Study Area.** **Otherwise, ENACAL is constructing a wastewater conduction and treatment plant in most of Managua city, with IDB, KfW and NDF co-finance. This wastewater network will serve new supply areas in Managua Zona Baja, Alta and Alta Superior.**			
12. HAZARDS INFECTIOUS DISEASES (HIV/AIDS)	B	Diarrheic and respiratory diseases in the project implementation due air pollution, puddles	Environmental inspection	Control of vectors
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			
14. SOIL EROSION	B	Soil erosion in pipeline trench construction in rainy season. Obstruction of natural drainage for	Mitigation measures in construction. Design analysis.	Protection works in construction and operation stages

Name of the Project		The Project for Improvement of Water Supply System in Managua in the Republic of Nicaragua		
Likely Impact	Rating	Impacts	Methods used to predict	Recommended Mitigation Measures
		pipeline construction		
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			
15. GROUNDWATER	B	Wastewater increase and their no treatment must affect groundwater quality	Water quality study of groundwater. Sanitary condition study	Education of users in water use. Water proof treatment and adequate drainage for facilities. Construction of wastewater treatment plant. Education in individual wastewater disposition
	C	Over pumping of groundwater may low groundwater level, more study will need for the sustainability of the resources	Monitoring of wells. Monitoring of land uses near wells (gasoline station, crop areas)	Actualization of hydro geologic studies. Establishment of policies for micro basin protection and recharge areas. Citizens education in environment and water uses
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	Proposed Project: the project propose few new wells in new areas, most of wells propose is for replacement or relocation of existing wells. Monitoring of groundwater quality and water level for study area are proposed (See Supporting Report No.3). **Basic Design and Detailed Design: ENACAL will confirm results of the present study, JICA study of 1994. and SUWAR study about groundwater balance and quality evaluation.** **Construction and Operation stages: SAME AS ITEM 11 and 10**			
16. HYDROLOGICAL SITUATION	B	Over pumping of groundwater may affect groundwater level	Groundwater level study	Control of groundwater exploitation
	C	Aquifer over explotation	Monitoring and evaluation	Groundwater inventory. Monitoring of existing wells. Study of groundwater potential
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME as ITEM 10 and 15			
19. METEOROLOGY	C	Existence of risks of damage in facilities for natural phenomenon (hurricane, drought)	Prevention measures	Adequate design for hurricane, droughts
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	Basic and Detail Design: ENACAL will design facilities for protection of hurricane and other natural phenomenon			
22. AIR POLLUTION	A	Pipelines construction in urban areas produce dusts and may affect population health	Construction works control	Implementation of adequate construction methods (watering in trench works). Efficient organization of works. Responsibility of Executing Agency and Contractor
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			
23. WATER POLLUTION	B	Water supply service improvement cause more wastewater This wastewater affect Lake Managua water quality	Groundwater exploitation studies. Studies in wastewater quality	Education of users in water use. Education in individual wastewater disposition
		Wastewater treatment plant construction. Control of pipeline contamination and wells recharge areas	Monitoring and inspection	Wastewater service. Education in water supply and sanitation uses
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 11			

Name of the Project		The Project for Improvement of Water Supply System in Managua in the Republic of Nicaragua		
Likely Impact	Rating	Impacts	Methods used to predict	Recommended Mitigation Measures
24. SOIL CONTAMINATION	B	Soil contamination for lacking of sanitation facilities	Improvement of sanitary facilities coverage	Construction of sanitary facilities
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 11			
25 WASTE	B	Construction waste production. Impact in living condition, accidents, urban aesthetics	Construction supervision	Adequate waste management
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			
26. NOISE AND VIBRATION	B	Noise and vibration in urban areas in construction stage	Supervision of construction. Public information of works	Selection of construction methods for minimize noise and vibration. Installation of isolated screens and mitigation zones. Selection of machineries and their maintenance. Protection for workers
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			
27 GROUND SUBSIDENCE	B	Inadequate construction in trench may cause ground subsidence, accidents and puddles (production of vectors)	Supervision of construction	Adequate supervision in soil compaction
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			
28 OFENSIVE ODOR	B	Overflow of tanks or wells may produce puddles with production of vectors. More wastewater in wastewater treatment plant	Supervision	Preventive maintenance program, utilization of adequate equipments. Adequate coordination of different projects
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2 Operation Stage: ENACAL is implementing modernization program for improvement of operation and maintenance organization			
29 ACCIDENTS	B	Workers, pedestrian, car accidents in construction stage. Construction machinery accidents		Application of MITRAB security regulations. Work area signals. Publishing of works, community participation.
	MEASSURES CONSIDERED IN THIS PROPOSED PROJECT:			
	SAME AS ITEM 2			

10.4 EVALUATION OF ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECTS

ENACAL with the assistance of JICA Study Team elaborated an initial Matrix for Scoping, Checklist for Scoping and Summary of Potential Impacts, this initial evaluation was discussed in public consultation, some new potential impact was proposed by stakeholders for the proposed project. ENACAL and the Study Team evaluated this stakeholder proposal, and most of this proposal was incorporated in the project and a final scoping of potential impacts was elaborated and summarized in following tables.

Table 10.4.1 Matrix of Scoping (Final)

Name of Cooperation Project			The study on improvement of water supply system in Managua in the Republic of Nicaragua											
				Planning Phase				Construction Phase			Operation Phase			
	No.	Likely Impacts	Overall Rating	Land acquisition	Change of Land use plan,	Sanitation and water quality	Resources Sustainability	Construction of Pipelines	Construction of Water Supply Facilities (Tank, pump station)	Operation of Construction Equipment and Vehicles	In taking Excessive Water from Rivers, Lakes, etc.	Operation of related facilities	Appearance/Occupancy of related building structures
Social Environment: Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment	1	Involuntary Resettlement											
	2	Local economy such as employment and livelihood, etc	B					B	B	B			
	3	Land use and utilization of local resource											
	4	Social Institutions such as social infrastructure and local decision-making institutions											
	5	Existing social infrastructures and services	B					B	B	B			
	6	The poor, indigenous and ethic people											
	7	Misdistribution of benefit and damage											
	8	Cultural heritage	C					C					
	9	Local conflict of interests											
	10	Water Usage of Water Rights and Rights of Common					C						
	11	Sanitation											
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS	B					B	B	B			
Natural Environment	13	Topography and Geographical features											
	14	Soil Erosion	B					B	B	B			
	15	Groundwater	B				B						
	16	Hydrological Situation											
	17	Coastal Zone											
	18	Flora, Fauna and Biodiversity											
	19	Meteorology											
	20	Landscape											
	21	Global Warming											
Pollution	22	Air Pollution	B					B	B	B			
	23	Water Pollution											
	24	Soil Contamination											
	25	Waste	B					B	B	B			
	26	Noise and Vibration	B					B	B	B			
	27	Ground Subsidence											
	28	Offensive Odor											
	29	Bottom sediment											
	30	Accidents	B					B	B	B			

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.). No Mark: No impact is expected. IEE/EIA is not necessary.

Table 10.4.2 Checklist for Scoping (Final)

Name of Cooperation Project		The study on improvement of water supply system in Managua in the republic of Nicaragua	
No.	Impacts	Rating	A Brief Description
Social Environment: Regarding the impacts on "Gender" and "Children's Right" might be related to all criteria of Social Environment.			
1	Involuntary Resettlement	D	There are no or few residents at the proposed facilities sites.
2	Local economy such as employment and livelihood, etc	B	A appropriated methodology of construction will be selected in Detailed Design and Construction Stage for the mitigation of this impact
3	Land use and utilization of local resource	D	The project doesn't use much space or local resource.
4	Social Institutions such as social infrastructure and local decision-making institutions	D	The project propose coordination committee and creation of Water Sanitation Committee and application of participatory methods for wide participation of community an local government
5	Existing social infrastructures and services	B	Same as Item 2
6	The poor, indigenous and ethic people	D	The propose project has an important component for low income settlement areas
7	Misdistribution of benefit and damage	D	The proposal plan is considered impartial benefit, an a important participation of the community by promotion of Water Sanitation Committee
8	Cultural heritage	C	The rock in Asososca Lake has an ancient picture, and possibility of no discover cultural heritage in excavation works.
9	Local conflict of interests	D	The project propose improvement in Ticuantepe and Nindiri areas, near important water sources of Managua water supply system
10	Water Usage of Water Rights and Rights of Common	B	Some companies use same groundwater, regulation in groundwater uses is needed
11	Sanitation	D	More usage of water causes more wastewater from homes., the project propose a important sanitation facilities improvement.
12	Hazards (Risk) Infectious diseases such as HIV/AIDS	B	Same as Item 2
Natural Environment			
13	Topography and Geographical features	D	The facilities of the Project are small, and don't change the topographical and geographical features on a large scale.
14	Soil Erosion	B	Same as item 2
15	Groundwater	B	The project propose few wells in new areas, most of them is for replacement or relocation of existing wells In Basic and Detailed Study stage, will confirm results of present study, JICA study of 1994 and SUWAR study about water balance and quality evaluation of groundwater.
16	Hydrological Situation	D	Same as item 16
17	Coastal Zone (Mangroves, Coral reefs, Tidal flats, etc.)	D	There isn't any Coastal Zone in the Study area.
18	Flora, Fauna and Biodiversity	D	There are few virgin Flora in the study area. The facilities are small, and don't affect forest on a large scale.
19	Meteorology	D	The Study don't build huge facilities affected Meteorology.
20	Landscape	D	The facilities are small, a few and scattered. Same as item 2
21	Global Warming	D	The Plan doesn't cause any global warming gasses directly. More pumping needs more electricity.
Pollution			
22	Air Pollution	D	Construction machinery will cause few exhaust gas during the construction. Same as item 2
23	Water Pollution	D	Same as item 11
24	Soil Contamination	D	Area where wastewater pipelines aren't existed, some soil contamination would cause. (Same as Item 11)
25	Waste	B	The amount of wastes in construction and operation is few. (Same as Item 2)
26	Noise and Vibration	B	Construction machinery will cause some noise and vibration during the construction.
27	Ground Subsidence	B	The pumping groundwater hasn't caused any ground subsidence.(Same as item 2)
28	Offensive Odor	D	There isn't any activities caused offensive odor. Adequate operation by ENACAL avoid offensive odor
29	Bottom sediment	D	There aren't any activities affected bottom sediment
30	Accidents	B	Same as Item 2

Rating:
A: Serious impact is expected
B: Some impact is expected
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
D: No impact is expected. IEE/EIA is not necessary.

Table 10.4.3 Summary of Potential Impacts (Final)

		The study on improvement of water supply system in Managua in the republic of Nicaragua		
Likely Impacts	Rating	Impact severity	Methods used to predict	Assumed mitigation measures
2. Local Economy	B	Temporal impacts in the construction stage	Design and construction plan analysis	Basic and Detailed Design stage: adequate selection of facilities and construction methodology. Construction Stage: adequate application of construction method and process. Adequate supervision of construction
5. Existing Social Infrastructure and Services	B	Temporal impacts in the construction stage	Design and construction plan analysis	Same as item 2
8. Cultural heritage	C	Over pumping of Asososca Lake will make the water level lower and cause possible affection to rock weathering in the Lake. Discover of unknown cultural heritage in excavation works	Monitoring of water level, cultural heritage impact study. Coordination with INC for unknown heritages	Control of the pumping from Asososca Lake (Proposed in Supp Report No3). Implementation of Cultural Heritage Study of Asososca in coordination with INC. Coordination with INC in construction stage
10. Water Usage of Water Rights and Rights of Common	B	Over pumping of groundwater will affect the activities of some companies.	Survey of the groundwater usage volume. Survey of the groundwater usage of private companies.	Approve of "Water Law" to control the usage of groundwater. Groundwater monitoring reinforcement program proposed in the project
12. Hazards Infectious Diseases	B	Temporary impacts in the construction stage	Design and construction plan analysis	Same as item2
14. Soil Erosion	B	Temporary impacts in the construction stage	Design and construction plan analysis	Same as item 2
15. Groundwater	B	Wastewater increase may affect groundwater quality Over pumping of groundwater may lower groundwater level	Study and review of groundwater balance and quality. Monitoring of groundwater	Basic and Detail Design Stage: review and confirm present study, JICA study of 1994 and SUWAR study results about groundwater balance and quality. Reinforcement of groundwater monitoring proposed in the project
25. Waste	B	Temporary impacts in the construction stage	Design and construction plan analysis	Same as item 2
26. Noise and Vibration	B	Temporary impacts in the construction stage	Design and construction plan analysis	Same as item 2
27. Ground Subsidence	B	Temporary impacts in the construction stage	Design and construction plan analysis	Same as item 2
30. Accidents	B	Temporary impacts in the construction stage	Design and construction plan analysis	Same as item 2

Note: Rating Criteria:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progress)

10.5 CONSIDERATIONS OF ALTERNATIVES

The main objective of the proposed project is to increase efficiency in the water supply system and to reduce leakage and wastage which account for almost half of the water distributed. Another important component of the proposed project is the improvement of water supply facilities for more than 46,000 low income households and the provision of sewerage facilities for more than 34,000 low income households. The only possible alternative to the proposed project would be to develop new water sources while leaving the current low efficiency in the water supply system, a high level of leakage and wastage and poor service in low income settlements. However, this alternative would be neither financially viable nor socially acceptable. Under the circumstances, consideration of alternatives was limited in this Study to the comparison between "with project" and "without project" scenarios.

Table 10.5.1 Summary of Alternatives

Alternatives	Description
No action	Leakage and wastage will remain at high levels. Future increase in water demand must be met by tank truck supplies. Low income settlements will continuously suffer from the current level of poor water service.
Proposed Project	Long term plan will increase efficiency in water supply system, reduce wastage &leakage and improve the level of water and sewerage services in low income settlements.

Table 10.5.2 shows the comparison of each case. Here, comparison of case was analyzed by a qualitative method because it is difficult to evaluate each alternative by quantitative methods.

Table 10.5.2 Comparison of Alternatives

Aspect	No action	Proposed Project
Natural Environment	High levels of leakage and wastage. High level of energy consumption.	Efficient use of water and energy.
Pollution	Volume of wastewater is increased	Volume of wastewater is decreased and sewerage system is implemented
Economy	Increase of water consumption and increase in tanks trucks supply, with increase in expense of combustibles.	Decrease in per capita supply cost, save in water transport costs.
Social Environment	Deterioration of quality of life in urban areas.	Improvement in quality of life in urban areas, especially in low income settlements
Health	Deterioration of sanitary environments. Increase in water- borne diseases.	Improvement of sanitary environments. Decrease in water-borne diseases.

10.6 WATER CONSERVATION, REDUCTION OF ILLEGAL CONNECTIONS AND IMPROVEMENT OF WATER AND SANITATION SERVICES IN LOW-INCOME SETTELEMENTS

10.6.1 Basic Strategies

(1) Social Protection for the Extremely Poor

Special protection measures must be considered for extremely poor families. Based on the poverty line established by the Nicaragua Government (MIFAMILIA) and Red de Proteccion Social Program (See **Annex 10F** for details), it is roughly estimated that 6 to 10 % of asentamiento residents currently stay below the poverty line. Financial resources required for implementation of these protection measures must be shared between ENACAL, ALMA, MINSA and MIFAMILIA (Red de Proteccion Social).

(2) Participation of the community

i) Active participation of asentamiento residents is necessary for water conservation, reduction of illegal connections and improvement of cost recovery
ii) A Water and Sanitation Committee (WSC) should be established in each asentamiento, which would be responsible for defining improvement programs in accordance with the needs and priorities of the community, promoting the regularization of connections and payments, identifying extremely poor households, and for receiving supports/assistance from ENACAL, ALMA, MINSA and MIFAMILIA.
iii) It would also be the role of WSCs to improve cost recovery and to promote water conservation.

10.6.2 Roles of ENACAL

(1) ENACAL should establish an Asentamientos Improvement Program Unit (AIPU) dedicated to solving various problems in asentamientos. AIPU will be working closely with ALMA, MINSA, MECD, MIFAMILIA and commercial, operation and administrative departments of ENACAL. It is recommended that AIPU should consist of two teams: "Promotion Team" which promotes asentamientos community organization for improvement of water and sanitation services, and "Technical Team" which will be in charge of technical designs and reduction/prevention of leakage.

(2) ENACAL should coordinate with ALMA, MINSA and SECREP for establishment of special protection measures for extremely poor families and for extension of the Social Protection Network of MIFAMILIA into Managua.

(3) ENACAL should review the results of the micro credits programs implemented under EU-ENACAL Program Agua (See **Annex 10G** for details) and on-going IDB water supply and sewerage project (See **Annex 10H** for details) in order to assess the effectiveness of such programs and whether they can be replicated in the future.

(4) ENACAL must implement publicity campaign programs designed for increasing awareness about importance of water conservation, applying EU-ENACAL Program Agua experience of "Guardianes del Agua", and "Juanita y La Gotita" program of sanitation education program of ENACAL GAR, UNICEFF, COSUDE and MECD project (See **Annex 10I**for details). Those publicity campaigns should include the tour of water supply facilities by primary school students, jointly with program of "Juanita y la Gotita", mass media campaigns through TV/radio, and the designation of the "Nicaraguan Water Day", arranging exhibitions and tours of water supply facilities on that particular day.

ANNEX 10A

Screening Format

Anexo 3 Formato de preselección

Nombre del proyecto: ESTUDIO DE LAS MEJORAS DEL SISTEMA DE ABASTECIMIENTO DE AGUA EN MANAGUA

Agencia ejecutora del proyecto: JICA-ENACAL

Nombre, departamento y cargo, organización, y contacto con el responsable para llenar el presente formato.

Nombre: ING. CAROLINA RUIZ BOJORGE
Departamento y cargo: GERENCIA AMBIENTAL, GERENTE AMBIENTAL
Organización: ENACAL/ EMPRESA NICARAGUENSE DE ACUEDUCTOS Y ALCANTARILLADOS
TEL: (505) 266-7921
FAX: (505) 266-7921
E-Mail: cambint@enacal.com.ni
Fecha: septiembre 17 de 2004
Firma:

Nombre: ING. MARCELINO JIMENEZ
Departamento y cargo: VICE-GERENTE DE PROYECTO SANEAMIENTO LAGO DE MANAGUA
Organización: ENACAL/ EMPRESA NICARAGUENSE DE ACUEDUCTOS Y ALCANTARILLADOS
TEL: (505) 266-7918
FAX: (505) 266-7918
E-Mail: enamga2@enacal.com.ni
Fecha: septiembre 17 de 2004
Firma:

Puntos de revisión

1. Domicilio del sitio del proyecto.

LaCiudad de Managua y áreas urbanas del municipio de Nindirí y Ticuantepe, República de Nicaragua

2. Contenido del proyecto.

2-1. ¿El proyecto corresponde a algún sector de la siguiente lista?

✓ Sí □ No

En caso de contestar "Sí", marque el sector correspondiente.

□ Desarrollo minero.

1

□ Desarrollo industrial.
□ Generación térmica de electricidad (incluyendo la geotérmica).
□ Generación hidráulica de electricidad, presas, embalse.
□ Ríos, construcciones contra la erosión del suelo.
□ Transmisión, transformación y distribución de la energía eléctrica.
□ Carreteras, vías férreas, puentes.
□ Aeropuertos.
□ Puertos.
✓ Sistema de agua potable, depuración de aguas sucias y residuales.
□ Tratamiento y eliminación de desechos.
□ Agricultura (que necesite la roturación o irrigación a gran escala).
□ Silvicultura.
□ Industria pesquera.
□ Turismo.

2-2. ¿Se prevé en el proyecto algún factor que se indique abajo?
✓ Sí □ No
En caso de contestar "Sí", marque el factor correspondiente.
□ Traslado involuntario de habitantes a gran escala.(Escala: familias, personas)
✓ Extracción de agua subterránea a gran escala. (Escala: El volumen de agua extraida será estimada en este estudio.)
□ Desecación, desarrollo o roturación de terrenos a gran escala.(Escala: ha)
□ Deforestación a gran escala. (Escala: ha)

2-3. Resumen del proyecto.
(Escala y contenido del proyecto)
El Estudio contiene los siguientes componentes:

(i) Formulación de un Plan de desarrollo a largo plazo hasta el año 2015 para un sistema de abastecimiento de agua potable eficiente y sostenible para la ciudad de Managua.
(ii) Identificación de un proyecto prioritario con respecto a las mejoras de la infraestructura de abastecimiento de agua y preparación de los diseños preliminares del proyecto prioritario
(iii) Transferencia tecnológica al personal de ENACAL durante el curso del estudio, en es especial las metodologías para formular un plan de desarrollo de abastecimiento de agua a largo plazo.

2-4. ¿De qué manera confirmó las necesidades de implementar el proyecto?
¿El proyecto tiene coherencia con el plan superior?
✓ Sí: Anote el nombre del plan superior. □ No

2

El Estudio fue solicitado por el Gobierno de Nicaragua para identificar nuevas fuentes de agua para el abastecimiento de la ciudad de Managua, partiendo del Estudio para el Proyecto de Abastecimiento de Agua de Managua de JICA en 1993 y de los Proyectos de Abastecimiento Managua I (1997) y Managua II (2001.

2-5. Antes de presentar la solicitud, ¿se analizaron las alternativas?
□Sí: Anote el contenido de alternativas analizadas.
(El Proyecto forma parte de varios estudios y proyectos desarrollados anteriormente por JICA y ENACAL)
✓ No

2-6. Antes de presentar la solicitud, ¿se sostuvieron discusiones con los interesados para confirmar las necesidades?
✓ Realizado □ No realizado
En caso de haberse realizado, marque los interesados correspondientes.
✓ Instituciones gubernamentales relacionadas
□ Habitantes de la localidad
□ ONGs
□ Otros

3. ¿Se trata de un proyecto nuevo que se desarrolla por primera vez, o que ya se ha implementado? En el caso de un proyecto ya implementado, ¿Han recibido quejas fuertes, etc. por parte de los habitantes de la localidad?
□ Nuevo □ Ya implementado (con quejas) □ Ya implementado (sin quejas)
✓ Otros El Proyecto contempla la mejora del sistema de AP de la ciudad de Managua, incluye el desarrollo de nuevas fuentes de agua y la mejora de las condiciones de otras fuentes existentes.

4. Nombre de la ley o norma para la evaluación del impacto ambiental.
(Ley 217 Ley General del Medio Ambiente, Decreto 45-94 "Reglamento de Permiso y Evaluación de Impacto Ambiental)
¿Para el proyecto se necesita la evaluación del impacto ambiental (EIA, IEE, etc.) según el sistema de Nicaragua?
□ Necesaria ✓ No necesaria
En caso que se necesite, marque lo que le corresponda de lo que se indica abajo.
□ Se necesita sólo IEE. (□ Realizada □ En ejecución □ Se prevé realizar)
□ Se necesita tanto IEE como EIA.(□ Realizada □ En ejecución □ Se prevé realizar)
□ Se necesita sólo EIA. (□ Realizada □ En ejecución □ Se prevé realizar)
□ Otros: Describa abajo.

3

ANNEX 10B

Scoping Tables Prepared For Public Consultation

SCOPING TABLES FOR PUBLIC CONSULTATION

10.B.1 Project Scoping

Project scoping tables prepared for public consultation is Description of Proposed Project (**Table 10.B.1**), Description of Project Site (**Table 10.B.2**), Matrix for Scoping (**Table 10.B.3**), Checklist for Scoping (**Table 10.B.4**) and Summary of Potential Impacts (**Table 10.B.5**).

Table 10.B.1 Description of the Proposed Project

Item		Description
Name of Cooperation Project		Improvement of water supply system in Managua in the republic of Nicaragua
Project Proponent		ENACAL
Background		A large influx of population during and after the civil war in the 1980s deteriorated the condition of water service in Managua city so seriously that the urgent development of new water sources became an evitable choice for GRN to significantly improve the quality of water service in the capital city. In the light of this, the JICA, in response to an official request of GRN, conducted a development study, called the "Study on Water Supply Project in Managua". Completed in 1993, this study recommended medium-term and long-term underground water development schemes which included the development of new well fields at two locations and associated water transmission facilities. Based on this recommendation, Japan Government subsequently implemented two grand aid projects. They were completed in 1997, "Managua I" and 2000, "Managua II", respectively. In each of these grant aid projects, a new well field and associated water transmission facilities were constructed. After this implementation of grant aid, GRN request the Government of Japan to conduct a development study for the Improvement of supply system in Managua in the Republic of Nicaragua. This proposed project is result of this study.
Objectives		The objectives of the project are: (1) Rehabilitation and Relocation of Existing Water Sources (2) Increasing Efficiency in Water Transmission and Distribution Systems (3) Reduction of Leakage and Wastage (4) Water Service Improvements and Protection of Sanitary Environments in Low-income Settlements
Location		Managua city, urban areas of Municipio de Nindiri and Municipio de Ticuantepe
Population of Beneficiaries		Approximately 1 million
Project Components		
	Type of Project	● Improvement of Water Supply System in Managua Area ● Improvement of Water Supply and Sanitation in low income areas of Managua
	Major Property	Drinking Water / Reservoir
	Water Sources and Water Quality	Water Sources: Groundwater and Surface Water (Asososca Lake) Water Quality: Good
	Conveyance Facilities	Wells rehabilitation : 84 New Wells : 6 Surface water: Asososca Lake : Transmission & Dist Pipe Line : 32.1km Tap Water Meter : 121,500 Low income WS improvement : 46,000 houses Low income sewerage : 34,000 houses
	Purification plan	Treatment Process: No purification process, ch1orine adds at the each pumping site.
	Reservoir Facilities	Number of Tanks :2 Capacity 8,000 m^3 Pumping Station : 2
	Appurtenant Facilities	Management Facility
Others		

Table 10.B.2 Description of the Project Site

Name of Cooperation Project		The study on improvement of water supply system in Managua in the republic of Nicaragua
Present Situation		Description
Social Environment	Affected and/or related peoples/groups:	All people in Managua city, Nindri and Ticuantepe.
	Land Use and Utilization of local resources:	Land use categories of Managua city: ・ Housing 50% ・ Uninhabited lots 18% ・ Industry 5% ・ Green area 1% ・ Services 6% ・ Commerce 3% ・ Main network road 8% ・ Pluvial drainage network 2% ・ Agriculture 7% (Source: Comprehensive transportation plan in the municipality of Managua, 1999)
	Public Facilities/Social Institutions:	The rate of initial enrolment at the primary education stage is nearly 100%.
	Economy:	GDP per Capita: 754 US$ (2003) (Source: Informe Annual 2003, Banco Central de Nicaragua) Inflation rate in Managua: 8% (2004) (Source: Indice de Precios al Consumidor de la Managua, pro Capitulos, segun Anos y Meses)
	Public Health and Sanitation	Life expectancy: 68 years old Baby death rate: 42 per 1,000 No plant for wastewater treatment. Wastewater pipes were built, however, damaged the past earthquake.
Natural Environment	Topography and Geology:	The Study area has typical volcanic topography and Geology.
	Flora and Fauna, and their habitats:	There is little virgin nature.
	Coast and Marine Zone:	There is no coast or marine zone in the Study area
	Lakes, River System, Coast and/or Climate:	Managua Lake locates the north of Managua city. Other 4 lakes in Managua city are the crater lagoons. Only Asososca Lake is a drinking water source. There aren't any rivers, which have water flow for whole year.
Pollution	Present Pollution:	Water pollution of Managua Lake by wastewater. The final disposal site of Managua is full.
	Complaints which people have utmost concern:	Water pollution and Waste disposal
	Measures taken for pollution:	Wastewater treatment plant is planned, a part of wastewater pipelines are built. The improvement plan of the solid waste management system was made.
Others	None	

Table 10.B.3 Matrix for Scoping

Name of Cooperation Project			The study on improvement of water supply system in Managua in the Republic of Nicaragua										
				Planning Phase		Construction Phase			Operation Phase				
	No.	Likely Impacts	Overall Rating	Land acquisition	Change of Land use plan, Restriction of Various Activities by constructing new facilities	Construction of Pipelines	Construction of Filtration Facilities	Operation of Construction Equipment and Vehicles	In taking Excessive Water from Rivers, Lakes, etc.	Drainage	Operation of related facilities	Appearance/Occupancy of related building structures
Social Environment: Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment	1	Involuntary Resettlement										
	2	Local economy such as employment and livelihood, etc										
	3	Land use and utilization of local resource										
	4	Social Institutions such as social infrastructure and local decision-making institutions										
	5	Existing social infrastructures and services										
	6	The poor, indigenous and ethic people										
	7	Misdistribution of benefit and damage										
	8	Cultural heritage	C						C			
	9	Local conflict of interests	B						B			
	10	Water Usage of Water Rights and Rights of Common	B						B			
	11	Sanitation	B							B		
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS										
Natural Environment	13	Topography and Geographical features										
	14	Soil Erosion										
	15	Groundwater	B						B	B		
	16	Hydrological Situation	B						B	B	B	
	17	Coastal Zone										
	18	Flora, Fauna and Biodiversity										
	19	Meteorology										
	20	Landscape										
	21	Global Warming										
Pollution	22	Air Pollution										
	23	Water Pollution	B							B		
	24	Soil Contamination	B							B		
	25	Waste										
	26	Noise and Vibration	B			B	B	B			B	
	27	Ground Subsidence										
	28	Offensive Odor										
	29	Bottom sediment										
	30	Accidents										

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.). No Mark: No impact is expected. IEE/EIA is not necessary.

Table 10.B.4 Checklist for Scoping proposed by ENACAL and the Study Team

Name of Cooperation Project		The study on improvement of water supply system in Managua in the republic of Nicaragua	
No.	Impacts	Rating	A Brief Description
Social Environment: Regarding the impacts on "Gender" and "Children's Right" might be related to all criteria of Social Environment.			
1	Involuntary Resettlement	D	There are no or few residents at the proposed sites.
2	Local economy such as employment and livelihood, etc	D	The project doesn't need much land acquisition.
3	Land use and utilization of local resource	D	The project doesn't use much space or local resource.
4	Social Institutions such as social infrastructure and local decision-making institutions	D	The project will use existing infrastructure such as roads and consider existing plans.
5	Existing social infrastructures and services	D	There are a few impacts on social infrastructures and services during the construction of facilities.
6	The poor, indigenous and ethic people	D	The project doesn't need much land acquisition. The proposal plan will be considered the proper payment system, which not affected livelihoods of the poor people.
7	Misdistribution of benefit and damage	D	The proposal plan is considered impartial benefit
8	Cultural heritage	C	The rock in Asososca Lake has an ancient picture.
9	Local conflict of interests	B	Some conflicts could be presented if deficit of water in the locations where are water sources occur.
10	Water Usage of Water Rights and Rights of Common	B	Some companies use same groundwater.
11	Sanitation	B	More usage of water causes more wastewater from homes.
12	Hazards (Risk) Infectious diseases such as HIV/AIDS	D	The Study doesn't any hazards such as infection diseases.
Natural Environment			
13	Topography and Geographical features	D	The facilities of the Project are small, and don't change the topographical and geographical features on a large scale.
14	Soil Erosion	D	The facilities of the Project are small, and don't change the soil on a large scale.
15	Groundwater	B	Wastewater from homes will affect the quality of groundwater.
16	Hydrological Situation	B	The high volume of pumping groundwater will be lower the groundwater level.
17	Coastal Zone (Mangroves, Coral reefs, Tidal flats, etc.)	D	There isn't any Coastal Zone in the Study area.
18	Flora, Fauna and Biodiversity	D	There are few virgin Flora in the study area. The facilities are small, and don't affect forest on a large scale.
19	Meteorology	D	The Study don't build huge facilities affected Meteorology.
20	Landscape	D	The facilities are small, a few and scattered.
21	Global Warming	D	The Plan doesn't cause any global warming gasses directly. More pumping needs more electricity.
Pollution			
22	Air Pollution	D	Construction machinery will cause few exhaust gas during the construction. During the operation of the wells, the pumping machinery doesn't cause air pollution directly.
23	Water Pollution	B	More usage of water cause more wastewater.
24	Soil Contamination	B	Area where wastewater pipelines aren't existed, some soil contamination would cause.
25	Waste	D	The amount of wastes in construction and operation is few.
26	Noise and Vibration	B	Construction machinery will cause some noise and vibration during the construction.
27	Ground Subsidence	D	The pumping groundwater hasn't caused any ground subsidence.
28	Offensive Odor	D	There isn't any activities caused offensive odor.
29	Bottom sediment	D	There aren't any activities affected bottom sediment
30	Accidents	D	There aren't any facilities caused serious accidents.

Rating:
A: Serious impact is expected
B: Some impact is expected
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
D: No impact is expected. IEE/EIA is not necessary.

Table 10.B.5 Preliminary Summary of Potential Impacts

		The study on improvement of water supply system in Managua in the republic of Nicaragua		
Likely Impacts	Rating	Impact severity	Methods used to predict	Assumed mitigation measures
8. Cultural heritage	C	Over usage of Asososca Lake will make the water level lower. The lower water would cause some affection to rock weathering in the Lake.	Survey of the condition of the rock. Survey of the water level of Asososca Lake.	To control the pumping from Asososca Lake.
9. Local conflict of interests	B	Some conflicts could be presented if deficit of water near wells occur.	Survey of coverage levels of water supply near wells.	To make a plan to cover the demand of water near wells.
10. Water Usage of Water Rights and Rights of Common	B	Over pumping of groundwater will affect the activities of some companies.	Survey of the groundwater usage volume. Survey of the groundwater usage of private companies.	To make a law to control the usage of groundwater. To understand about the reasonable usage volume of groundwater, then control the total pumping volume.
11. Sanitation	B	More usage of water causes more wastewater from homes.	Survey of contents and progression for wastewater plant.	To inform the user to reduce of the usage volume To place concrete for the ground and proper drainage system. To construct wastewater treatment plant. To educate on the user about the proper home waste treatments.
15. Groundwater	B	More the usage of water will cause more wastewater. It will affect quality of groundwater.	Survey of the groundwater quality.	To inform the user to reduce of the usage volume To place concrete for the ground and proper drainage system. To construct wastewater treatment plant. To educate on the user about the proper home waste treatments.
16. Hydrological	B	Over pumping of groundwater will affect the groundwater level.	Survey of the groundwater level.	To understand about the reasonable usage volume of groundwater, then control the total pumping volume. To inform the user to reduce of the usage volume.
23. Water Pollution	B	More the usage of water will cause more wastewater. It will affect water quality of surface water, such as Managua Lake.	Survey of the usage of groundwater volume Survey of the wastewater quality	To inform the user to reduce of the usage volume. To educate on the user about the proper home waste treatments.
26. Noise and Vibration	B	Noise and Vibration will be caused during the construction.	Survey of location and distribution of public facilities and private residence. Survey of information and awareness of residents.	To select the construction methods which minimize the noise and vibration? To install acoustic walls and buffer zone.

Note: Rating Criteria:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progress)

Table 10.B.5 shows a summary of potential impacts, based on which ENACAL and the Study Team categorized the proposed project as “Type B”.

ANNEX 10C

List of Stakeholders

INSTITUTION			REPRESENTANT	TELEPHONE
ENTES DEL ESTADO				
1	Ministerio de Salud/**MINSA**	Unidad Ambiental	Ing. Maritza Obando	289-4515
2	SILAIS Managua	Dirección de Salud Ambiental y Epidemiologia	Dra. Sara Moraga	249-5853
3	Ministerio de Transporte e Infraestructura/MTI	Unidad Ambiental	Lic. Livio Bendaña	268-6222
4	Ministerio del Ambiente y Recursos Naturales/**MARENA**	Dirección de Calidad Ambiental	Lic. Hilda Espinoza	263-2830
5		Dirección de Recursos Naturales	Ing. Arcadio Choza	263-2595/263-1994
6		Delegación Departamental Managua	Ing. Róger Pérez	233-1277
7		Delegación Departamental Masaya	Cidar Cárdenas	0522-4767
8	Ministerio de Fomento, Industria y Comercio/**MIFIC**	Dirección de Recursos Hídricos	Dra. Mariluz Mendoza	267-5451
9	Ministerio Agripecuario y Forestal/**MAGFOR**	Dirección General de Estrategia Territorial	Arq. Martha Loyman	276-0154
10	Instituto Nicaragüense de Energía/**INE**	Unidad Ambiental	Ing. Giovanni Carranza	222-5611
11	Instituto Nicaragüense de Acueductos y Alcantarillados/**INAA**	Unidad Ambiental	Ing. Dennis Quesada	266-8444
12		Dpto. de Fiscalización	Ing. Evenor Masís	266-8444
13	Instituto Nicaragüense de Estudios Territoriales/**INETER**	Dirección de Recursos Hídricos	Ing. Luis Palacios	244-1270
14	Comisión Nacional de Agua Potable y Saneamiento CONAPAS	Director	Ing. Nelson Medina	265-3554
15	Red de Agua Potable y Saneamiento RASNI	Director	Ing. Ilya Cardoza	266-0718/266-3748 266-4719
16	PROCURADURÍA AMBIENTAL	Procurador Ambiental	Dr. Lizandro DeLeón	267-1774/266-6612
17	Secretaria de Coordinacion y Estrategia de la Presidencia **(SECEP)**			
18	Fondo de Inversion Social de Emergencia **(FISE)**			

GOBIERNOS MUNICIPALES				
19	Alcaldía de Managua/Unidad Ambiental	Dirección de Medio Ambiente	Ing. Edgardo Cuarzma	265-0156/2651797
20				
21		Delegado del Alcalde Distrito II	Arq. Héctor Gatica	
22		Delegado del Alcalde Distrito III	Lic. Carlos Herrera	
23		Delegado del Alcalde Distrito IV	Lic. Antenor Ferrey	
24		Delegado del Alcalde Distrito V	Lic. Jonny Torres	
25		Delegado del Alcalde Distrito VI	Ing. Roberto Bermúdez	
26	Alcaldía de Ticuantepe		St. Manuel Salvador Ampié	279-8752
27	Alcaldía de Nindirí		Dr. José Alfonso Castillo	0522-2030
UNIVERSIDADES Y CENTROS DE INVESTIGACION				
28	Universidad Nacional de Ingeniería **UNI**	Programa de Investigación y Docenicia en Medio Ambiente PIDMA-UNI	Ing. Sergio Gámez	278-1452
29	Facultad de Ciencia y Tenología del Ambiente **UCA**	Facul. Ciencia, Tecnologia y Ambiente	Ing. Ster Robinson	278-3923
30	Dirección de Recursos Naturales /**Universidad Nacional Agraria** UNA	Facultad de Recursos Naturales y Ambiente	Lic. Esther Carballo	263-3082
31	Centro de Investigaciones de Recursos Acuáticos **CIRA-UNAN**	Director	Lic. Salvador Montenegro	262-8211

ORGANIZACIONES CIVILES Y ONG'S				
32	Liga de Defensa del Consumidor/LIDECONIC		Lic. Norma Aracelly Chávez	249-4677/252-9049
33	Centro Alexander Von Humbolt		Amado Ordóñez	250-6454/249-8922
34	Centro de Derecho Ambientel y Promoción para el Desarrollo/ CEDAPRODE		Dr. Erick Rámirez	278-3711/270-0079
35	Asociación de Jóvenes Ambientalistas		Camilo Lara	289-7557
36	Acción Médica Cristiana		Francisco Gutiérrez Herrera	267-4003/277-4282
37	Asociación de Ayuda a los Niños en la Escuela y en la Calle		Daysi Sánchez de Illescas	266-6223/2668433
38	Asociación Familia Padre Fabretto		Miriam Lazo	266-8772/266-2883
39	Asociación Martín Luther King		Enrique Beteta	260-3260/260-3260
40	Asociación para el Desarrollode los Pueblos		Edwin Maradiaga Lacayo	228-1360/228-3005
41	Caritas de Nicaragua		Padre Eddy Rojas	266-1253/266-0404
42	Centro de Apoyo a Programas y Proyectos		María del Socorro Carvajal	266-0490/266-7138
43	Centro de Educatión y Comunicación Popular		Anabel Torres	277-5329/278-0103
44	Centro de Estudio y Acción para el Desarrollo		Allan Danilo Fajardo Reina	268-7234/268-7253
45	Centro de Estudios e Investigaciones Centroamericanas		Giobla Nuss/Liuva D'Ciofalo	222-7472/222-7472
46	Centro de Estudios y Promoción Social		Leonel Argüello	266-4719/266-0718
47	Centro de Información y Servicios de Asesoría en Salud		Ana Quirós Víquez	268-5907/266-3690
48	Centro de Investigación y Promoción del Habitar		Ninette Morales Ortega	266-6126
49	Centro de Investigación y Promoción para el Desarrollo Rural y Social		Orlando Núñez Soto	267-4990/278-7068
50	Centro de Promoción del Desarrollo Local		Miguel González Solorzano	222-6366/222-3161
51	Comité Pro Ayuda Social Distrito III		Hélia María Gutiérrez Téllez	268-1847
52	Fundación Manolo Morales		Omar González Gaitán	228-4038
53	Fundación para Desarrollo Integral		Modesto Baltodano B.	233-0517/263-1922
54	Fundación Popol-Na para la Promoción y el Desarrollo Municipal		Mónica Baltodano Marcenaro	266-6718
55	Instituto de Acción Social "Juan XXIII"		Edwin Novoa	267-3626/278-5374
56	Movimiento Comunal Nicaragüense		Douglas Pérez Bermudez	291-2316

ANNEX 10D

Stakeholders Meeting

"TALLER DE PARTICIPACION PUBLICA PARA LA REVISION DE LAS CONSIDERACIONES AMBIENTALES Y SOCIALES DEL PROYECTO DE MEJORAMIENTO DEL SISTEMA DE AGUA POTABLE DE LA CIUDAD DE MANAGUA"

16 de Febrero de 2005, Hotel Holiday Inn

OBJETIVO:

- Presentar el "Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua".

- Revisión de las consideraciones ambientales y sociales del proyecto.

PROGRAMA DE ACTIVIDADES

8:00 - 8:15	Introducción, Ing. Guillermo Leclair/Ing. Marcelino Jimenez
8:15 - 9:00	Presentación del proyecto. Mr. Sadonobu Sawara/Jefe Misión del Estudio JICA
9:00 - 9:20	Consideraciones ambientales y sociales determinadas por JICA y ENACAL. Ing. Carolina Ruiz/Gerente Ambiental ENACAL
9:20 - 9:45	Explicación de la metodología a emplear para el trabajo en grupos / Formación de grupos de Trabajo. Ing. Carolina Ruiz, Lic. Eduardo Mejía/ENACAL
9:45 - 10:00	Refrigerio
10:00 - 11:30	Trabajo en grupos
11:30 - 1:00	Presentación de resultados y Discusión
1:00	Almuerzo

MATERIAL DE REFERENCIA

- **Para determinar las consideraciones ambientales y sociales del proyecto, se utilizó la metodología de los "Lineamientos de JICA para las consideraciones ambientales y sociales a nivel de Evaluación Inicial de Impacto Ambiental". Se proporcionará el siguiente material de referencia:**

  a) Cuadro No. 1.0 Descripción del Proyecto
  b) Cuadro No. 2.0 Descripción del sitio de estudio
  c) Cuadro No. 3.0 Matriz de Alcance (Verificación de Impactos)
  d) Cuadro No. 4.0 Lista de Chequeo de Impactos
  e) Cuadro No. 5.0 Resumen de Impactos

- **Los lineamientos de JICA están dirigidos a evaluaciones de proyectos globales a través de una Lista de Chequeo de impactos, en donde se abordan los posibles impactos y su confrontación en una matriz de verificación, en la cual se relacionan las actividades de las diferentes etapas del proyecto con los posibles impactos esperados. (Cuadro No. 3.0 Matriz de verificación).**

- A los posibles impactos esperados por cada una de las etapas del proyecto se les asignó un valor según el siguiente criterio:

  A: Impactos Serios Esperados
  B: Algún impacto esperado
  C: Magnitud del Impacto desconocida, requiere mayor evaluación, los impactos pueden definirse con el progreso del estudio
  D: No se esperan impactos

- A partir de esta matriz se elaboró una Lista de Chequeo con los impactos y magnitud otorgada, justificándose el valor asignado (Lista de Chequeo 4.0).

- Se seleccionaron los impactos principales y se realizó un **cuadro resumen de impactos** (Cuadro 5.0) conteniendo por cada aspecto lo siguiente:

  a) Impacto esperado
  b) Etapa del proyecto en que pueda producirse el impacto
  c) Magnitud del Impacto (A,B,C,D)
  d) Descripción del impacto
  e) Métodos de predicción posibles para monitorearlo
  f) Medidas de mitigación posibles

METODOLOGÍA DEL TALLER

1. Se conformaran grupos de trabajo de acuerdo a las disciplinas de los participantes y serán agrupados en tres categorías de impactos, los cuales son: medio social, medio ambiente y contaminación. Cada grupo deberá nombrar un moderador y secretario.

2. Para efectos del taller se requiere que cada grupo analice la **matriz de verificación de Impactos 2.0**, según la categoría de impactos asignada (social, ambiental o contaminación) y, definir si están de acuerdo con la magnitud e impactos identificados por JICA-ENACAL en esta matriz. En caso de no estar de acuerdo pueden asignar otra magnitud con su debido análisis y definir otros impactos que consideren importantes en el desarrollo del proyecto.

3. El análisis anterior puede retomarse con la elaboración de un cuadro resumen de impactos (como el que se muestra en el material de referencia, cuadro No. 5.0 RESUMEN DE IMPACTOS) detallando entre otros los siguientes aspectos:

   g) Impacto esperado

   h) Etapa del proyecto en que pueda producirse el impacto
   i) Magnitud del Impacto (A,B,C,D)
   j) Descripción del impacto
   k) Métodos de predicción posibles para monitorearlo
   l) Medidas de mitigación posibles

4. El cuadro resumen obtenido de impactos por cada componente ambiental será presentado y discutido en plenario. Se les suministrará material adecuado para presentarlo en papelógrafo.

5. Las consideraciones ambientales y sociales obtenidas del taller serán evaluadas en el Estudio para su inclusión o recomendación para estudios posteriores en dependencia de los alcances del proyecto.

Gracias por su participación.

"TALLER DE PARTICIPACION PUBLICA PARA LA REVISION DE LAS CONSIDERACIONES AMBIENTALES Y SOCIALES DEL PROYECTO DE MEJORAMIENTO DEL SISTEMA DE AGUA POTABLE DE LA CIUDAD DE MANAGUA"

ACTA DE CONCLUSIONES DEL TALLER

El Gobierno de la República de Nicaragua a través de la Empresa Nicaragüense de Acueductos y Alcantarillados (ENACAL) ejecuta con la colaboración del Gobierno de Japón, a través de la Agencia de Cooperación Internacional del Japón (JICA), el "Estudio del Mejoramiento del Sistema de Abastecimiento de agua de la ciudad de Managua"

Con base a lo anterior y dando cumplimiento a la minuta de acuerdo, para la realización del estudio y conforme los requerimientos ambientales de JICA se ha elaborado la Evaluación Inicial de Impacto Ambiental del mismo, la cual se sometió a la participación Pública en el presente Taller, el cual tuvo como objetivos: 1) Presentar la propuesta del Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua y 2) Revisión de las consideraciones ambientales y sociales del proyecto.

En el presente taller participaron las Instituciones del Estado, incluyendo las del comité de dirección del estudio, Organismos Financieros, Alcaldías Municipales y Asociaciones Civiles. Anexo 1.

Hubo mucho interés y participación de los presentes, lográndose el objetivo del taller al mejorarse la guía presentada y adicionarse otras consideraciones, criterios y recomendaciones que se muestran en el Anexo 2.

Dado en la ciudad de Managua, Hotel Holiday Inn, a los dieciséis días del mes de febrero del año dos mil cinco.

Ing. Sadanobu Sawara /Jefe del Equipo de estudio JICA
Ing. Carolina Ruíz/ Gerente Ambiental ENACAL
Ing. Marcelino Jiménez/ Coordinador Contraparte del Estudio.

ANEXO 1 LISTA DE PARTICIPANTE EN EL TALLER DE PARTICIPACION PUBLICA

N°	NOMBRES	INSTITUCION
	GRUPO No. 1 MEDIO SOCIAL	
1	Yuri Leonardo Andino	ALMA D- IV
2	Carlos García Caracas	Fundación Manolo Morales
3	Carolina Navarro	Red de Mujeres
4	Mario Gutiérrez	Red de Vivienda
5	Carlos Castillo	ALADENIC
6	Rosa Sánchez Ruiz	Fundación p/Desarrollo Integral
7	Libia Barreda	Fundación Popol –Na.
8	María Lilí Calero Arellano	Dirección de Patrimonio Cultural
9	Fanny Loaisiga	ENACAL
10	Maritza Obando	MINSA
11	Sadanobu Sawara	Equipo de Estudios JICA
12	Joji Yokokawa	Equipo de Estudios JICA
13	Eduardo López Davila	Alcaldía de Ticuantepe
14	Carolina Ruiz	ENACAL
15	Naoe Sato	JICA
	GRUPO No. 2 MEDIO NATURAL	
1	**Luis Palacio**	INETER
2	Simón Zbinder	COSUDE
3	José Toruño	FISE
4	Oscar Lawrence	Club De Jóvenes Ambientalista
5	Agnes Magaña	SECEP
6	Juan Carlos Valle	Equipo de Estudios JICA
7	Donal Zavala	P. Ambiental
8	Roger Pérez	MARENA
9	Guillermo Casas	PROMAPER
10	Armando Valdivia	PROMAPER
11	Santos Martínez	ENACAL
12	Martha Orozco	UNA
13	Merilúz Mendoza	MIFIC
14	Clemente Martínez	Centro Humboldt
15	Eduardo Mejía	ENACAL.
	GRUPO No. 3 CONTAMINACION	
1	Ninette Morales	HABITAR
2	Martín Brenes	ENACAL
3	Willian Méndez	ALMA
4	Valeria Campbell	Periódico 7 Días
5	Allan Fajardo	CESADE
6	Aura Romero Gutiérrez	CEPS
7	Ilya Cardoza	RASNIC
8	Yoshiaki Yokota	Equipo de Estudios JICA
9	Marcelino Jiménez	ENACAL
10	Dennis Quesada	INAA

10D - 6

TALLER DE PARTICIPACION PUBLICA "CONSIDERACIONES AMBIENTALES Y SOCIALES" PROYECTO DE MEJORAMIENTO DEL SISTEMA DE AGUA POTABLE DE LA CIUDAD DE MANAGUA.

LISTA DE ASISTENCIA

	NOMBRE	INSTITUCION	CARGO Y PROFESION	FIRMA	TELEFONOS	CORREO ELECTRONICO
1	Clemente Martínez	Centro Humboldt	Ambiente Coord. Campaña Agua	[firma]	2478722 2506454	agua@humboldt.org.ni
2	Mario Gutierrez M	Red de Vivienda, C.C.	Ambiente Enlace	[firma]	2666711 2662033	mario_g997@hotmail.com
3	Alberto Avellan C	ENACAL	Gerente General	[firma]	2650736	
4	Carolina Ruiz	ENACAL	Gte Amb.			
5	Periodista Rosario Hendigu C	R. Restauración	periodista	[firma]	08610913 2784029	[illegible]@hotmail.com
7	Ilya Cardoza	RASNIC	Secretaria Ejecutiva (Ing)	[firma]	2660718	rasnic@ibw.com.ni
8	Carlos Castillo C	ALA de Nic	Presidente Nacional	[firma]	061-39935	
9	Dennis Quesada	Inaa	Depto. Gestion Ambiental	[firma]	2668444	dquesada@inaa.gob.ni
10	Oscar Lawrence Salazar	Club de jóv. Amb	Gestor Ambiental	[firma]	2529524	clujaejecutiva@yahoo.com
11	Homero Villavicencio	Alcaldía - Dirección Grol. M.A.		[firma]	265-0156 265-1797	
12	[illegible]	R América	periodista	[firma]	2786430	
13	Brígida Guadamuz C	R/América	Periodista	[firma]	2334953	—
14	Guillermo Casas	PROMAPER	Ingeniero Hidráulico	[firma]	8699202	

10D - 7

	NOMBRE	INSTITUCION	CARGO Y PROFESION	FIRMA	TELEFONOS	CORREO ELECTRONICO
15	Carolina Nacarro R.	Redmonds.	Polta Geo. Lic. Bo.	[signature]	8955919	—
16	periodista José León Quant.	R-580	Periodista	[signature]	8329184.	
17	Sato, Naoe	JICA	Asesora de Formuracion Proyecto	[signature]	85-24-805	
18	Agnes Mogaña	SNIP / Secep	Esp. Inversiones	[signature]	217-5331	
19	Nelson Medina	CONAPAS	Secretario Ejecutivo	[signature]	2653554	nmedina@tmx.com.ni
20	Carlos Martinez	ENACAL	5 Dpto Agua potable	[signature]	2650366	
21	JOJI (JORGE) YOKOKAWA	JICA		[signature]		
22	Roger Pérez Elvado	MARENA	Delegado Territorial	[signature]	2331277	dtmanagua@marena.gob.ni
23	Luis S Palacios R.	INETER	Director Gral R. Hidricos	[signature]	2492756	
24	EDUARDO LOPEZ D.	ALCALDIA TICUANTEPE	ALCALDE	[signature]	2757012 8547276	
25	Allan Fajardo	CESADE / F-ONG	Director / Presidente	[signature]	2687264	cesade@cablenet.com.ni
26	Maritza López	Radio el Pensamiento	Periodista	[signature]	660 21744 2706636	—
27	Simon Zbinden	COSUDE AGUASAN	Asesor Asociado	[signature]	268-0772	simon.zbinden@aguasan.org
28	~~Gerardo Hernández~~	~~UNIFOCO~~	~~Asist. Contable~~	[signature]		
29						

	NOMBRE	INSTITUCION	CARGO Y PROFESION	FIRMA	TELEFONOS	CORREO ELECTRONICO
30	Yadira Lily Calero A.	INC/Dirección Patrimonio	Arqueóloga	[signature]	2226290	mlilycalero@yahoo.com
31	Martha Orozco I.	UNA	Profesor Universitario	[signature]	2331146	
32	Yuri Leonardo Andino	ALMA D-IV	J. Dpto. Promotoría	[signature]	2222788	
33	Rosa Sánchez Rivas	Fund. p/Desarrollo Integral	Contador	[signature]	2-63-19-22	
34	Carlos Garcia G	F M M	PRESIDENTE	[signature]	2284038	Fmm@hotmail.com
35	Libia Barreda R.	Popol-Na	Responsable Proyectos	[signature]	2660600	Libia81@Hotmail.com
36	José Toruño	FISE	Asesor Agua	[signature]		jtoruño@fise.gob.ni
37	Armando Valdivia C	PROMAPER/UE	Ing. Hidráulica	[signature]	265-8579-8616755	promaper@cablenet.com
38	Marcelino Gómez G	ENACAL		[signature]	2667918	emgomez@enacal.com.ni
39	Alfredo J. Castaño O.	CHAPPRICH.	Jefe D' Sistemas	[signature]		
40	Donald Zavala M.	PGR.	Proc. Ambiental	[signature]	5526225	donaldzm@hotmail.com
41	Fanny Loaisiga	ENACAL	Vice Gcia M. PD.	[signature]	—	—
42	Marlyng Obando	MINSA	Directora Salud Ambiental	[signature]	289-4514	saludambiental@minsa.gob.ni
43	Lydia Manzell	TELCOR				
44	Mario S. Montenegro M	ENACAL	Gerente de Operaciones	[signature]	263-1284	mmontenegro@enacal.com.ni

	NOMBRE	INSTITUCION	CARGO Y PROFESION	FIRMA	TELEFONOS	CORREO ELECTRONICO
45	Merily Mendoza	DGZN/MIFIC	Asesora Legal	[signature]	2513128/2674554	mmendoza@mific.gob.ni
46	William Muñoz Alonso	AIMA · D III	Supervisor Obras	[signature]	2650987	
47	VALERIA CAMPBELL	7 DIAS	PERIODISTA	[signature]	2791196	
48	Ninette Morales O	HABITAR	Directora Ejecutiva	[signature]	2666120-7	habitar@ibw.com.ni
49	[signature] R.	Yelba López R.	[illegible]		2780327	[signature]
50	Martha Álvarez B.	ENACAL	Dir. Div. [illegible]	[signature]	2667845	
51	Daniel Aguilar	ENACAL	Fotógrafo	[signature]	2667825	
52	Aura Romero Gutiérrez	CEPS	Monitoreo y Evaluación	[signature]	2660718	roaura@yahoo.com
53	Escarleth Sánchez	Radio Nicaragua	Periodista	[signature]	2674559	
54	Gretchen Martínez	Canal 4	Periodista	[signature]	2281317	
55	Alfonso Flores B	TVNORCASC.2	"	[signature]	2683000	also13@hotmail.com
56	Yolanda Corea	Bolsa Noticias	Periodista	[signature]		
57						
58						
59						

10D - 9

PHOTOGRAPHS OF STAKEHOLDERS MEETING (FEBRUARY 16, 2005)


Working Group No.1 (Social Environments)


Working Group No.2 (Natural Environments)


Working Group No.3 (Contamination)


Presentation of Outcome by Group No.1


Presentation of Outcome by Group No.2


Presentation of Outcome by Group No.3

ANEXO II. RESULTADOS DEL TALLER DE PARTICIPACION PUBLICA PARA LAS CONSIDERACIONES AMBIENTALES Y SOCIALES DEL PROYECTO.

Cuadro 3.0 Matriz de Alcance (Verificación de Impactos)

Nombre del Proyecto			Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua								
				Etapa de Planificación		Etapa de Construcción		Etapa de Operación			
	No.	Impactos Esperados	Evaluación Conjunta	Adquisición de tierra	Cambios en el uso del suelo, Restricción de otras actividades por la construcción de nueva infraestructura	Instalación de líneas de conducción e infraestructura	Operación de maquinaria y equipos de construcción	Explotación excesiva de la fuentes de agua (ríos,, lagos, etc)	Drenaje	Operación de infraestructura y equipos	Modificación de paisaje por la infraestructura del proyecto
Medio social: impactoos de "Género" y "Derechos de los niños" que pudieran estar relacionados con los criterios de ambiente social	1	Reubicación involuntaria de población	**C**		**C**	**C**					
	2	Economía local: empleos, sustento, etc	B			B					
	3	Uso del suelo y de los recursos locales	**C**	**C**	**C**						
	4	Instituciones Sociales: Organizaciones civiles sociales y gobiernos municipales	**C**					**C**			
	5	Infraestructura y servicios sociales existentes	B			B					
	6	Grupos indígenas, población con escasos recursos económicos y grupo ético									
	7	Mala Distribución de los beneficios y daños	**C**					**C**			
	8	Patrimonio Cultural	**B**			**B**		**B**			
	9	Intereses y conflictos locales	B					B			
	10	Usos y derechos del agua, derechos comunes	B					B			
	11	Saneamiento	B						B		
	12	Peligros (Riesgos) Enfermedades y creación de vectores	**B**			B			B		
Ambiente Natural	13	Topografía y accidentes geográficos									
	14	Erosión del suelo	**B**			**B**					
	15	Agua subterránea	**C**					**C**			
	16	Condiciones Hidrológicas	**C**					**C**			
	17	Zonas Costeras									
	18	Flora, Fauna y biodiversidad									
	19	Meteorología									
	20	Paisaje									
	21	Calentamiento Global									
Contaminación	22	Contaminación del aire	**A**			**A**					
	23	Contaminación del agua	B						B		
	24	Contaminación del suelo	B						B		
	25	Desechos	**B**			**B**					
	26	Ruidos y vibración	B				B			B	
	27	Hundimiento del suelo	**B**			**B**				B	
	28	Olores desagradables	B			B	B			B	
	29	Sedimentación									
	30	Accidentes	**B**			**B**				**B**	

Clasificación
A: Se espera un gran impacto
B: Se espera algún impacto
C: Magnitud del impacto desconocido (Exige mayor evaluación, los impactos pueden definirse con el progreso del estudio)
D: SIN VALORACION : No se esperan impactos. No es necesario IEE/EIA

Cuadro 4.0 Lista de chequeo

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua	
No.	Impactos	Rating	Descripción breve
Medio social: impacto de "Géneros" y "Derechos de los niños" que pudieran estar relacionados con los criterios de ambiente social			
1	Reubicación involuntaria de población	**C**	Posibles afectaciones se definirán en el avance y diseño del proyecto, debido a la instalación de líneas de conducción e infraestructura.
2	Economía local: empleos, sustento, etc	B	Durante la etapa de construcción cambios en la circulación de vías por obstrucción de las obras puede influir en la economía de algunos negocios y servicios. Sin embargo es de carácter temporal
3	Uso del suelo y de los recursos locales	**C**	Los posibles impactos se definirán con el avance del proyecto, podrían utilizarse recursos locales y áreas de ciertas localidades para beneficio de otras, posible cambio de usos en menor escala.
4	Instituciones Sociales: Organizaciones civiles sociales y gobiernos municipales	**C**	Pueden Producirse conflictos entre las posiciones de los gobiernos locales y gobierno central (ENACAL)
5	Infraestructura y servicios sociales existentes	B	Instalación de infraestructura y líneas de conducción pueden afectar temporalmente vías de transporte y otra infraestructura social existente
6	Grupos indígenas, población con escasos recursos económicos y grupo ético	D	No se contemplan afectaciones.
7	Mala Distribución de los beneficios y daños	**C**	Podría producirse conflictos por la falta de equidad en la distribución del servicio de agua potable si no se logra un ajuste equilibrado
8	Patrimonio Cultural	**B**	Riesgos de destrucción de patrimonio cultural (hallazgos arqueológicos en excavaciones)
9	Intereses y conflictos locales	B	Podrían presentarse conflictos si existe déficit de agua en las localidades donde se encuentren las Fuentes de agua
10	Usos y derechos del agua, derechos comunes	B	La sobreexplotación del agua subterránea puede afectar la disponibilidad para los diferentes usuarios del agua.
11	Saneamiento	B	Un mayor uso del agua incrementa aguas residuales de los hogares
12	Peligros (Riesgos) Enfermedades y creación de vectores	**B**	Pueden producirse Enfermedades diarreicas y respiratorias en ciertas etapas del proyecto por emisión de polvo, formación de charcas por pruebas de bombeo y mantenimiento de equipos de bombeo, etc.
Medio Natural			
13	Topografía y accidentes geográficos	D	Infraestructura requerida es pequeña y no modificará la topografía ni accidentes geográficos en gran escala.
14	Erosión del suelo	**B**	Pueden producirse impactos si no se toman las medidas adecuadas como el arrastre de suelo durante la etapa de construcción (zanjeo) por lluvias; alteración del drenaje natural por la construcción de líneas de conducción.
15	Agua subterránea	**C**	Traslado de fuentes puede afectar capacidad de disponibilidad. Mejoramiento del servicio aumentará el consumo de Agua
16	Condiciones Hidrológicas	**C**	Un alto volumen de extracción de agua subterránea puede bajar los niveles freático, es necesario mayores estudios para evaluar los niveles de explotación y rendimiento seguro, así como factores se sostenibilidad del recurso
17	Zonas Costeras (Mangles, arrecifes de coral, mareas)	D	No hay este tipo de zonas costeras en el área de estudio
18	Flora, Fauna y biodiversidad	D	No hay zonas naturales en el área de estudio, la infraestructura es pequeña, no afectará este componente.
19	Meteorología	**C**	Existe un riesgo de vulnerabilidad de los sistemas de AP ante desastres naturales si los diseños no contemplan medidas contra restantes.
20	Paisaje	D	Infraestructura pequeña, poca y esparcida
21	Calentamiento Global	D	El plan no causa calentamiento global directamente, sin embargo requerirá más consumo de energía para el bombeo.
Contaminación			
22	Contaminación del aire	**A**	La excavación de zanjas para la instalación de tuberías de conducción pueden producir polvo y afectar localmente salud de población, de forma temporal durante la etapa de construcción, especialmente población vulnerable
23	Contaminación del agua	B	Mayor uso del agua incrementa las aguas residuales, interrupción del servicio produce riesgos sanitarios en el sistema de distribución, fugas del sistema de alcantarillado y falta de saneamiento pueden contaminar aguas subterráneas y propiciar vectores (charcas, aguas grises, etc)
24	Contaminación del suelo	B	Áreas sin alcantarillado sanitario pueden causar alguna contaminación del suelo.
25	Desechos	**B**	Producción de desechos en la etapa de construcción. Molestias, accidentes laborales y de la población, estética urbana
26	Ruidos y vibración	B	La maquinaria puede causar ruidos y vibraciones durante la etapa de construcción y operación de equipos de bombeo
27	Hundimiento del suelo	**B**	Hundimiento de zanjas excavadas mal compactadas, produce accidentes, charcas que pueden afectar a la salud (vectores)
28	Olores desagradables	**B**	Derrame en pozos de visita producen charcas. Flujo mayor de aguas servidas a los sistemas de tratamiento, aguas grises.
29	Sedimentación	D	No hay actividades que causen sedimentación
30	Accidentes	**B**	Construcción: Instalación de tuberías: accidentes de trabajadores, peatones, automóviles. Operación de máquinas

Cuadro 5.0 Resumen de Impactos

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación adoptadas
1. REUBICACION DE LA POBLACION	C	Posibles afectaciones se definirán en el avance y diseño del proyecto, debido a la instalación de líneas de conducción e infraestructura.	Análisis de planos de diseño de distribución de las redes	Contemplar un programa de compensación en conjunto con las entidades establecidas por la ley
2. ECONOMÍA LOCAL: EMPLEOS, SUSTENTO, ETC	B	Durante la etapa de construcción cambios en la circulación de vías por obstrucción de las obras puede influir en la economía de algunos negocios y servicios. Sin embargo es de carácter temporal	Análisis de Diseños y planos.	Organización comunal e información de obras a la población. Publicación de zonas a afectar, rotulación de desvíos.
3. USO DEL SUELO Y RECURSOS LOCALES	C	Los impactos se definirán en las etapas del proyecto, posibles cambios de uso en pequeñas áreas.	Estos dependen de las etapas del proyecto y estudios realizados	Estarán en dependencia de las predicciones
4. INSTITUCIONES SOCIALES	C	Conflictos entre los gobiernos locales e instituciones gubernamentales	Establecer Comisiones de las partes involucradas en el uso del recurso	Dar seguimiento y cumplimiento a los compromisos establecidos por las comisiones
5. INFRAESTRUCTURA Y SERVICIOS SOCIALES EXISTENTES	B	Instalación de infraestructura y líneas de conducción pueden afectar temporalmente vías de transporte y otra infraestructura social existente.	Análisis del diseño del proyecto y obras a construir. Inspección de obras.	Organización eficiente de obras y aplicar medidas de restauración.
7. MALA DISTRIBUCIÓN DE LOS BENEFICIOS	C	Podría producirse conflictos por la falta de equidad en la distribución del servicio de agua potable si no se logra un ajuste equilibrado.	Co-participación de la población, gobierno local, organismos civiles y entidades del gobierno	Planificación para la protección del uso del recurso. Revisión factibilidad en todas las etapas del proyecto.
8. PATRIMONIO CULTURAL	B	La sobre explotación de la laguna de Asososca puede bajar el nivel del agua. La reducción del nivel de agua podría causar algún efecto de meteorización en la estructura rocosa que conforma la caldera de la laguna.	Inspección de las condiciones de las la estructura rocosa de la caldera. Monitoreo de los niveles del agua de la laguna.	Controlar la extracción de agua de la laguna de Asososca
		Riesgo de destrucción del patrimonio cultural (hallazgos arqueológicos)	ENACAL debe preparar un Documento de Estudio de Impacto Cultural a la entidad Correspondiente	Realización de Estudio de Impacto Cultural
9. INTERESES Y CONFLICTOS LOCALES	B	Podrían presentarse conflictos si la población aledaña a las Fuentes de agua mantienen un déficit en el servicio de AP.	Monitoreo de la cobertura de AP de la población cercana a las Fuentes.	Elaborar un plan para cubrir la demanda de AP de las poblaciones cercanas a las Fuentes. Debe garantizarse un beneficio equitativo de las mejoras del servicio, especialmente en las localidades donde se

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación adoptadas
				encuentran las fuentes
10. USO Y DERECHOS DEL AGUA, DERECHOS COMUNES	B	La sobreexplotación del agua subterránea puede afectar la disponibilidad para los diferentes usuarios del agua.	Monitoreo de la utilización del agua subterránea por los diferentes sectores. Monitoreo del uso del agua subterránea por compañías privadas	Implementar Leyes para la regulación del uso del agua subterránea. Establecer un uso racional y equilibrado del agua subterránea y regular la extracción.
11 SANEAMIENTO	B	Incremento del servicio de Agua Potable causa mayor agua residual.	Seguimiento de la cobertura de sistemas de tratamiento y disposición de agua residual.	Crear conciencia en los usuarios para reducir la utilización del agua. Construcción de sistemas de tratamiento de aguas residuales. Educar a la población en el manejo adecuado de sistema individuales de disposición de aguas residuales.
12. PELIGROS: Enfermedades y creación de vectores	B	Pueden producirse Enfermedades diarreicas y respiratorias en ciertas etapas del proyecto por emisión de polvo, formación de charcas (vectores) por pruebas de bombeo y mantenimiento de equipos de bombeo, etc.	Inspección Ambiental.	Control de vectores.
14. EROSION DEL SUELO	B	Arrastre de suelo durante la etapa de construcción (zanjeo), a consecuencia de las lluvias. Alteración del drenaje natural por la construcción de líneas de conducción (formación de cárcavas)	Inspección de Medidas contrarrestantes Análisis de diseño	Realizar obras de protección durante la etapa de construcción y operación
15. AGUA SUBTERRÁNEA	B	El incremento de aguas residuales y en dependencia de su disposición puede afectar la calidad del agua subterránea.	Estudio de la calidad del agua subterránea, estado del saneamiento.	Concienciar a usuarios en la reducción del uso del agua. Impermeabilización de obras y sistemas de drenaje adecuado. Soluciones de disposición y tratamiento de aguas residuales. Educar a la población en el manejo adecuado de sistema individuales de disposición de aguas residuales.
	C	Un alto volumen de extracción de agua subterránea puede bajar los niveles freático, es necesario mayores estudios para evaluar los niveles de explotación y rendimiento seguro, así como factores se sostenibilidad del recurso. Mejoramiento del Servicio aumentará el consumo de AP (mayor gasto de AP)	Monitoreo de Capacidades de pozos Considerar uso del suelo y actividades en el área cercana a las fuentes (gasolineras, agricultura, etc)	Actualizar estudios hidrogeológicos. Establecer políticas de protección de fuentes y Microcuencas. Educación ambiental y del uso del agua a la ciudadanía.
16. Hidrología	B	Sobreexplotación del agua subterráneas puede afectar el nivel del agua subterránea.	Estudio sobre el nivel del agua subterránea	Establecer un uso razonable del agua subterránea y controlar el volumen de explotación. Informar a los usuarios sobre la reducción del uso del agua.

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación adoptadas
	C	Sobreexplotación del acuífero	Monitoreo y Evaluación	Inventario de Acuíferos. Monitoreo adicional (pozos p). Realizar estudios que demuestren la no sobreexplotación,
19. Meteorología	C	Existe un riesgo de vulnerabilidad de los sistemas de AP ante desastres naturales	Inclusión de medidas preventivas	Diseños adecuados para proteger de sequías, inundaciones
22. AIRE	A	Afectación de la salud por emisión de partículas en suspensión (polvo) durante la construcción de líneas de conducción, mayormente en lugares habitados por población vulnerable	Inspección ambiental de obras	Implementar adecuadas técnicas de construcción, riego. Organización eficiente de obras. Mayor responsabilidad entre Ejecutor y Constructor
23. CONTAMINACIÓN DEL AGUA	B	Mayor uso del agua causa mayor agua residual. Esto afectará la calidad del agua superficial, Lago de Managua.	Estudio sobre de la explotación del agua subterránea Estudio sobre la calidad de las aguas residuales	Concientizar a usuarios en la reducción del uso del agua. Educar a la población en el manejo adecuado de sistema individuales de disposición de aguas residuales.
		Construcción y Operación. Complicación de aguas servidas, interrupción servicio, contaminación de tuberías y fuentes de aguas subterráneas	Inspección, Monitoreo	Suministro oportuno del servicio. Sensibilización y capacitación para el manejo adecuado de Agua potable y aguas residuales
24. SUELO	B	Contaminación por carencia de dispositivos sanitarios	Cobertura de dispositivos saneamiento	Ampliar cobertura alcantarillado sanitario
25 DESECHOS	B	Producción de desechos en la etapa de construcción. Molestias, accidentes laborales y de la población, estética urbana	Inspección de obras	Manejo adecuado de desechos
26. Ruidos y vibración	B	Ruido y vibración podrán producirse durante la etapa de construcción y operación	Inspección de la localización y distribución de la infraestructura pública y zonas residenciales. Encuestas de información de zonas residenciales.	Seleccionar métodos de construcción que minimicen la emisión de ruidos y vibración. Instalar pantallas aislantes y zonas de amortización. Seleccionar tecnología, adecuado mtto de maquinaria y equipos, silenciadores de bombas. Equipo de protección para obreros
27 HUNDIMIENTO DEL SUELO	B	Hundimiento de zanjas excavadas mal compactadas, produce accidentes, charcas que pueden afectar a la salud (vectores)	Inspección l de Obras	Supervisión eficiente, Métodos adecuados de construcción, compactación, % proctor
28 OLORES DESAGRADABLES	B	Derrame en pozos de visita producen charcas. Flujo mayor de aguas servidas a los sistemas de tratamiento	Inspección	Aplicación de planes preventivos de mtto y utilización de equipos adecuados, Supervisión. Coordinación entre proyectos, Regulación
29 ACCIDENTES	B	Construcción: Instalación de tuberías: accidentes de trabajadores, peatones, automóviles. Operación de máquinas		Aplicar de normas de seguridad ambiental MITRAB, señalización, iluminación de obras. Divulgación y comunicación de áreas a afectarse. Coordinar participación comunitaria.

ANNEX 10E

Measures Considered and Incorporated in The Proposed Project

MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO

<table>
<tr><td>Nombre del Proyecto</td><td colspan="4">Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua</td></tr>
<tr><td>Aspecto Impactado</td><td>Magnitud</td><td>Impacto</td><td>Métodos de predicción</td><td>Medidas de mitigación recomendadas</td></tr>
<tr><td rowspan="2">1. REUBICACION DE LA POBLACION</td><td>C</td><td>Posibles afectaciones se definirán en el avance y diseño del proyecto, debido a la instalación de líneas de conducción e infraestructura.</td><td>Análisis de planos de diseño de distribución de las redes</td><td>Contemplar un programa de compensación en conjunto con las entidades establecidas por la ley</td></tr>
<tr><td colspan="4">MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO

El proyecto no requiere de áreas extensas para la implantación de infraestructura, además que estás son dispersas, por lo cual no existe la necesidad reubicación de poblaciones. En el caso de los sitios a seleccionarse para el emplazamiento de tanques de almacenamiento, pozos y estaciones de bombeo que afectarán algunas propiedades, se establecerá las negociaciones necesarias en consenso con los afectados.</td></tr>
<tr><td rowspan="2">2. ECONOMÍA LOCAL: EMPLEOS, SUSTENTO, ETC</td><td>B</td><td>Durante la etapa de construcción cambios en la circulación de vías por obstrucción de las obras puede influir en la economía de algunos negocios y servicios. Sin embargo es de carácter temporal</td><td>Análisis de Diseños y planos.</td><td>Organización comunal e información de obras a la población. Publicación de zonas a afectar, rotulación de desvíos.</td></tr>
<tr><td colspan="4">MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO

Diseños Detallados: ENACAL incluirá las medidas de mitigación necesarias en la planificación de las obras, además de establecerlas en las especificaciones técnicas en los procesos de licitación.

Etapa de Construcción: ENACAL establecerá una adecuada supervisión durante la etapa de construcción para verificar el cumplimiento de las medidas establecidas. Estos impactos son de carácter temporal, la infraestructura no es de gran escala por ende la afectación no es de gran magnitud. La divulgación de obras y la comunicación con las comunidad y gobiernos locales será establecida para una mejor planificación.</td></tr>
<tr><td rowspan="2">3. USO DEL SUELO Y RECURSOS LOCALES</td><td>C</td><td>Los impactos se definirán en las etapas del proyecto, posibles cambios de uso en pequeñas áreas.</td><td>Estos dependen de las etapas del proyecto y estudios realizados</td><td>Estarán en dependencia de las predicciones</td></tr>
<tr><td colspan="4">MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO

Etapa de Diseños Básicos y Detallados: El proyecto no requiere de áreas extensas para la implantación de infraestructuras, además que estás son dispersas, por lo tanto los cambios de uso de suelo o recursos locales no son de gran magnitud. En todo caso se establecerán las negociaciones necesarias en consenso con los afectados y las autoridades respectivas.</td></tr>
<tr><td rowspan="2">4. INSTITUCIONES SOCIALES</td><td>C</td><td>Conflictos entre los gobiernos locales e instituciones gubernamentales</td><td>Establecer Comisiones de las partes involucradas en el uso del recurso</td><td>Dar seguimiento y cumplimiento a los compromisos establecidos por las comisiones</td></tr>
<tr><td colspan="4">MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO

ENACAL promoverá y apoyará la formación de comisiones para realizar las consultas necesarias de los componentes del proyecto que necesiten el consenso de los organismos e instituciones relacionados, para establecer acuerdos, de manera que no se generen conflictos y se proceda según las competencias legales.</td></tr>
</table>

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación recomendadas
5. INFRAESTRUCTURA Y SERVICIOS SOCIALES EXISTENTES	B	Instalación de infraestructura y líneas de conducción pueden afectar temporalmente vías de transporte y otra infraestructura social existente.	Análisis del diseño del proyecto y obras a construir. Inspección de obras.	Organización eficiente de obras y aplicar medidas de restauración.
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EN EL ITEM 2			
7. MALA DISTRIBUCIÓN DE LOS BENEFICIOS	C	Podría producirse conflictos por la falta de equidad en la distribución del servicio de agua potable si no se logra un ajuste equilibrado.	Co-participación de la población, gobierno local, organismos civiles y entidades del gobierno	Planificación para la protección del uso del recurso. Revisión factibilidad en todas las etapas del proyecto.
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	El proyecto propone la amplia participación de la comunidad, para la implementación de las obras, mediante el establecimiento de los Comités de Agua y Saneamiento			
8. PATRIMONIO CULTURAL		La sobre explotación de la laguna de Asososca puede bajar el nivel del agua. La reducción del nivel de agua podría causar algún efecto de meteorización en la estructura rocosa que conforma la caldera de la laguna.	Inspección de las condiciones de las la estructura rocosa de la caldera. Monitoreo de los niveles del agua de la laguna.	Controlar la extracción de agua de la laguna de Asososca
		Riesgo de destrucción del patrimonio cultural (hallazgos arqueológicos)	ENACAL debe preparar un Documento de Estudio de Impacto Cultural a la entidad Correspondiente	Realización de Estudio de Impacto Cultural
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	Etapa de diseños Básicos y Detallados: ***ENACAL estudiará la reducción del bombeo de Asososca propuesto en este Estudio (Ver Reporte No. 3). Se realizarán gestiones con el Instituto Nacional de Cultura(INC) para tomar en cuenta las consideraciones necesarias para la planificación de obras y recomendaciones específicas para los rasgos ancestrales que se encuentran en las laderas de la laguna de Asososca.*** ***Etapa de Construcción:ENACAL realizará las coordinaciones necesarias con INC en las obras de movimientos de tierras y*** *en caso de hallazgos arqueológicos se suspenderá las obras para notificar al INC y realizar la evaluación patrimonial respectiva.* ***Etapa de Operación:*** *ENACAL mantendrá un programa de monitoreo sistemático del nivel de agua de la Laguna de Asososca.*			
9. INTERESES Y CONFLICTOS LOCALES	B	Podrían presentarse conflictos si la población aledaña a las Fuentes de agua mantienen un déficit en el servicio de AP.	Monitoreo de la cobertura de AP de la población cercana a las Fuentes.	Elaborar un plan para cubrir la demanda de AP de las poblaciones cercanas a las Fuentes. Debe garantizarse un beneficio equitativo de las mejoras del servicio, especialmente en las localidades donde se encuentran las fuentes
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación recomendadas
	Este Proyecto incluye el mejoramiento del servicio de abastecimiento en las áreas de Ticuantepe y Nindirí, en donde se encuentran fuentes de agua imporantes para el sistema de Managua.			
10. USO Y DERECHOS DEL AGUA, DERECHOS COMUNES	B	La sobreexplotación del agua subterránea puede afectar la disponibilidad para los diferentes usuarios del agua.	Monitoreo de la utilización del agua subterránea por los diferentes sectores. Monitoreo del uso del agua subterránea por compañías privadas	Implementar Leyes para la regulación del uso del agua subterránea. Establecer un uso racional y equilibrado del agua subterránea y regular la extracción.
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	El Estudio propone la aprobación urgente por parte del Gobierno de Nicaragua, de una ley de aguas, en proceso de aprobación en la Asamblea, mediante la cual se establecerá un organismo regulador de uso de aguas. *Asimismo, el proyecto propone la explotación sostenible y el monitoreo de calidad y nivel de aguas de los acuíferos del Área del Estudio (Informe de Soporte No3) y el establecimiento de un regimen de explotación sostenible del recurso.*			
11 SANEAMIENTO	B	Incremento del servicio de Agua Potable causa mayor agua residual.	Seguimiento de la cobertura de sistemas de tratamiento y disposición de agua residual.	Crear conciencia en los usuarios para reducir la utilización del agua. Construcción de sistemas de tratamiento de aguas residuales. Educar a la población en el manejo adecuado de sistema individuales de disposición de aguas residuales.
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	El Objetivo del Componente 3 es la reducción de fugas y pérdidas, incluyendo la Educación en el uso del agua. **El Componente 4 tiene como objetivo el mejoramiento del sistema de abastecimiento de agua y saneamiento en asentamientos de bajos ingresos, siendo las áreas con mayores problemas en el área de estudio.** **ENACAL además se encuentra dentro del proceso de consturcción de una Planta de Tratamiento de Aguas Servidas para la ciudad de Managua, con el financiamiento del BID, KFW y NDF, ampliándose la cobertura del servicio de alcantarillado sanitario en diferentes zonas de la ciudad de Managua.**			
12. PELIGROS: Enfermedades y creación de vectores	B	Pueden producirse Enfermedades diarreicas y respiratorias en ciertas etapas del proyecto por emisión de polvo, formación de charcas (vectores) por pruebas de bombeo y mantenimiento de equipos de bombeo, etc.	Inspección Ambiental.	Control de vectores.
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EN EL ITEM 2			

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación recomendadas
14. EROSION DEL SUELO	B	Arrastre de suelo durante la etapa de construcción (zanjeo), a consecuencia de las lluvias. Alteración del drenaje natural por la construcción de líneas de conducción (formación de cárcavas)	Inspección de Medidas contrarrestantes Análisis de diseño	Realizar obras de protección durante la etapa de construcción y operación
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EN EL ITEM 2			
15. AGUA SUBTERRÁNEA	B	El incremento de aguas residuales y en dependencia de su disposición puede afectar la calidad del agua subterránea.	Estudio de la calidad del agua subterránea, estado del saneamiento.	Concienciar a usuarios en la reducción del uso del agua. Impermeabilización de obras y sistemas de drenaje adecuado. Soluciones de disposición y tratamiento de aguas residuales. Educar a la población en el manejo adecuado de sistema individuales de disposición de aguas residuales.
	C	Un alto volumen de extracción de agua subterránea puede bajar los niveles freático, es necesario mayores estudios para evaluar los niveles de explotación y rendimiento seguro, así como factores se sostenibilidad del recurso. Mejoramiento del Servicio aumentará el consumo de AP (mayor gasto de AP)	Monitoreo de Capacidades de pozos Considerar uso del suelo y actividades en el área cercana a las fuentes (gasolineras, agricultura, etc)	Actualizar estudios hidrogeológicos. Establecer políticas de protección de fuentes y Microcuencas. Educación ambiental y del uso del agua a la ciudadanía.
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	Proyecto propuesto: *El proyecto propone nuevos pozos en nuevas localidades, sinembargo la mayoría de estos pozos son para reemplazar y reubicar fuentes ya existentes. El monitoreo de la calidad y el nivel del agua subterranea para el área de estudio está propuesto. (Ver Reporte No. 3).* ***Diseños Básicos y Detallados:*** *ENACAL evaluará los resultados de este Estudio, además de los realizados por JICA en 1994 Y SuWAR, con relación a los balnces de agua subterránea en la zona de estudio.* ***Etapa de Construcción y Operación: IGUAL A LOS ITEM 11 y 10***			
16. Hidrología	B	Sobreexplotación del agua subterráneas puede afectar el nivel del agua subterránea.	Estudio sobre el nivel del agua subterránea	Establecer un uso razonable del agua subterránea y controlar el volumen de explotación. Informar a los usuarios sobre la reducción del uso del agua.
	C	Sobreexplotación del acuífero	Monitoreo y Evaluación	Inventario de Acuíferos. Monitoreo adicional (pozos p). Realizar estudios que demuestren la no sobreexplotación,
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL AL ITEM 10 y 15			

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación recomendadas
19. Meteorología	C	Existe un riesgo de vulnerabilidad de los sistemas de AP ante desastres naturales	Inclusión de medidas preventivas	Diseños adecuados para proteger de sequías, inundaciones
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	Diseños Básicos y Detallados: *ENACAL incluirá en los diseños de la infraestructura las medidas necesarias tomando en cuenta la vulnerabilidad ante desastres naturales.*			
22. AIRE	A	Afectación de la salud por emisión de partículas en suspensión (polvo) durante la construcción de líneas de conducción, mayormente en lugares habitados por población vulnerable	Inspección ambiental de obras	Implementar adecuadas técnicas de construcción, riego. Organización eficiente de obras. Mayor responsabilidad entre Ejecutor y Constructor
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL AL ITEM 2			
23. CONTAMINACIÓN DEL AGUA	B	Mayor uso del agua causa mayor agua residual. Esto afectará la calidad del agua superficial, Lago de Managua.	Estudio sobre de la explotación del agua subterránea Estudio sobre la calidad de las aguas residuales	Concientizar a usuarios en la reducción del uso del agua. Educar a la población en el manejo adecuado de sistema individuales de disposición de aguas residuales.
		Construcción y Operación. Complicación de aguas servidas, interrupción servicio, contaminación de tuberías y fuentes de aguas subterráneas	Inspección, Monitoreo	Suministro oportuno del servicio. Sensibilización y capacitación para el manejo adecuado de Agua potable y aguas residuales
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EL ITEM 11			
24. SUELO	B	Contaminación por carencia de dispositivos sanitarios	Cobertura de dispositivos saneamiento	Ampliar cobertura alcantarillado sanitario
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EL ITEM 11			
25 DESECHOS	B	Producción de desechos en la etapa de construcción. Molestias, accidentes laborales y de la población, estética urbana	Inspección de obras	Manejo adecuado de desechos
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EL ITEM 2			

Nombre del Proyecto		Proyecto de mejoramiento del sistema de agua potable en mediano y largo plazo de la ciudad de Managua en la República de Nicaragua		
Aspecto Impactado	Magnitud	Impacto	Métodos de predicción	Medidas de mitigación recomendadas
26. Ruidos y vibración	B	Ruido y vibración podrán producirse durante la etapa de construcción y operación	Inspección de la localización y distribución de la infraestructura pública y zonas residenciales. Encuestas de información de zonas residenciales.	Seleccionar métodos de construcción que minimicen la emisión de ruidos y vibración. Instalar pantallas aislantes y zonas de amortización. Seleccionar tecnología, adecuado mtto de maquinaria y equipos, silenciadores de bombas. Equipo de protección para obreros
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EL ITEM 2			
27 HUNDIMIENTO DEL SUELO	B	Hundimiento de zanjas excavadas mal compactadas, produce accidentes, charcas que pueden afectar a la salud (vectores)	Inspección l de Obras	Supervisión eficiente, Métodos adecuados de construcción, compactación, % proctor
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EL ITEM 2			
28 OLORES DESAGRADABLES	B	Derrame en pozos de visita producen charcas. Flujo mayor de aguas servidas a los sistemas de tratamiento	Inspección	Aplicación de planes preventivos de mtto y utilización de equipos adecuados, Supervisión. Coordinación entre proyectos, Regulación
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EL ITEM 2.			
29 ACCIDENTES	B	Construcción: Instalación de tuberías: accidentes de trabajadores, peatones, automóviles. Operación de máquinas		Aplicar de normas de seguridad ambiental MITRAB, señalización, iluminación de obras. Divulgación y comunicación de áreas a afectarse. Coordinar participación comunitaria.
	MEDIDAS CONSIDERADAS EN EL PROYECTO PROPUESTO			
	IGUAL QUE EL ITEM 2			

Fecha: Agosto de 2005

ANNEX 10F

Social Protection Network (Red de Proteccion Social)

SOCIAL PROTECTION NETWORK (RED DE PROTECCION SOCIAL)

(1) Objective

Objective of this program is to promote a better life level for extremely poor families in rural areas with the following specific objectives:

i) Help increase revenues of extremely poor families for 3 years maximum, for improvement in food expenditure.
ii) Care increase for 0 to 9 years old children and fertile age women.
iii) Reduction in student desertion of 7 to 13 years old children.

(2) Beneficiaries

Direct beneficiaries are extremely poor families with yearly consumption expenditure falls to buy minimum per capita calorie requirements established by the Living Standards Measurement Survey of INEC.

(3) Criteria for beneficiaries selection

The Program Execution Unit of MIFAMILIA select municipals for the program in base of Poverty Map of 1998, priority identify mainly by MAGFOR and MARENA, community participation capacity. Based in those criteria, pick up of villages of the program in selected municipals.

In relatively low extension of extremely poverty villages, pick up families for application of program. The results of selection are consulted in village meeting.

(4) Aid program

This program is financed by IDB and CABEI, First Phase of US$9 millions and Second Phase with US$ 20 millions. Subsidies have 2 components:

- Health and food security; Food ticket (bono alimentario: BA), yearly amount of US$224 per family; and Offer Ticket (Bono a la Oferta: BO), yearly amount of US$ 54 per family. This ticket is paid to health prevention providers.
- Education; Student Ticket (Bono escolar: BE), year amount of US$ 112 per family with children in first to fourth grade school; Student Knapsack (Mochila Escolar: ME), student stationary, uniform and estimate value of US$21 per year; and Offer Ticket (Bono a la Ofreta: BO) to be paid directly to School Management Council. Amount is US$ 4.75 per student.

(5) Goal and Execution

In June 2004, total children of this program covered more than 20,000 and fertile women were 30,000.

ANNEX 10G

Programa Agua of ENACAL / European Union

PROGRAMA AGUA of ENACAL / EUROPEAN UNION

(1) Objectives

Provision of water supply and sewerage facilities in 4 municipals are as follows;

i) Chichigalpa with 5,000 houses (33,000m pipelines, reservoir 500,000 gallons, one new wells and equipment of 2 wells)
ii) Camoapa with 1,200 houses (7km of conduction pipeline, reservoir 300,000 gallons, treatment plant, 17 m height dam)
iii) Masatepe with 1,000 houses (13,000 m of pipelines, reservoir 500,000 gallons)
iv) El Viejo: with 250 users (400?)
v) Jinotega with 2,000 users (21,000 m of pipes, treatment plant).

Total Amount of Project: Approximately. US$ 5,200,000

(2) Components

i) Amount for micro credit component : ECU 330,000 (US$280,000)
ii) Period of execution: 1994 to Dec 2001
iii) Municipals of El Viejo, Masatepe, Chichigalapa, Jinotega and Camoapa.
iv) Credit conditions: Maximum micro credit for water supply C$4,000 and C$6,000 per beneficiaries, one year of loan, C$10 for arrear fees, and two persons in guarantee.
v) 2% for administration expenses, 8% in collection fees, 3.5% in risks and others 6%, Total of administration: 19.5%
vi) Credit committee: Credit manager, CUAPAS (Users Committee) and municipality.
vii) Plan of micro credit beneficiaries: 2,200 clients.
viii) Program of water save community education “Guardianes del Agua”.

(3) Results

ix) Actual disposability 30% of original funds
x) 60% of areas
xi) Beneficiaries: 2,300 users
xii) Cost for users US$123/users with 30% of recovery : Final Cost: U$86/users

ANNEX 10H

Managua Domestic Connection Facilities Program (IDB 1049)

MANAGUA DOMESTIC CONNECTION FACILITIES PROGRAM
(SUB PROGRAM 2 of LOAN IDB 1049/SF-NI)

(1) Objective

- Expansion and rehabilitation of water supply and sewerage facilities in 10 Barrios of Managua, 4,000 households.
- This sub program 2 has two components: ENACAL contract physical construction and another Consultant will develop community sanitary education and divulgation.
- Construction of facilities estimation costs: US$4,372,000, with 6,475 users of water supply and 8,035 users for sewerage system in 10 barrios of Managua. (50,000 m of water pipes with US$1,264,000, US$195/user and 62,500 m of sewerage pipes with US$3,108,000, US$387/user).
- Consultant social works and micro credits.

(2) Terms of Reference of the social work for the sub program 2

i) Diagnosis of environmental, socio economic situation of each Barrios
ii) Promotion of sanitary education in each barrios
iii) Socio economical census for each barrios
iv) Design and administration of community micro credits for in house sanitary facilities. Estimated budget for this micro credits is US$ 150,000.
v) Consultant fees: Estimated in US$ 250,000

(3) Proposed Procedures for the project implementation

Phase I:

i) Identification of community leader, and status of existent organization in each barrios
ii) Introductory workshop for explanation of project scope and proposed methodology in each barrios
iii) Socio economic and technical census for each barrio, in joint work with ENACAL and consultants. Workshop with survey team and community leaders. The census contents: number of persons per house, level of consumption, revenue level of each families, condition of houses, actual water uses, etc. All the potential beneficiaries' families will be censed.
iv) Workshop for analysis results of the census
v) Conformation of Water and Sanitation Committee (WSC) in each barrios

Phase II:

vi) Divulgation activities, redial, TV, newspaper, schools, health center and different sites. Preparation of divulgation material.
vii) All potential beneficiaries of the project will sign commitment for implementation of the project.
viii) Evaluation of divulgation activities
ix) Contract with local NGO for design and direct administration of micro credit. Definition of type of credit, pay back period and their amount, type of guarantee, collect modality, forms of penalty, etc.
x) Conformation of micro credit Committee, Sub program Consultant, NGO and credit delegate for each barrio.
xi) Collect modality has 4 alternatives: NGO direct collection, ENACAL bill collect, local commerce collect and group of beneficiaries collect (10 to 20 users group). These alternatives will be discussed and tested.

Pre conditions for the sub program

i) Guarantee from ENACAL to construct main supply and sewerage system in each barrios.
ii) Support of National Police for nigh works
iii) Clear policy of ENACAL about land property conflict.

(4) Evaluation of the project

This project will start this year 2005. Expected participation level of beneficiaries is uncertain and proposed methodology have many conditions. There are too many participants in this program: IDB, ENACAL, Consultant, NGO, WSC, and Credit Committee. This system has high risk to delay and dilute responsibilities in decision make and correction policy in project management.

ANNEX 10I

Basic Sanitation Education Program - UNICEF, COSUDE, ENACAL

BASIC SANITATION EDUCATION PROGRAM "Juanita y La Gotita", PROGRAM of AGUASAN/COSUDE and GAR ENACAL (PPA-NICA/2004/0019-0/YHNT)

(1) Objectives:

- Construction of sanitary facilities for 125 rural elementary schools.
- Basic Sanitation Education at the selected schools

(2) Executing Agencies and Cooperating Agencies:

- MINSA, MEDC, MARENA, INIFOM, ENACAL-GAR
- UNICEF, ASDI, Holland Found,

(3) Activities:

- Elaboration of Basic Sanitation Manual for Primary School Teachers
- Distribution of Manual of Sanitary Education for Primary Students,
- Elaboration of Gender Sanitation Guidelines

(4) Estimated Costs:

- Construction of Facilities and Capacitating: US$300,000

ANNEX 10J

Nicaragua's PRSP

NICARAGUA's PRSP

(1) The Poverty Reduction Strategy Paper presented by the Government of Nicaragua, in July 2001, is called Strengthened Growth and Poverty Reduction Strategy (SGPRS). The preparation of the SGPRS involved intensive consultation within the government and civil society, stakeholders, and the poor. The SGPRS's main strengths are (i) an active participatory process; (ii) a good diagnosis of poverty and its multidimensional nature; (iii) the identification and adequate progress in costing of goals, targets, and intermediate indicators, which are related to International Development Goals; (iv) a clear position than macroeconomic stability, including a prudent management of public finances, is critical to growth and poverty reduction; and (v) the identification of program areas critical for poverty reduction.

(2) High-quality data from the 1998 Living Standards Measurement Survey and 1995 Census used as input for elaboration of 1998 Poverty Map. The 1998 Poverty Map classifies Nicaragua's population according to geological zones (for 151 municipalities). SGPRS classified Managua, Ticuantepe and Nindiri Municipalities as low poverty areas.

(3) A household is classified as poor if household yearly consumption expenditure per capita falls bellow a poverty line of US$402.05. The poverty line is the yearly amount of per capita consumption expenditure needed to buy minimum per capita calorie requirements plus other consumption item including housing, clothing and transportation. A household is identified as extremely poor if household's yearly consumption expenditure per capita falls bellow an extreme poverty line of US$ 212.22. Estimate number of poor persons and extremely poor persons is shown in **Table 10.J.1**.

Table 10.J.1 Nicaragua Poverty Population by Municipalities

Poverty Status order	Municipality	Estimated Population 1995	Estimated number of poor persons	% of poors in rural areas	Estimated number of extremely poor persons	% of extremely poor in rural areas
151	Managua	832,824	146,791	4.3	24,923	4.3
148	Ticuantepe	19,929	5,223	61.4	1,022	61.4
131	Nindiri	28,850	14,447	79.1	4,102	81.6
Total		881,603	166,461		30,047	

Source: Government of Nicaragua, SGPRS, 1998

(4) SGPRS rests on four pillars and three cross-cutting themes. The four pillars are: (i) broad-based economic growth; (ii) investment in human capital; (iii) better protection of vulnerable groups; and (iv) institutional strengthening and good governance. The three cross-cutting themes address the country's ecological vulnerability, social inequality and the need for greater decentralization. The SGPRS ranks broad-based economic growth as the most important pillar to reduce poverty.

(5) Principal guidelines and objectives related to this Study are as follows:

i. Increase coverage of safe water and sanitation in urban and rural areas. Encourage sustainable water usage at homes by implementing educational programs and by providing information on water conservation and the cost of the service. (Executor: ENACAL)

ii. Improve capacity of households to care for their own health. Change family sanitary behavior and habits in order to improve the health and nutrition conditions of poor families. (Executor: MINSA)

iii. Improve the quality of life for socially vulnerable groups and providing subsidies to protect extremely poor families as new water and sewerage tariffs are introduced. (Executor: SETEC, MIFAMILIA, Municipalities, ENACAL, etc.)

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.11
Economic & Financial Evaluation of Long-term Improvement Plan and Priority Project

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.11
Economic & Financial Evaluation of Long-term Improvement Plan and Priority Project

Table of Contents

11.1 OBJECTIVES OF THE EVALUATION

Water is becoming a scarce resource in almost all countries and cities with growing population and fast growing economies and developmental activities. This scarcity makes water a social and an economic good. Its users range from poor households with basic needs to agriculturists, industries and commercial undertakings with their needs for economic activity, and to rich households for their higher standard of living.

It is essential to carry out an economic and financial analysis of projects so that planners, policy makers, water enterprises and consumers are aware of the actual economic cost of scarce water resources. Besides, the analysis also provides appropriate levels of tariff and cost recovery needed to financially sustain the projects.

The objectives of evaluation study are to provide the information and data of the evaluation results to the stakeholders and agencies concerned. In this supporting report, the economic and financial analysis provides the evaluation results of both the Long-term Improvement Plan and the Priority Project.

11.2 SUMMARY OF THE EVALUATION RESULTS

11.2.1 Long-term Improvement Plan

The project evaluation was conducted to examine the viability of the proposed Long-term Improvement Plan. The preconditions and assumptions for economic evaluation are based on the report of "Guía Metodológica para Formulación y Evaluación de Proyectos de Agua Potable y Alcantarillado Sanitario, December 2004, SECEP". The economic evaluation was conducted on the basis of the comparison between with-project condition and without-project condition.

The evaluation indices were 15.6% of EIRR, US$1.64 million of NPV and 1.01 of B/C, as shown in the table below. Then, the Long-term Improvement Project is viable from the economic point of view, because its EIRR was higher than the social discount rat of 15% proposed in the SECEP report.

Item	EIRR (%)	NPV* (US$ Million)	B/C*
Results of Evaluation	15.6	1.64	1.01

Note: * Discounted at 15%.

The financial evaluation was conducted on the basis of the comparison between the costs of capital investment, replacement and O&M, and the financial benefits of sales revenues and installation fees from water consumers. The financial opportunity cost of capital was set as 2% per annum, referring to the national average financial procurement conditions in the World Bank Report, "Global Development Finance, Country Tables 2004, March 2004, World Bank".

The evaluation indices were negative of FIRR, minus US$97.0 million of NPV and 0.90 of B/C, as shown in the table below. Then, the Long-term Improvement Project is not viable from the financial point of view, because its FIRR was negative and much lower than the financial opportunity cost of capital, 2%.

Item	FIRR (%)	NPV (US$ Million)	B/C
Results of Evaluation	Negative	-97.0	0.90

Note: * Discounted at 2%.

In order to make the project viable, the financial benefits must increase around 12% more than

the present ones in every year during the evaluation period. In another way, the financial costs must decrease 10% more than the present ones in every year during the evaluation period.

11.2.2 Priority Project

The procedure of the project evaluation for the Priority Project was the same as that of the Long-term Improvement Plan. The assumptions and criteria are set in the same conditions. The results of the economic evaluation were slightly worse than those of the Lang-term Plan.

The evaluation indices were 14.4% of EIRR, minus US$1.16 million of NPV and 0.99 of B/C, as shown in the table below. Then, the Priority Project is not viable from the economic point of view. However, it could be considered to be almost viable because the indices were quite close to those of the Long-term Plan.

Item	EIRR (%)	NPV* (US$ Million)	B/C*
Results of Evaluation	14.4%	-1.16	0.99

Note: * Discounted at 15%.

Yet, the indices of financial evaluation were negative of FIRR, minus US$58.4 million of NPV and 0.74 of B/C, as shown in the table below. Then, the Priority Project is not viable from the financial point of view.

Item	FIRR (%)	NPV* (US$ Million)	B/C*
Results of Evaluation	Negative	-58.4	0.74

Note: * Discounted at 15%.

In order to make the project viable, the financial benefits must increase around 20% more than the present ones in every year during the evaluation period. In another way, the financial costs must decrease 17% more than the present ones in every year during the evaluation period.

11.3 ECONOMIC EVALUATION

11.3.1 Overview of Economic Evaluation

In this study, the project proposed is evaluated on the basis of two quantitative analyses: (1) economic evaluation, and (2) financial evaluation. The economic evaluation is to examine the proposed project from the economic point of view, that is, viability as social investment in the national economy. The financial evaluation is to inspect the proposed project from the financial point of view, that is, tests of earning capacity and financial efficiency. This is the fundamental difference between the two evaluations.

The project evaluation is conducted in accordance with the conventional methodology that is commonly applied for evaluation of development project under finance of the World Bank and other international agencies such as Inter-American Development Bank (IDB). The methodology suggests that the project evaluation have two steps for quantifying evaluation factors in general. At first, the project cost and benefit are identified and quantified in monetary terms, which arise from implementation of the proposed project. Then, they are compared and condensed into evaluation factors. The factors are Economic Internal Rate of Return (EIRR) for a main index, and Net Present Value (NPV) and Benefit-Cost Ratio (B/C) for supplementary indices.

The EIRR is defined as a special rate of discount that settles the following conditions to the

satisfaction:

1) The present value of cost is obtained through discounting the all costs incurred during the economic life of the proposed project at the special rate.
2) The present value of benefit is obtained through discounting the all benefits accruing from the project during the same lifetime at the special rate.
3) As a result, the present value of cost is equal to the present value of benefit.

In the case that this EIRR exceeds the social discount rate, the proposed project could be judged as viable economically. The NPV shows the magnitude of project incremental benefit. The B/C indicates the gap between the project efficiency and the social discount rate.

11.3.2 Assumptions for Economic Evaluation

(1) Basic Conditions for Economic Evaluation

Economic evaluation of the proposed project is a guideline of assessing its economic viability. Economic net benefit is given as the effect of difference between with-project condition and without-project condition in the areas influenced by the proposed project. In the case of water supply project, for instance, the benefit is estimated as a difference between net value of water procurement cost under with-project condition and net value of water procurement cost under the present condition. This difference is accounted as project net benefit.

Economic cost differs from financial cost in the sense of value judgment since the former is valued at real resource cost and the latter is resource cost valued at market prices. In **Supporting Report No.7**, the project costs are estimated on the basis of the market prices. Thus, to estimate the economic costs of the proposed project, the financial costs have to be converted using conceivable adjustment.

(2) Criteria of Evaluation

In estimating the economic cost and benefit, the following criteria and assumptions are applied to transfer the financial values of the project cost and benefit to the economic ones in this study.

1) Conversion Factors and Elements for Real Economic Values
   (a) Standard Conversion Factor
   All the costs involved in every project have to be measured as economic costs, i.e., the real costs or "opportunity costs" incurred from the viewpoint of the national economy. In general, market values are usually distorted by transfer payments such as taxes and subsidies. These transfer payments are transferred to the government which acts on behalf of the society. Then, they should not be treated as economic cost. These have to be eliminated from the market values of cost and benefit as a whole. It is clearly impracticable to trace procurement sources for all the project inputs, particularly in this study stage. Thus, the local currency portion of economic costs was estimated by applying a special conversion factor to the financial costs. This rate is called as a standard conversion factor (SCF). In this study, it was estimated at 0.93, as shown in **Table 11.3.1**.
   (b) Shadow Foreign Exchange
   It is said that the foreign exchange rate has some distortions in the prevailing exchange rate due to balance of payments disequilibrium and protection structures in the country. In this study, however, the shadow exchange rate (SER) is assumed at 1.15 of the prevailing exchange rate. This rate is proposed to apply to economic evaluation in “Guía Metodológica para Formulación y Evaluación de Proyectos de Agua Potable y Alcantarillado Sanitario”, December 2004, SECEP.
   (c) Land Value

Market price of land has peculiar characteristics as compared with other commodities, especially in urban areas. Land price should be evaluated on the basis of productivity of the land for productive plots such as crop cultivation and balance of supply and demand for non-productive land such as residential plots. On the other hand, land price is sometimes distorted by speculation in future escalation expectation and by social prestige. In this study, most lands which would be expropriated for pump stations and distributing reservoirs are utilized for water distribution. These lands are not utilized for productive activities at present and even in the future. Thus, the value of these lands will be evaluated at nothing from the economic viewpoint.

Table 11.3.1 Standard Conversion Factor

Item	1998	1999	2000	2001	2002	2003	Average
A. Import (CIF) in US$ Million	1,491.7	1,861.7	1,791.6	1,779.3	1,774.0	1,886.9	1,764.2
B. Export (FOB) in US$ Million	573.2	545.2	625.3	605.0	561.0	604.5	585.7
1. Import (CIF) in C$ Billion	15.8	22.0	22.7	23.8	25.3	28.5	23.0
2. Export (FOB) in C$ Billion	6.1	6.4	7.9	8.1	8.0	9.1	7.6
3. Import Tax in C$ Million	1.5	1.9	2.1	2.1	2.5	2.8	2.2
4. Export Tax in C$ Million	-	-	-	-	-	-	-
5. Subsidies for Foreign Trade	-	-	-	-	-	-	-
6. Total of (1) & (2)	21.8	28.4	30.7	31.9	33.3	37.6	30.6
7. (1)+(2)+(3)-(4)+(5)	23.4	30.3	32.8	34.0	35.8	40.5	32.8
8. Standard Conversion Factor (SCF)*1	0.94	0.94	0.94	0.94	0.93	0.93	0.93
9. Foreign Exchange Rate (C$/US$) *2	10.6	11.8	12.7	13.4	14.3	15.1	-

Source: Informe Annual 2000, & 2003, Banco Central de Nicaragua
Note: *1 SCF = (6)/(7)
*2 Quoted from International Financial Statistics, IMF.

2) Schedule and Evaluation Period

(a)	Base Year	Beginning of 2006. The JICA project is assumed to start at the beginning of 2006.
(b)	Construction Period	The project component works in the first stage period are constructed between 2006 and 2010. After 2011, the second stage works will be continues in accordance with the increasing water demand until the target year 2015.
(c)	Disbursement Schedule	Uniform distribution of project costs during the construction period above
(d)	Economic Life	30 years after the completion of the project
(e)	Evaluation Period	30 years after the completion of the second stage construction work (2016 – 2045)

3) Other Criteria

(1)	Price Level	Cost and benefits of the project were set at the beginning of December, 2004.
(2)	Prevailing Exchange Rate	C$16.2834 per US$1.00 and JP¥106.09 per US$1.00
(3)	Social Discount Rate	15% per annum (Referred to Guía Metodológica para Formulación y Evaluación de Proyectos de Agua Potable y Alcantarillado Sanitario, December 2004, SECEP)

11.3.3 Economic Evaluation of Long-term Improvement Plan

(1) Effects of Water Supply Project

A water supply project has a great influence to people and organizations concerned in that project area. In the evaluation study, effects of the water supply project have to be enumerated and quantified as benefits of the project. Some of them may be applicable to this proposed project, as well. The project will have these effects upon stakeholders in Managua City. Direct beneficiaries of the project are considered as ENACAL (the undertaker of the project), water consumer and organizations concerned in the city. The effects are listed as follows in general.

Effect	Substance of Effect
Cost saving from present water supply system	• Cut of (a) costs from drawing-water labor, (b) purchase of bottled water, and (c) operating costs of wells etc.
	• Cut of emergency water procurement expense against suspension or insufficiency of water supply
Increase of water consumption owing to convenience	• Enjoying satisfactory water supply condition through improved water supply system
Evasion of damage by suspension or insufficiency	• Evasion of damage due to suspension or sufficiency of water supply resulting from unstable supply condition
Improvement of public hygiene	• Mitigation of damage to residents' health owing to occurrence prevention of water borne diseases
Environmental preservation	• Saving of natural water resources through improvement of water leakage
Improvement of living environment	• Improvement in residents' living conditions owing to sufficiency of basic needs
Other effects	• Promotion of tourism recreation business, etc.

(2) Identification of Economic Benefits

The proposed project is formulated in the following targets and conditional propositions. Within the project area, existing water resources have already been developed for water supply purposes. To meet the future water demand, ENACAL has to provide new water sources by means of (i) water conservation from improvement of system efficiency and reduction of physical leakage and wastage in the present water usage and (ii) new water resources from outside of the project area. Considering the target year 2015 and referring to the reports provided by donors, the proposed project was established to select the former countermeasure. The proposed project has the following components for actualizing the purposes of the project: (i) improvement and relocation of water sources and intake facilities; (ii) increasing efficiency in water transmission and distribution systems; (iii) improvement of water effective usage; and (iv) improvement of water supply and preservation of sanitation in asentamientos.

In Managua City, most of the present water supply facilities are becoming superannuated, because ENACAL has scarcely replaced their plant facilities since it was inaugurated. There are many facilities of which the depreciation period expired already. Some of them are still working with technical problems through technicians' diligent efforts. Most of them have to be replaced or rehabilitated within a short period. The proposed project involves this component to improve efficiency of system operation and to reduce physical leakage and wastage.

The project economic benefit is identified as a difference between with-project condition and without-project condition. The water supply system under with-project condition will provide the various benefits mentioned in the previous sections. Under without-project condition, there are many problems and constraints in terms of water supply service, already discussed in

previous supporting reports. In this economic evaluation study, the case of without-project condition is set as follows.

The present water supply system is utilized as it works in Managua City. As discussed above, most of water supply facilities are almost dilapidated, so they must be replaced or rehabilitated within a certain period. These improvement works are inevitable even in without-project condition. Moreover, because of limited water sources in the project area, its supply capacity is already limited to cover the present beneficiaries under without-project condition. On the other hand, it is said that it is impossible to develop new water resources in the project areas to meet new water demand in the project area.

Thus, ENACAL has no capacity to meet new water demand in the future. It will not serve potable water for new residents even in the near future. They have to procure their potable water from other water sources. The most popular water source in the city is a water wagon system. It is the cheapest way for potable water among many alternatives except ENACAL's water. The system is utilized on a day-to-day basis by the residents in case of water shortage. In this study, these people are assumed to rely on this water source under without-project condition.

These phenomena under without-project condition are quantified in economic monetary terms. Finally, the difference between with-project and without-project conditions is estimated as the project economic benefits.

(3) Benefits of Water Supply Project

Among the effects of the proposed project, some of them could be quantified referring to the present socio-economic conditions in the study area. Those quantifiable effects are selected as tangible benefits. They are discussed in the following paragraphs.

1) Cost saving from the present water supply system

The present water supply system covers the present beneficiaries who are living in the project area.

Its capacity is almost full for the present water demand. The costs for operation of the present system comprise (i) physical water leakage reduction and (ii) energy saving owing to system improvement. The O&M costs were estimated referring to the present O&M data of financial statements.

(i) Physical leakage reduction through piping networks

In the project area, it is said that the service ratio has almost attained 97%. Some of special areas are not covered by the piped system at present. Thus, the people in the service area enjoy their lives with potable water. However, the present water supply system has many weak points in terms of engineering matters. These engineering problems were improved in this proposed project. As a result, the project presents the following two cost saving benefits.

Positive countermeasures for leakage protection from piping networks and for reduction of wastage due to defective equipment are introduced in the proposed project. The effective water ratio will be increased from 55% in 2004 to 75% in the target year 2015. This reduction of leakage is accounted as the largest benefit of the proposed project.

The leakage reduction benefit is calculated as a product of the volume of reduction volume and

a unit production cost of water at plant site. The physical leakage from the network system was planned to decrease from 45% in 2004 to 25% in 2015. In the target year, the reduction was calculated at 48.0 million m^3 per year, which was worthy of around US$4.71 million in financial market value. It was converted to US$3.81 million in economic value, applying SCF of 0.93 and SER of 1.15. The annual benefits for the evaluation period were tabulated in **Table 11.3.2**.

(ii) Energy saving owing to system improvement

The present water supply networks were expanded to the present scales by putting extension to existing piping system. Thus, the networks have ineffective weakness from the engineering viewpoint. The efficiency of operation will go up through the improvement of overall water supply system. It results to cost saving of operation cost of the system, particularly of energy costs.

According to the engineering planning experts, the saved energy owing to system improvement was estimated at 1,830 MWh/annum after the inauguration of the improved system. The average power cost was calculated at around C$1.4/kWh in Managua water supply system. The energy saving was estimated at C$3.42 million, or US$ 210 thousand at market price. It is converted to US$170 thousand in economic terms.

2) Cost saving from water procurement expenses of residents who can not receive potable water from the piped water system of ENACAL

In the project area, moreover, there are no longer water resources to meet the future water demand. In this proposed project presents countermeasures to solve these capacity problems by means of reduction of leakage and wastage owing to improvement of effective ratio. These countermeasures of the proposed project are able to cover the demand increase until the target year 2015. On the other hand, ENACAL can not serve potable water under without-project condition, because of no more water resources. To increase its supply capacity to meet the future water demand, ENACAL has to develop new water resources in outside of the project area. Yet, it will cost much to develop new water resources from outside areas, since several research reports have already reported before.

In this case, the future residents will procure potable water from the cheapest water of water wagon service. This procurement system is popular in the project area for the residents who install a few water tanks for emergency situation, such as suspension of water supply. Although 3% of the total household is still without piped water supply, they are relying on water supply from water wagon service. Thus, the future residents might rely on this existing water supply service.

According to INEC report of “Informe General, Encuesta Nacional de Hogares sobre Medicion de Nivel de Vida, 2001, INEC”, a household disposable income in Managua was estimated at around C$77,450 per annum in 2001. This income was recalculated at C$92,220 per annum in 2004 as estimated in **Supporting Report No.9**. The affordability-to-pay was set as 4% of disposable income, as discussed in the World Bank Report of “Information and Modeling Issues in Designing Water Sanitation Subsidy Scheme, May 2000”. Applying these data, an average water expense was estimated at C$3,700 per year.

The water from water wagon service costs C$72/$m^3$ or C$15 per drum can (55 gallons). Although it costs much higher than the piped water, it is the cheapest and the most popular among water sold in the market except piped water by ENACAL. That expense provides only 51m^3 per year, corresponding to 26 lpcd. This scarce consumption water of 26 lpcd will bring

living circumstance with bad surroundings on the residents. These phenomena will arouse social and medical disorders. However, it is impossible to quantify these effects in monetary terms. Thus, these effects are considered as intangible benefits for the proposed project.

3) Investment for replacement and rehabilitation

The present water supply system has been operated within the limit of its capacity for the existing water consumers. Most of its water supply facilities are becoming superannuated, because ENACAL has scarcely replaced their plant facilities since it was inaugurated. Thus, most of them have to be replaced or rehabilitated within a short period. In the proposed project, these replacement and rehabilitation are involved in the proposed component as one of the main schemes.

Yet, even if the proposed project is not implemented in the proposed schedule, ENACAL should replace and rehabilitate their old equipment and facilities in the near future. Otherwise, the water supply system will not function well and its supply capacity will fall drastically at an early date. To avoid the worst phenomenon, ENACAL has to implement almost the same replacement and rehabilitation program as the JICA Plan proposed in this study.

Accordingly, the costs for these replacement and rehabilitation schemes are appropriated in the both sides of economic costs and benefits and are set off costs against benefits. In other words, they function to decrease the project cots for the cost side. At the same time, they also function to decrease ENACAL's costs of replacement costs.

(4) Economic Benefits

The tangible benefits of the propose project are composed of three components discussed in the previous section. They are: (i) physical leakage reduction through piping networks; (ii) energy saving owing to system improvement; and (iii) cost saving from water procurement expenses of residents who can not received potable water from the piped system of ENACAL. The total benefits are calculated as the total of the respective benefit components as shown in **Table 11.3.2**. The total economic benefit was estimated at US$7.2 million in 2010 and US$13.4 million in 2015.

Table 11.3.2 Economic Benefits of Proposed Project

(Unit: US$1,000)

Year	Reduction of Production Energy Cost	Cost Saving of Leakage Reduction	Water Costs of Residents without Piped System	Total
2006	0	537	735	1,272
2007	0	877	1,486	2,363
2008	127	1,234	2,641	4,002
2009	170	1,602	3,829	5,601
2010	170	1,981	5,051	7,202
2011	170	2,337	5,894	8,401
2012	170	2,697	6,756	9,623
2013	170	3,062	7,636	10,868
2014	170	3,433	8,536	12,139
2015	170	3,808	9,455	13,434

Besides these economic benefits, the existing water supply system need O&M cost and replacement costs to meet water demand for existing present beneficiaries under without-project

condition. However, these costs will not be necessary once the proposed project is implemented. Thus, these costs are considered as the economic benefits for the proposed project. These costs are estimated as US$25.9 million for the O&M cost and US$1.5 million for replacement cost in the matured year 2015. The details of these costs are enumerated in **Table 11.3.4.**

(5) Economic Costs

The estimate of the proposed project was already described in **Supporting Report No.7**. The estimate, however, was enumerated in market prices, what is called "financial value". In economic evaluation, the financial value has to be converted into economic value. The procedure of this conversion was already discussed at the beginning of this chapter. The total economic cost of the proposed project was calculated at US$113 million. The financial and economic costs are broken down in **Table 11.3.3**. The construction costs are annually disbursed in compliance with the construction schedule. In these investment costs, the installation costs of connection works such as service pipes and water meter are included in the construction costs and disbursed in accordance with the increase of new consumers. The annual disbursement is tabulated in the same table.

In this evaluation, the existing equipment and facilities were considered as sunk cost. These costs were not included in the capital investment of the project costs. Thus, the all investment costs are valuated as pure construction costs for the proposed project.

The pipeline facilities of the respective projects are considered to last 30 years long. Then, the evaluation period (corresponding to economic life) is set up as 30 years after the completion of the project construction. On the other hand, the machinery such as circulating pump and booster pump is considered to last 20 years. These machines have to be replaced during the system's economic life. In the disbursement schedule, the replacement costs of these machines are appropriated every 20 years. The replacement and rehabilitation costs for the existing equipment and facilities are estimated based on the inventory list of existing facilities. Thus, these costs were appropriated not only for those of the proposed project but also the existing equipment and facilities. These costs are tabulated in **Table 11.3.4**.

After the evaluation period of 30 years, some replaced machines will still be able to work well, because they are in their durable period after the replacement. In the evaluation procedure, however, these residual values were neglected because they were quite small at the end of evaluation period. In addition, although the values of the existing facilities, which are not replaced by the target years 2015, should be involved in the total costs as the existing assets, these values are eliminated in the cost stream as sunk costs in this evaluation study.

The operation and maintenance (O&M) cost is annually required during the economic life of the proposed project. The O&M cost was estimated as a product of the volume of water produced and unit production cost of C$2.90 per m^3, which is an average cost for the recent three years in Managua City water supply records. The O&M cost for the project life was tabulated in **Table 11.3.4**.

Table 11.3.3 Financial Cost and Economic Cost of Long-term Improvement Plan

Financial Costs (Unit: US$ Million)

Item	Total	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Water Resource/Water Intake Facilities	21.13	0.00	3.49	7.47	2.06	2.06	0.96	1.20	1.52	1.10	1.28
2. Transmission/Distribution Lines	45.93	0.00	1.45	5.03	6.36	9.68	9.77	4.48	4.71	4.21	0.24
3. Water Effective Rate Improvement	33.07	1.69	4.47	8.15	2.05	2.21	2.25	2.86	3.75	3.23	2.42
4. Improvement of Low-income Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	100.13	1.69	9.41	20.65	10.46	13.94	12.98	8.54	9.98	8.54	3.94
5. Engineering Services	7.01	0.12	0.66	1.45	0.73	0.98	0.91	0.60	0.70	0.60	0.28
6. Physical Contingency	5.36	0.09	0.50	1.10	0.56	0.75	0.69	0.46	0.53	0.46	0.21
7. Price Contingency	25.71	0.07	0.84	2.82	1.94	3.30	3.76	2.94	4.01	3.94	2.06
8. Administration	3.46	0.05	0.29	0.65	0.34	0.47	0.46	0.31	0.38	0.34	0.16
Grand Total	141.66	2.02	11.70	26.67	14.04	19.44	18.80	12.85	15.61	13.87	6.65

Economic Costs (Unit: US$ Million)

Item	Total	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Water Resource/Water Intake Facilities	20.76	0.00	3.43	7.34	2.02	2.02	0.94	1.18	1.50	1.08	1.26
2. Transmission/Distribution Lines	45.14	0.00	1.43	4.94	6.25	9.51	9.60	4.40	4.63	4.14	0.23
3. Water Effective Rate Improvement	32.50	1.66	4.39	8.01	2.01	2.17	2.21	2.81	3.68	3.17	2.38
4. Improvement of Low-income Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	98.40	1.66	9.25	20.29	10.28	13.70	12.75	8.39	9.81	8.39	3.87
5. Engineering Services	6.89	0.12	0.65	1.42	0.72	0.96	0.89	0.59	0.69	0.59	0.27
6. Physical Contingency	5.26	0.09	0.49	1.09	0.55	0.73	0.68	0.45	0.52	0.45	0.21
7. Price Contingency	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Administration	2.76	0.05	0.26	0.57	0.29	0.38	0.36	0.24	0.28	0.24	0.11
Grand Total	113.32	1.91	10.65	23.37	11.84	15.78	14.69	9.66	11.29	9.66	4.46

(6) Economic Efficiency

Economic costs and benefits during the economic evaluation period are shown in **Table 11.3.4**. The evaluation indices were 15.6% of EIRR, US$1.64 million of NPV and 1.02 of B/C, as shown in the summarized table below. Then, the Long-term Improvement Project is viable from the economic point of view, because its EIRR was higher than the social discount rat of 15% proposed in the SECEP report.

Item	EIRR (%)	NPV* (US$ Million)	B/C*
Results of Evaluation	15.6	1.64	1.01

Note: * Discounted at 15%.

11.3.4 Economic Evaluation of Priority Project

In this economic and financial evaluation study, the Priority Project is evaluated as the entire schemes in the First Stage. The Priority Project is included as the highest priority parts of the schemes in the First Stage. In the Long-term Improvement Plan, the project benefits are estimated as integrated complex benefits of the respective cost components, so it is impossible for these benefits to be segregated into the respective components of the schemes. Hence, the evaluation of "First Stage including the Priority Project" is regarded as the evaluation of the "Priority Project" in this Economic and Financial Evaluation Section hereinafter.

The Priority Project is selected from the viewpoints of emergency on water availability at water supply conditions and water distress due to water shortage in the first stage. It is implemented in the first half of the project period for five years from 2006 to 2010. In this section, this Priority Project is evaluated from the economic viewpoint. The implementing schedule is set as the same way discussed in the Long-term Improvement Plan. The Priority Project is evaluated on the conditions that only the Priority Project (i.e., the first stage) is independently completed by the year 2010. The preconditions and assumptions for the evaluation are the same as mentioned in the Long-term Improvement Plan.

Table 11.3.4 Economic Cost and Benefit Stream of Long-term Improvement Plan

(Unit: US$1000)

Year		Economic Cost of Proposed Water Supply System				Economic Benefit				Balance (Net Benefit)	Reference for Capital Investment	Reference for Net Benefit	
						Supplier Side for Existing Residents		Consumer Side					
		Construc-tion	O&M	Replace-ment	Total	O&M	Replacement	Residents without Piped Water Service	Total		Net Construction Cost	Reduction of Production Energy Cost	Cost Saving of Leakage Reduction
-10	2006	1,914	20,340		25,672	20,878	0	735	21,613	-4,059	1,914	0	537
-9	2007	10,652	20,434		31,086	21,311	2,394	1,486	25,191	-5,896	8,258	0	877
-8	2008	23,367	20,617		43,985	21,978	5,314	2,641	29,933	-14,052	18,054	127	1,234
-7	2009	11,842	20,893		32,734	22,665	3,358	3,829	29,852	-2,883	8,484	170	1,602
-6	2010	15,780	21,219		36,999	23,370	2,741	5,051	31,162	-5,837	13,039	170	1,981
-5	2011	14,688	21,351		36,039	23,857	1,497	5,894	31,249	-4,790	13,191	170	2,337
-4	2012	9,660	21,488		31,148	24,355	1,497	6,756	32,608	1,460	8,162	170	2,697
-3	2013	11,294	21,631		32,925	24,863	1,497	7,636	33,997	1,072	9,797	170	3,062
-2	2014	9,662	21,780		31,442	25,383	1,497	8,536	35,416	3,974	8,165	170	3,433
-1	2015	4,460	21,935		26,396	25,914	1,497	9,455	36,866	10,471	2,963	170	3,808
1	2016		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
2	2017		21,935	4,432	26,367	25,914	3,855	9,455	39,224	12,857		170	3,808
3	2018		21,935	4,094	26,029	25,914	3,517	9,455	38,886	12,857		170	3,808
4	2019		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
5	2020		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
6	2021		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
7	2022		21,935	4,340	26,275	25,914	3,763	9,455	39,132	12,857		170	3,808
8	2023		21,935	4,340	26,275	25,914	3,763	9,455	39,132	12,857		170	3,808
9	2024		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
10	2025		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
11	2026		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
12	2027		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
13	2028		21,935	4,107	26,043	25,914	3,530	9,455	38,900	12,857		170	3,808
14	2029		21,935	3,533	25,468	25,914	2,956	9,455	38,325	12,857		170	3,808
15	2030		21,935	3,533	25,468	25,914	2,956	9,455	38,325	12,857		170	3,808
16	2031		21,935	3,832	25,768	25,914	3,255	9,455	38,624	12,857		170	3,808
17	2032		21,935	3,832	25,768	25,914	3,255	9,455	38,624	12,857		170	3,808
18	2033		21,935	3,832	25,768	25,914	3,255	9,455	38,624	12,857		170	3,808
19	2034		21,935	4,293	26,229	25,914	3,716	9,455	39,086	12,857		170	3,808
20	2035		21,935	3,832	25,768	25,914	3,255	9,455	38,624	12,857		170	3,808
21	2036		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
22	2037		21,935	4,432	26,367	25,914	3,855	9,455	39,224	12,857		170	3,808
23	2038		21,935	4,094	26,029	25,914	3,517	9,455	38,886	12,857		170	3,808
24	2039		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
25	2040		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
26	2041		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
27	2042		21,935	4,340	26,275	25,914	3,763	9,455	39,132	12,857		170	3,808
28	2043		21,935	4,340	26,275	25,914	3,763	9,455	39,132	12,857		170	3,808
29	2044		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808
30	2045		21,935	3,417	25,353	25,914	2,840	9,455	38,209	12,857		170	3,808

Evaluation Indices: EIRR= 15.6% B/C= 1.01 NPV (US$ 1000) = 1,636

(1) Economic Benefit

As discussed in the Long-term Improvement Plan, the tangible benefits of the proposed project are composed of three components discussed in the previous section. They are: (i) physical leakage reduction through piping networks; (ii) energy saving owing to system improvement; and (iii) cost saving from water procurement expenses of residents who can not receive potable water from the piped system of ENACAL. In addition, the investment for replacement and rehabilitation of the existing water supply system is inevitable and therefore functioned as the benefit of the Proposed Project. These components of economic benefit of the Priority Project are considered as the same as in the Long-term Improvement Plan. In this evaluation, however, the project is evaluated as an independent project. Then, the following assumptions were set up in the evaluation procedure.

1) Physical water leakage is expected to decrease to 25% of the total production volume by the target year 2015, in the Long-term Improvement Plan. In the Priority Project, a part of the improvement programs of effective water ratio is implemented until 2010. Then, the physical leakage ratio was assumed to be improved to around 35% of the total production by 2010. In case that any improvement plan is not implemented consecutively after the Priority Project, the physical leakage ratio could go back to worsening in general. In this evaluation, however, the ratio was assumed to be kept at the same level of leakage owing to ENACAL's effort even after the completion year 2010.

2) Energy saving through system improvement can be expected completely. The Priority Project includes the water system improvement schemes. Thus, the total benefit of energy saving in the Long-term Improvement Plan is appropriated even in the Priority Project.

3) The Priority Project intends to improve the existing water supply system urgently. The improved system has a water supply capacity to cover not only for the existing water users but also for the future increasing population under with-project condition. In the first stage under without-project condition, however, the increasing population will not be able to get water supply service of ENACAL because of no water resources for new users. They can not receive the piped water even after the first stage project is completed, because they are not covered by the connection service pipes in this stage. They have to accept potable water through water wagon services which are the cheapest water sources for the people at present.

The benefits of the Priority Project can be expected from the items above until the year 2010. The total economic benefit was estimated at US$7.20 million in 2010, as shown in **Table 11.3.5**.

Table 11.3.5 Economic Benefits of Proposed Project

(Unit: US$1,000)

Year	Reduction of Production Energy Cost	Cost Saving of Leakage Reduction	Water Costs of Residents without Piped System	Total
2006	0	537	735	1,272
2007	0	877	1,486	2,363
2008	127	1,234	2,641	4,002
2009	170	1,602	3,829	5,601
2010	170	1,981	5,051	7,202

Besides these economic benefits, the existing water supply system need O&M cost and replacement costs to meet water demand for existing present beneficiaries under without-project condition. However, these costs will not be necessary once the proposed project is

implemented. Thus, these costs are considered as the economic benefits for the proposed project. These costs are estimated as US$23.4 million for the O&M cost and US$0.66 million for replacement cost in the matured year 2015. The details of these costs are enumerated in **Table 11.3.7**.

(2) Economic Cost

The total cost of the Priority Project (i.e., the first stage) was estimated at US$27.6 million in market prices. It was converted to the economic value of US$63.6 million in economic terms. These values were broken down in **Table 11.3.6**. The table shows the annual disbursement for the construction period between 2006 and 2010.

Table 11.3.6 Financial and Economic Costs of Capital Investment

Financial Costs (Unit: US$ Million)

Item	Total	2006	2007	2008	2009	2010
1. Water Resource/Water Intake Facilities	15.07	0.00	3.49	7.47	2.06	2.06
2. Transmission/Distribution Lines	22.52	0.00	1.45	5.03	6.36	9.68
3. Water Effective Rate Improvement	18.57	1.69	4.47	8.15	2.05	2.21
4. Improvement of Low-income Areas	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	56.16	1.69	9.41	20.65	10.46	13.94
5. Engineering Services	3.93	0.12	0.66	1.45	0.73	0.98
6. Physical Contingency	3.00	0.09	0.50	1.10	0.56	0.75
7. Price Contingency	8.98	0.07	0.84	2.82	1.94	3.30
8. Administration	1.80	0.05	0.29	0.65	0.34	0.47
Grand Total	73.88	2.02	11.70	26.67	14.04	19.44

Economic Costs (Unit: US$ Million)

Item	Total	2006	2007	2008	2009	2010
1. Water Resource/Water Intake Facilities	14.81	0.00	3.43	7.34	2.02	2.02
2. Transmission/Distribution Lines	22.13	0.00	1.43	4.94	6.25	9.51
3. Water Effective Rate Improvement	18.25	1.66	4.39	8.01	2.01	2.17
4. Improvement of Low-income Areas	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	55.19	1.66	9.25	20.29	10.28	13.70
5. Engineering Services	3.86	0.12	0.65	1.42	0.72	0.96
6. Physical Contingency	2.95	0.09	0.49	1.09	0.55	0.73
7. Price Contingency	0.00	0.00	0.00	0.00	0.00	0.00
8. Administration	1.55	0.05	0.26	0.57	0.29	0.38
Grand Total	63.56	1.91	10.65	23.37	11.84	15.78

In the same manner as mentioned in the Long-term Improvement Plan, the replacement costs were appropriated for newly installed pumps and machines every 20 years. The existing facilities were also replaced based on the inventory list of fixed assets. These annual costs are tabulated in **Table 11.3.7**.

The O&M cost is annually required during the economic life of the proposed project. The O&M cost is estimated as a product of the volume of water produced and unit production cost of C$2.90 per m^3, which is an average cost for the recent three years in Managua City water supply records. The O&M cost for the project life is tabulated also in **Table 11.3.7**.

(3) Economic Efficiency

Economic costs and benefits stream during the economic evaluation period are shown in **Table 11.3.7**. The evaluation indices were 14.4% of EIRR, minus US$1.16 million of NPV and 0.99 of B/C, as shown in the summarized table below. Then, the Priority Project is not viable from

the economic point of view, because its EIRR was less than the social discount rat of 15%.

Item	EIRR (%)	NPV* (US$ Million)	B/C*
Results of Evaluation	14.4%	-1.16	0.99

Note: * Discounted at 15%.

The reason why the Priority Project has lower EIRR than the Long-term Improvement Plan is considered as follows. The priority Project includes some portions of up-front costs to the second stage. Thus, capacity of some facilities has excess capacity than the expected capacity. This excess capacity will function to decrease economic efficiency. As a result, EIRR of the Proposed Project was slightly lower than the social discount rate of 15%. As mentioned in the Long-Term Improvement Plan, its EIRR was 15.6% so it is economically viable. Thus, the Priority Project might be considered to be viable as a whole.

11.3.5 Evaluation Results and Recommendations

According to the economic evaluation, EIRR of the Long-term Improvement Project was 15.6%. This means the project was viable from the economic point of view, because the EIRR exceeded the social discount rate of 15%. Thus, the economic evaluation recommends that the project be implemented without delay because it is viable from the economic point of view.

In spite of the fact that the Long-term Improvement Plan is viable from the economic viewpoint, the project is evaluated not to be feasible from the financial viewpoint, which will be discussed in the next chapter. This is because the water tariff is considerably lower than the project benefit.

In this study, the economic benefit was estimated on the basis of the present water supply service conditions. Accordingly, if the present water supply system were going well financially reflecting the actual water production costs on its tariff, the proposed project would also go much better than the present system condition from the financial viewpoint, as well.

The problem is ENACAL can not get the revenue by way of compensation for real benefit of its water supply service. In other words, the problem is alienation between the water production cost reflecting water supply operation on normal conditions and the water tariff charging to water consumers. Thus, its solution is found in mutual understanding between ENACAL and its stakeholders as well as beneficiaries. ENACAL has to release its management information to water consumers of water supply service and to strive to make them understand the structure of water supply service. The stakeholders also request ENACAL to replay their desire for potable water services. Through these discussions, they will be able to find a solution for the desirable water supply service structure.

ENACAL strives to attain reasonable water rates for sound management. Domestic water charge for low-income people should be set up to utmost around 4% of household income. Furthermore, in case that a water supply company sets up a higher water rate in its service areas, the charge of domestic water should be not more than 5% of household income taking into consideration of internal subsidization among categories in the service areas.

Table 11.3.7 Economic Cost and Benefit Stream of Priority Project

(Unit: US$1000)

Year		Economic Cost of Proposed Water Supply System				Economic Benefit				Balance (Net Benefit)	Reference for Capital Net Construction Cost	Reference for Net Benefit	
						Supplier Side for Existing Resident		Consumer Side					
		Construc-tion	O&M	Replacement	Total	O&M	Replacement	Residents without Piped Water Service	Total			Reduction of Production Cost	Cost Saving of Leakage Reduction
-5	2006	1,914	20,340		25,368	20,878	0	735	21,613	-3,755	1,914	0	537
-4	2007	10,652	20,434		31,086	21,311	2,394	1,486	25,191	-5,896	8,258	0	877
-3	2008	23,367	20,617		43,985	21,978	5,314	2,641	29,933	-14,052	18,054	127	1,234
-2	2009	11,842	20,893		32,734	22,665	3,358	3,829	29,852	-2,883	8,484	170	1,602
-1	2010	15,780	21,219		36,999	23,370	2,741	5,051	31,162	-5,837	13,039	170	1,981
1	2011		21,219	3,113	24,332	23,370	1,497	5,051	29,918	5,586		170	1,981
2	2012		21,219	3,113	24,332	23,370	1,497	5,051	29,918	5,586		170	1,981
3	2013		21,219	3,113	24,332	23,370	1,497	5,051	29,918	5,586		170	1,981
4	2014		21,219	3,113	24,332	23,370	1,497	5,051	29,918	5,586		170	1,981
5	2015		21,219	3,113	24,332	23,370	1,497	5,051	29,918	5,586		170	1,981
6	2016		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
7	2017		21,219	4,128	25,347	23,370	3,835	5,051	32,256	6,909		170	1,981
8	2018		21,219	3,790	25,009	23,370	3,497	5,051	31,918	6,909		170	1,981
9	2019		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
10	2020		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
11	2021		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
12	2022		21,219	4,036	25,254	23,370	3,743	5,051	32,164	6,909		170	1,981
13	2023		21,219	4,036	25,254	23,370	3,743	5,051	32,164	6,909		170	1,981
14	2024		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
15	2025		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
16	2026		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
17	2027		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
18	2028		21,219	3,804	25,022	23,370	3,511	5,051	31,932	6,909		170	1,981
19	2029		21,219	3,229	24,448	23,370	2,936	5,051	31,357	6,909		170	1,981
20	2030		21,219	3,229	24,448	23,370	2,936	5,051	31,357	6,909		170	1,981
21	2031		21,219	3,528	24,747	23,370	3,236	5,051	31,657	6,909		170	1,981
22	2032		21,219	3,528	24,747	23,370	3,236	5,051	31,657	6,909		170	1,981
23	2033		21,219	3,528	24,747	23,370	3,236	5,051	31,657	6,909		170	1,981
24	2034		21,219	3,990	25,208	23,370	3,697	5,051	32,118	6,909		170	1,981
25	2035		21,219	3,528	24,747	23,370	3,236	5,051	31,657	6,909		170	1,981
26	2036		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
27	2037		21,219	4,128	25,347	23,370	3,835	5,051	32,256	6,909		170	1,981
28	2038		21,219	3,790	25,009	23,370	3,497	5,051	31,918	6,909		170	1,981
29	2039		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981
30	2040		21,219	3,113	24,332	23,370	2,821	5,051	31,242	6,909		170	1,981

Evaluation Indices: EIRR= 14.4% B/C= 0.99 NPV (US$ 1000) = -1,163

11.4 FINANCIAL EVALUATION

11.4.1 Overview of Financial Evaluation

Financial analysis is carried out on the basis of market values of project costs and revenues from the water supply services of the proposed project. The project costs are estimated in **Supporting Report No.7**. These costs reflect the actual present market conditions. The revenue of water sales is calculated mainly as a product of a volume of water sold and water rates lay down by ENACAL. Finally, the projects are examined in financial efficiency and evaluated taking into account of financial situation. Financial viability of the proposed project is verified by means of an evaluation index of "financial internal rate of return (FIRR)". The definition of internal rate of return is the same as mentioned in **Section 11.3.1**, although the values applied in the calculation are evaluated at market prices. If the FIRR were not satisfied to implement from the financial point of view, financial constraints would be analyzed and identified, and countermeasures for them would be proposed in this section. In addition, Net Present Value (NPV) and Benefit-Cost Ratio (B/C) are also calculated as evaluation indices for supplementary of FIRR. The analysis is conducted mainly on the supply side. The project viability is also examined from the viewpoint of demand side. Affordability-to-pay as well as willingness-to-pay of water consumers for the proposed project is important constraint for the project to be accepted by the consumers. This will be discussed also in this study. Through these analyses, this financial study proposes financial solutions and recommendations in the sectoral conclusion of this study.

11.4.2 Assumptions for Financial Evaluation

Basic conditions for financial evaluation are almost same as mentioned in the economic evaluation. These conditions as follows.

1)	Schedule and Evaluation Period		
	(a)	Base Year	Beginning of 2006
	(b)	Construction Period	The project component works in the first stage period are constructed between 2006 and 2010. After 2011, the second stage works will be continues in accordance with the increasing water demand until the target year 2015.
	(c)	Disbursement Schedule	Uniform distribution of project costs during construction period
	(d)	Economic Life	30 years after the completion of the project
	(e)	Evaluation Period	30 years after the completion of the major works (2016 – 2045)
2)	Other Criteria		
	(1)	Price Level	Cost and benefits of the project were set at the beginning of December, 2004.
	(2)	Prevailing Exchange Rate	C$16.2834 per US$1.00 and JP¥106.09 per US$1.00
	(3)	Financial Opportunity Cost of Capital	2% per annum, referring to the national average financial procurement conditions in the World Bank Report, "Global Development Finance, Country Tables 2004, March 2004, World Bank".

11.4.3 Financial Evaluation of Long-term Improvement Plan

(1) Financial Benefit

The revenue of the project accrues from the payment of water charges paid by the water consumers. The water consumers are charged in accordance with their water volume consumed. ENACAL lays down the present water tariff on water consumption in their service areas in January 2003. Its details are shown in **Table 9.3.9** of **Supporting Report No.9**. According to the sales' records in 2003, an average water price was estimated at around C$2.12/$m^3$ (equivalent to US$0.130/$m^3$) for domestic users in low-income group (category 1) and around C$4.54/$m^3$ (US$0.279/$m^3$) for domestic users in medium and high income groups (category 2 and 3). The average water price for non-domestic users (category 4) was estimated at around C$11.05/$m^3$ (equivalent to US$0.679/$m^3$). The overall average price in 2003 was announced at around C$4.76/$m^3$ (equivalent to US$0.292/$m^3$). According to ENACAL's publication, however, the overall average price was announced at around C$5.80/$m^3$ (equivalent to US$0.356/$m^3$).

1) Income from Ordinary Water Consumers

The revenue from water supply services is calculated as a product of water volume consumed and average unit rates settled in the water tariff. In 2005, the water charge was estimated in consideration of under-billing due to defective meters. In 2005, 65% of installed meters were considered as defective, of which the metered charge was considered to be calculated 20% lower than the volume actually consumed, according to the analysis of the JICA study team. These defective meters will be rectified by the target year 2015. **Table 11.4.1** shows the annual average revenue from the respective consumers in the beginning year of the project in 2006 and in the target year 2015, reflecting these meter correction activities.

2) Income from Newly Registered Water Consumers

In 2003, residents who did not register themselves as water consumers to ENACAL were estimated to consume potable water of around 6.2 million m^3/annum. The number of these households was estimated at 18,500 in 2003 and is assumed to increase to 24,000 in the target year 2015 in case that the same percentage is kept until 2015. In this study, a half of these households are expected to register themselves as registrants to ENACAL by 2015, owing to mutual understanding between ENACAL and water consumers in the future. They are expected to consume water as follows. Incidentally, the water consumption of non-registered consumers as of 2005 was not included in **Table 11.4.2**.

Table 11.4.1 Average Water Consumption and Water Charge in 2005 and 2015

Item	Unit	Domestic Users		Non-Domestic Users	Total
		Low Income Group	Middle & High Income Groups		
Average Unit Price[*1] (as of Dec. 2004)	C$/m^3	2.20	5.50	11.10	-
1. Annual Consumption in 2005					
Registered Consumers	Nos.	183,400		750	184,450
Annual Consumption Volume	Million m^3	19.4	42.0	6.5	67.8
Annual Charge	US$ Million	2.6	12.6	7.0	22.4
2. Annual Consumption in 2015					
Registered Consumers	Nos.	227,680		930	228,610
Annual Consumption Volume	Million m^3	24.0	52.1	8.0	84.1
Annual Charge	US$ Million	3.2	17.7	10.1	31.1

Note: *1 Unit prices of the respective categories were adjusted on the basis of the income data in the financial statements of ENACAL in 2003.

Table 11.4.2 Average Water Consumption and Water Charge of Newly Registration

Item	Unit	Newly Registered Consumers[*1]
Average Water Consumption	m^3/month/Connection	27.8*
Average Unit Price[*2]	C$/m^3	4.50*
1. Annual Consumption in 2006		
Number of newly Registered Connections	Nos.	1,755
Annual Consumption Volume	1000 m^3	587
Annual Charge	US$ 1000	162
2. Annual Consumption in 2015		
Number of Registered Connections	Nos.	11,983
Annual Consumption Volume	1000 m^3	4,006
Annual Charge	US$ 1000	1,106

Note: *1 Distribution of households registered newly was summed as the same as the ones in 2004.
*2 Unit prices of the respective categories were adjusted with the income data in the financial statements of ENACAL in 2003.

3) Income of Connection Fee

In addition to the water sales, ENACAL can receive the connection charges from new registrants. The number of the new registrants is estimated around 46,100 of domestic connections and around 900 of non-domestic connections by the target year 2015. Thus, ENACAL can collect the connection charge of US$1.38 million by 2015. The annual amounts of this revenue in 2005 and 2015 are calculated in **Table 11.4.3**.

Table 11.4.3 New Connections and Connection Fee from New Registrations

Item	Unit	New Connection Fee	
Average Unit Price (as of May 2003)	C$/Unit	Low & Middle-income group	450
		High-income group	650
		Non-domestic group	3,500
1. New Connection in 2006			
Number of Connections	Unit	3,761	
Monthly Charge	US$ 1000	110	
2. New Connection in 2015			
Number of Connections	Unit	4,760	
Annual Charge	US$ 1000	140	

(2) Project Cost

The estimate of the proposed project was already described in **Supporting Report No.7**. The total cost of the construction works in financial value was tabulated in **Table 11.3.3**. The total cost was estimated at US$142 million. The construction costs are annually disbursed in compliance with the construction schedule. In these investment costs, the installation costs of connection works such as service pipes and water meter are included in the construction costs and disbursed in accordance with the increase of new consumers. The annual disbursement of construction costs is enumerated as shown in **Table 11.4.4**.

In addition to the construction costs, the replacement costs of machinery such as pumps and other machines are appropriated every 20 years. The replacement and rehabilitation costs for the existing equipment and facilities are estimated based on the inventory list of existing facilities. Thus, these costs were appropriated not only for those of the proposed project but also the existing equipment and facilities. These costs are tabulated in **Table 11.4.4**.

After the evaluation period of 30 years, the replaced machines will still be able to work well, because they are in their durable period after the replacement. In the evaluation, however, these residual values were neglected because they were quite small at the end of evaluation period. In addition, although the values of the existing facilities, which are not replaced by the target years 2015, should be involved in the total costs as the existing assets, these values are also eliminated in the cost stream as sunk costs in this evaluation study.

The O&M cost is annually required during the economic life of the proposed project. At the starting point in 2005, the O&M cost was estimated as a product of the volume of water produced and unit production unit cost of C$2.90/$m^3$, which is an average cost for the recent three years in Managua City water supply records. This production unit cost will increase in accordance with the progress of water leakage reduction, because the production cost decrease owing to leakage reduction but the production volume also decrease more rapidly than the pace of the production cost reduction. Thus, the production unit cost will be C$3.35/$m^3$ in 2015. However, the water unit cost per sold water decreases from C$5.74/$m^3$ in 2005 to C$4.86/$m^3$ in 2015. Accordingly, this reduction of water unit cost per sold water contributes to improve the management of ENCAL. The trend of O&M costs are tabulated in **Table 11.4.4.**

Table 11.4.4 Financial Cost and Benefit Stream of Long-term Improvement Plan

(Unit: US$1000)

Year		Financial Cost				Financial Benefit				Balance
		Construction	O&M	Replacement	Total	Income from Ordinary Consumers	Income from Newly Registered Consumers	Connection Fee	Total	
-10	2006	2,023	25,152		27,175	22,427	162	110	22,699	-4,476
-9	2007	11,701	25,268		36,969	23,190	248	113	23,551	-13,417
-8	2008	26,669	25,494		52,163	24,223	341	118	24,682	-27,481
-7	2009	14,042	25,835		39,877	25,296	440	121	25,857	-14,020
-6	2010	19,442	26,238		45,680	26,410	544	124	27,078	-18,601
-5	2011	18,802	26,401		45,203	27,294	648	126	28,067	-17,136
-4	2012	12,847	26,571		39,418	28,203	756	129	29,088	-10,330
-3	2013	15,607	26,748		42,355	29,139	868	132	30,140	-12,215
-2	2014	13,872	26,933		40,805	30,103	985	136	31,224	-9,581
-1	2015	6,654	27,124		33,778	31,095	1,106	140	32,340	-1,438
1	2016		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
2	2017		27,124	4,702	31,826	31,095	1,106	0	32,201	375
3	2018		27,124	4,343	31,467	31,095	1,106	0	32,201	733
4	2019		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
5	2020		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
6	2021		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
7	2022		27,124	4,604	31,728	31,095	1,106	0	32,201	473
8	2023		27,124	4,604	31,728	31,095	1,106	0	32,201	473
9	2024		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
10	2025		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
11	2026		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
12	2027		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
13	2028		27,124	4,358	31,482	31,095	1,106	0	32,201	719
14	2029		27,124	3,748	30,872	31,095	1,106	0	32,201	1,329
15	2030		27,124	3,748	30,872	31,095	1,106	0	32,201	1,329
16	2031		27,124	4,066	31,190	31,095	1,106	0	32,201	1,011
17	2032		27,124	4,066	31,190	31,095	1,106	0	32,201	1,011
18	2033		27,124	4,066	31,190	31,095	1,106	0	32,201	1,011
19	2034		27,124	4,555	31,679	31,095	1,106	0	32,201	521
20	2035		27,124	4,066	31,190	31,095	1,106	0	32,201	1,011
21	2036		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
22	2037		27,124	4,702	31,826	31,095	1,106	0	32,201	375
23	2038		27,124	4,343	31,467	31,095	1,106	0	32,201	733
24	2039		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
25	2040		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
26	2041		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
27	2042		27,124	4,604	31,728	31,095	1,106	0	32,201	473
28	2043		27,124	4,604	31,728	31,095	1,106	0	32,201	473
29	2044		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451
30	2045		27,124	3,625	30,750	31,095	1,106	0	32,201	1,451

Evaluation Indices: FIRR= Negative B/C= 0.90 NPV (US$ 1000) = -96,970

(3) Financial Efficiency

Financial costs and benefits stream during the evaluation period are shown in **Table 11.4.4**. The evaluation indices were negative of FIRR, minus US$97.0 million of NPV and 0.90 of B/C, as shown in the summarized table below. Then, the Long-term Improvement Project is not viable from the financial point of view, because its FIRR was negative and much lower than the financial opportunity cost of capital, 2%.

Item	FIRR (%)	NPV* (US$ Million)	B/C*
Results of Evaluation	Negative	-97.0	0.90

Note: * Discounted at 2%.

In order to make the project viable, the financial benefits must increase around 11% more than the present ones in every year during the evaluation period. In another way, the financial costs must decrease around 10% more than the present ones in every year during the evaluation period.

Since ENACAL has procured its financial source from foreign donors so far, the terms of loans have been in comparatively favorable conditions. According to the World Bank Report, the terms of loans from official creditors were 2.0% of interest rate, 35.2 years of maturity, 9.4 years of grace period on average. Accordingly, its grant element resulted in 66%. Thus, ENACAL can operate its water supply and sanitation business in advantageous conditions in terms of financial conditions.

In spite of that, the present water rate was set at too low to operate in normal way. At present, ENACAL operates its water supply system on much lower quality O&M level because of stringent budget cuts. If ENACAL continues this low quality O&M level even in the future, the water supply system in Managua City would collapse at some future time. In order to circumvent this problem, ENACAL makes endeavor to establish a proper budget for perpetual O&M system and to ensure proper financial balance between revenue and expenditure.

11.4.4 Financial Evaluation of Priority Project

In the financial evaluation of the Priority Project as well, the evaluation of "First Stage including the Priority Project" is regarded as the evaluation of the "Priority Project" in this Economic and Financial Evaluation Section hereinafter, as mentioned in **Section 11.3.4**. Then, the project in the first stage was evaluated as the evaluation of the Priority Project in this Section.

In this Section, the Priority Project is evaluated from the financial point of view. The implementation schedule is set as the same way discussed in the Long-term Improvement Plan. The project is evaluated as a single project. The preconditions and assumptions for the evaluation are the same as mentioned in the Long-term Improvement Plan.

(1) Financial Benefit

Components of the financial benefit are the same as discussed in the Long-term Improvement Plan. They are: 1) Income from Ordinary Water Consumers, 2) Income from Newly Registered Water Consumers, and 3) Income of Connection Fee. The benefit figures of the respective components are enumerated as shown in **Tables 11.4.5** to **11.4.7**.

Table 11.4.5 Average Water Consumption and Water Charge from Ordinary Consumers in 2006 and 2015

Item	Unit	Domestic Users		Non-Domestic Users	Total
		Low Income Group	Middle & High Income Groups		
Average Unit Price[*1] (as of Dec. 2004)	C$/m^3	2.20	5.50	11.10	-
1. Annual Consumption in 2006					
Registered Consumers	Nos.	183,400		750	184,150
Annual Consumption Volume	Million m^3	19.4	42.0	6.5	67.8
Annual Charge	US$ Million	2.6	12.6	7.2	22.4
2. Annual Consumption in 2010					
Registered Consumers	Nos.	205,330		840	206,170
Annual Consumption Volume	Million m^3	21.7	47.0	13.4	82.1
Annual Charge	US$ Million	2.9	15.0	8.5	26.4
Accumulation between 2006 and 2010					121.5

Note: *1 Unit prices of the respective categories were adjusted on the basis of the income statement in the financial statements of ENACAL in 2003.

Table 11.4.6 Average Water Consumption and Water Charge of Newly Registration

Item	Unit	Newly Registered Consumers[*1]
Average Water Consumption	m^3/month/Connection	27.8*
Average Unit Price[*2]	C$/m^3	4.50*
1. Annual Consumption in 2006		
Number of newly Registered Connections	Nos.	1,755
Annual Consumption Volume	1000 m^3	587
Annual Charge	US$ 1000	162
2. Annual Consumption in 2010		
Number of Registered Connections	Nos.	5,894
Annual Consumption Volume	1000 m^3	1,971
Annual Charge	US$ 1000	544
Accumulation between 2006 and 2010	US$ 1000	1,735

Note: *1 Distribution of households registered newly was summed as the same as the ones registered already as of 2004.

*2 Unit prices of the respective categories were adjusted on the basis of the income statement in the financial statements of ENACAL in 2003.

Table 11.4.7 New Connections and Connection Fee from New Registrations

Item	Unit	New Connection Fee	
Average Unit Price (as of May 2003)	C$/Unit	Low & Middle-income group	450
		High-income group	650
		Non-domestic group	3,500
1. New Connection in 2006			
Number of New Connections	Unit	3,761	
Monthly Charge	US$ 1000	110	
2. New Connection in 2010			
Number of New Connections	Unit	4,176	
Annual Charge	US$ 1000	124	
Accumulation between 2006 and 2010	US$ 1000	587	

(2) Financial Cost

The estimate of the Priority Project was already described in **Supporting Report No.7**. The total cost of the construction works in financial value was tabulated in the financial cost table in **Table 11.3.6**. The total cost was estimated at US$27.6 million at market prices. The construction costs are annually disbursed in compliance with the construction schedule. This annual disbursement is enumerated in **Table 11.4.8**. In addition to the construction costs, the replacement costs of machinery such as pumps and other machines are appropriated every 20 years. The replacement and rehabilitation costs for the existing equipment and facilities are estimated based on the inventory list of fixed assets. Thus, these costs were appropriated not only for those of the proposed project but also the existing equipment and facilities. These costs are tabulated in **Table 11.4.8**. The O&M cost is annually required during the economic life of the project. At the starting point in 2006, the O&M cost was estimated as a product of the volume of water produced and unit production unit cost of C$2.90/$m^3$. The trend of O&M costs are also tabulated in **Table 11.4.8.**

(3) Financial Efficiency

Financial costs and benefits stream during the evaluation period are shown in **Table 11.4.8**. The evaluation indices were negative of FIRR, minus US$58.4 million of NPV and 0.74 of B/C, as shown in the summarized table below. Then, the Priority Project is not viable from the financial point of view, because its FIRR was negative and much lower than the financial opportunity cost of capital, 2%.

Item	FIRR (%)	NPV* (US$ Million)	B/C*
Results of Evaluation	Negative	-58.4	0.74

Note: * Discounted at 2%.

In order to make the project viable, the financial benefits must increase around 20% more than the present ones in every year during the evaluation period. In another way, the financial costs must decrease around 17% more than the present ones in every year during the evaluation period. As mentioned before, ENACAL operates its water supply system on much lower quality of O&M level because of stringent budget cuts. If ENACAL continues this low quality O&M level even in the future, the water supply system in Managua City would collapse at some future time. In order to circumvent this problem, ENACAL makes endeavor to establish a proper budget for perpetual O&M system and to ensure proper financial balance between revenue and expenditure.

Table 11.4.8 Financial Cost and Benefit Stream of Priority Project

(Unit: US$1000)

Year		Financial Cost				Financial Benefit				Balance
		Construction	O&M	Replacement	Total	Income from Ordinary Consumers	Income from Newly Registered Consumers	Connection Fee	Total	
-5	2006	2,023	25,152		27,175	22,427	162	110	22,699	-4,476
-4	2007	11,701	25,268		36,969	23,190	248	113	23,551	-13,417
-3	2008	26,669	25,494		52,163	24,223	341	118	24,682	-27,481
-2	2009	14,042	25,835		39,877	25,296	440	121	25,857	-14,020
-1	2010	19,442	26,238		45,680	26,410	544	124	27,078	-18,601
1	2011		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
2	2012		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
3	2013		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
4	2014		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
5	2015		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
6	2016		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
7	2017		26,238	4,379	30,618	26,410	544	0	26,954	-3,663
8	2018		26,238	4,021	30,259	26,410	544	0	26,954	-3,305
9	2019		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
10	2020		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
11	2021		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
12	2022		26,238	4,281	30,520	26,410	544	0	26,954	-3,566
13	2023		26,238	4,281	30,520	26,410	544	0	26,954	-3,566
14	2024		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
15	2025		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
16	2026		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
17	2027		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
18	2028		26,238	4,035	30,273	26,410	544	0	26,954	-3,319
19	2029		26,238	3,425	29,664	26,410	544	0	26,954	-2,710
20	2030		26,238	3,425	29,664	26,410	544	0	26,954	-2,710
21	2031		26,238	3,743	29,982	26,410	544	0	26,954	-3,028
22	2032		26,238	3,743	29,982	26,410	544	0	26,954	-3,028
23	2033		26,238	3,743	29,982	26,410	544	0	26,954	-3,028
24	2034		26,238	4,233	30,471	26,410	544	0	26,954	-3,517
25	2035		26,238	3,743	29,982	26,410	544	0	26,954	-3,028
26	2036		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
27	2037		26,238	4,379	30,618	26,410	544	0	26,954	-3,663
28	2038		26,238	4,021	30,259	26,410	544	0	26,954	-3,305
29	2039		26,238	3,303	29,541	26,410	544	0	26,954	-2,587
30	2040		26,238	3,303	29,541	26,410	544	0	26,954	-2,587

Evaluation Indices: FIRR= Negative B/C= 0.74 NPV (US$ 1000) = -58,415

11.4.5 Evaluation Results and Recommendations

The economic evaluation recommends that the Long-term Improvement Plan be implemented in the water supply service areas because it is viable from the economic point of view. On the other hand, the financial evaluation states that the project is not viable from the financial viewpoint. As discussed in **Supporting Report No.9**, there are several financial problems that ENACAL makes the project substantial in its service areas.

ENACAL strives to attain reasonable water rates for sound management. In the World Bank Report, it suggests that price of the minimum block of water is commonly set at 3 to 5 percent of household income, which is affordable for beneficiaries. On the other hand, water consumers in Managua City recognize that their willingness-to-pay was estimated at C$121/$m^3$ in the total interviewees, and atC$93/$m^3$ only in the interviewees in asentamientos, according to the JICA household survey conducted in September 2004. C$121/$m^3$ of the willingness-to-pay was analyzed as around 1.6% of their annual income. Thus, they are substantially aware of importance of water supply in their living circumstance. Considering these circumstances, ENACAL make endeavor to set up reasonable water tariff based on the mutual understanding between water consumers and the water supplier.

It is said that the price elasticity of water supply leads to little practical effect for water conservation. In fact, the revisions of water tariff in the past had little effects on decrease in water consumption. This is because that the water price in Managua City was too cheap for ENACAL to manage its waters system soundly. This cheap water price might make the water consumers lesser effective for water conservation. It is recommended, thus, that the rational water price could give them some motivation for water conservation.

To improve financial conditions, ENACAL would rather incorporate in its management policy.

(1) For safety management, ENACAL should expand its equity instead of long-term liabilities to improve the fixed asset ratio as much earlier as possible.
(2) To shorten the collection period of account receivable, ENACAL has to make endeavors to earn peoples full understanding of waterworks management through public relation.
(3) To develop sound water production costs, ENACAL has to make an endeavor to purchase the raw materials such as chemicals, pipes and fixing tools and to keep the favorable management conditions.
(4) To develop versatile worker as well as specialists, ENACAL must make programs to cultivate men of ability.

ANNEX 11A

Socio-economic Tables

Table 11A-1 Gross Domestic Product at Current Prices: 1998-2003

(Unit: C$ Million)

Sector	1998	1999	2000	2001*1	2002*1	2003*1
1. Agriculture	7,584	7,865	9,274	9,335	10,319	11,056
2. Mining & Quarrying	302	276	363	443	504	537
3. Manufacturing	5,697	6,273	6,980	7,785	8,281	8,947
4. Electricity, Gas & Water	1,052	1,252	1,444	1,629	1,838	1,987
5. Construction	1,867	3,138	3,628	4,282	3,951	4,396
6. Trade, Hotels & Restaurant	6,099	7,082	7,864	8,514	9,099	9,910
7. Transport & Communication	2,176	2,595	2,196	2,284	2,465	2,646
8. Banking	1,017	1,477	1,755	1,741	1,961	2,231
9. Dwellings	2,832	3,279	4,186	4,616	5,048	5,569
10. Personal & Business Services	2,666	3,041	3,373	3,641	3,911	4,197
11. Public Services	2,957	4,057	4,962	5,795	5,652	6,368
12. Imputed Interest	-1,060	-1,333	-1,653	-1,810	-2,079	-2,382
13. Import Duties	4,617	5,198	5,746	5,746	6,150	6,996
GDP at Current Prices	**37,805**	**44,198**	**50,119**	**54,000**	**57,099**	**62,458**

Source: (1) Informe Annual 2003, Banco Central de Nicaragua
Note: *1 Preliminary
*2 Estimated

Table 11A-2 Share of Gross Value Added to GDP: 1990-2001

(Unit: %)

Sector	1998	1999	2000	2001	2002	2003
1. Agriculture	20.1	17.8	18.5	17.3	18.1	17.7
2. Mining & Quarrying	0.8	0.6	0.7	0.8	0.9	0.9
3. Manufacturing	15.1	14.2	13.9	14.4	14.5	14.3
4. Electricity, Gas & Water	2.8	2.8	2.9	3.0	3.2	3.2
5. Construction	4.9	7.1	7.2	7.9	6.9	7.0
6. Trade, Hotels & Restaurant	16.1	16.0	15.7	15.8	15.9	15.9
7. Transport & Communication	5.8	5.9	4.4	4.2	4.3	4.2
8. Banking	2.7	3.3	3.5	3.2	3.4	3.6
9. Dwellings	7.5	7.4	8.4	8.5	8.8	8.9
10. Personal & Business Services	7.1	6.9	6.7	6.7	6.8	6.7
11. Public Services	7.8	9.2	9.9	10.7	9.9	10.2
12. Imputed Interest	-2.8	-3.0	-3.3	-3.4	-3.6	-3.8
13. Import Duties	12.2	11.8	11.5	10.6	10.8	11.2
GDP	100.0	100.0	100.0	100.0	100.0	100.0

Table 11A-3 GDP per Capita: 1990-2001

Item	1998	1999	2000	2001	2002	2003
Population (Mid-year, 1000)	4,804	4,935	5,072	5,205	5,342	5,482
In Local Monetary Unit (C$ at Current Prices)	7,869	8,956	9,882	10,375	10,689	11,393
Exchange Rate (C$/US$)*1	10.58	11.81	12.69	13.37	14.25	15.10
In US Dollars Equivalent (US$)	744	758	780	776	750	754

Note: *1 Annual average rate (refer to Table 23-23)

Table 11A-4 Gross Domestic Product at 1994 Constant Prices: 1990-2001

(Unit: C$ million)

Sector	1998	1999	2000	2001	2002	2003*1
1. Agriculture	4,664	4,966	5,564	5,708	5,779	5,962
2. Mining & Quarrying	275	328	277	292	307	318
3. Manufacturing	4,155	4,362	4,686	4,932	5,011	5,117
4. Electricity, Gas & Water	514	514	499	514	526	535
5. Construction	919	1,277	1,264	1,284	1,124	1,168
6. Trade, Hotels & Restaurant	4,138	4,566	4,739	4,930	5,045	5,175
7. Transport & Communication	1,611	1,759	1,779	1,800	1,880	1,951
8. Banking	553	654	664	616	665	718
9. Dwellings	1,624	1,689	1,768	1,856	1,926	1,973
10. Personal & Business Services	1,761	1,801	1,821	1,852	1,900	1,944
11. Public Services	1,729	1,853	1,761	1,728	1,717	1,734
12. Imputed Interest	-426	-508	-497	-509	-561	-617
13. Import Duties	2,782	2,748	2,783	2,907	2,879	2,874
GDP at 1994 Constant Prices	**24,299**	**26,009**	**27,109**	**27,909**	**28,197**	**28,850**

Source: (1) Basic Statistics of the Lao PDR 1975-2000, State Planning Committee National Statistical Centr
Note: *1 Preliminary
*2 Estimated

Table 11A-5 Real Growth Rate of Gross Value Added: 1991-2001

(Unit: %)

Sector	1998/99	1999/2000	2000/01	2001/02	2002/03	1998/2003
1. Agriculture	6.5	12.0	2.6	1.2	3.2	5.0
2. Mining & Quarrying	19.1	-15.5	5.5	5.1	3.4	2.9
3. Manufacturing	5.0	7.4	5.2	1.6	2.1	4.3
4. Electricity, Gas & Water	0.1	-3.0	3.0	2.4	1.7	0.8
5. Construction	39.1	-1.0	1.5	-12.5	3.9	4.9
6. Trade, Hotels & Restaurant	10.3	3.8	4.0	2.3	2.6	4.6
7. Transport & Communication	9.2	1.2	1.2	4.4	3.8	3.9
8. Banking	18.3	1.5	-7.2	7.9	8.0	5.4
9. Dwellings	4.0	4.7	5.0	3.8	2.5	4.0
10. Personal & Business Services	2.3	1.1	1.7	2.6	2.3	2.0
11. Public Services	7.1	-4.9	-1.9	-0.6	1.0	0.1
12. Imputed Interest	19.4	-2.1	2.4	10.1	10.0	7.7
13. Import Duties	-1.2	1.3	4.4	-1.0	-0.2	0.7
GDP	7.0	4.2	3.0	1.0	2.3	3.5

Table 11A-6 Real Growth Rate of GDP per Capita: 1991-2001

Item	1998	1999	2000	2001	2002	2003
Population (Mid-year, 1000)	4,804	4,935	5,072	5,205	5,342	5,482
GDP per Capita (C$ at 1994 Constant Prices)	5,058	5,270	5,345	5,362	5,278	5,262
	1998/99	1999/2000	2000/01	2001/02	2002/03	1998/2003
Real Growth Rate (% per annum)	4.2	1.4	0.3	-1.6	-0.3	0.8

Table 11A-7 Balance of Payments: 1998- 2002

(Unit: US$ Million)

Item	1998	1999	2000	2001	2002	2003
I. Current Account	-819.6	-1,091.9	-918.6	-931.5	-869.7	-859.6
1. Goods, Services and Income (net)	-1,019.6	-1,391.9	-1,238.6	-1,267.2	-1,246.2	-1,298.4
(1) Trade Balance	-823.8	-1,153.5	-1,009.0	-1,015.4	-1,056.6	-1,115.8
Export (FOB)	573.2	545.2	625.3	605.0	561.0	604.5
Import (CIF)	-1,397.0	-1,698.7	-1,634.3	-1,620.4	-1,617.6	-1,720.3
(2) Services (net)	-10.5	-41.6	-29.2	-11.5	10.8	20.6
Receipts	257.2	293.3	317.1	341.5	346.4	392.7
Payments	-267.7	-334.9	-346.3	-353.0	-335.6	-372.1
(3) Income (net)	-185.3	-196.8	-200.4	-240.3	-200.4	-203.2
Receipts	26.0	30.7	30.7	14.7	9.2	6.7
Payments	-211.3	-227.5	-231.1	-255.0	-209.6	-209.9
2. Transfers (net)	200.0	300.0	320.0	335.7	376.5	438.8
II. Capital & Financial Account	678.4	1,045.4	775.0	665.6	656.8	641.8
1. Public Capital Account	334.9	507.6	454.6	405.7	189.1	337.3
(1) Doneation	341.8	409.8	307.1	294.7	248.2	261.6
(2) Lending	407.7	347.4	274.1	211.6	203.5	273.6
(3) Amortaization	-235.4	-147.0	-172.2	-137.9	-278.4	-211.7
(4) Others	-179.2	-102.6	45.6	37.3	15.8	13.8
2. Private Capital Account	343.5	537.8	320.4	259.9	467.7	304.5
(1) Financial System	55.5	80.8	60.7	2.0	-10.0	-13.0
(2) Direct Investment	183.7	300.0	150.0	112.9	188.1	187.5
(3) Portfolio Investment	-128.2	-19.9	17.4	14.9	1.2	0.3
(4) Others	232.5	176.9	92.3	130.1	288.4	129.7
III. Overall Balance	-141.2	-46.5	-143.6	-265.9	-212.9	-217.8

Source : Bank of Nicaragua

Table 11A-8 Foreign Trade: 1998-2003

(Unit: US$ million)

Item	1998	1999	2000	2001	2002	2003
Export (FOB)						
1. Agricultural Products	344.0	332.4	389.4	301.1	268.5	282.5
(1) Agricultural and Livestock	254.0	238.6	267.2	213.2	177.8	201.7
1) Coffee	173.4	135.3	169.5	103.3	73.6	85.5
2) Banana	19.6	13.6	8.6	11.6	11.0	12.0
3) Sesame	6.1	3.9	3.8	2.4	2.1	1.2
4) Cattle	8.1	15.7	20.4	27.6	23.3	25.9
5) Others	46.8	70.2	64.9	68.3	67.8	77.1
(2) Fishery Products	90.0	93.8	122.2	88.0	90.7	80.8
1) Shrimp	49.4	44.5	56.0	38.1	45.5	36.1
2) Lobster	29.4	39.5	56.1	38.4	33.1	33.0
3) Others	11.1	9.8	10.1	11.5	12.2	11.8
2. Mineral Products	32.9	30.4	29.8	30.3	35.8	36.6
1) Gold	32.2	30.2	29.5	29.9	35.0	35.0
2) Silver	0.4	0.2	0.2	0.4	0.3	0.3
3) Others	0.3	0.1	0.0	0.1	0.5	1.3
3. Manufacturing Products	196.3	182.4	206.2	273.5	256.7	285.5
1) Meat	37.6	41.8	50.9	65.6	78.0	83.8
2) Sugar	35.6	30.4	28.9	49.1	28.6	25.7
3) Molasses	1.2	0.0	0.1	0.5	0.0	0.0
4) Others	121.9	110.2	126.3	158.3	150.0	176.0
Total Exports	573.2	545.2	625.3	605.0	561.0	604.5
Import (CIF)						
1. Consumption Goods	434.6	541.6	516.6	554.9	571.5	631.8
Non-durable Goods	356.8	439.2	409.6	447.6	452.0	489.5
Durable Goods	77.8	102.4	107.0	107.3	119.5	142.3
2. Petroleum, Fuels & Lubricant	143.3	180.5	296.4	269.8	253.7	328.4
Crud Oil	87.2	108.5	184.4	171.6	149.5	194.4
Fuels & Lubricant	55.6	67.4	107.1	97.4	103.8	133.6
Electrict Energy	0.5	4.6	4.9	0.8	0.4	0.4
3. Intermediate Goods	461.8	543.1	537.8	543.3	512.8	562.4
For Agriculture & Stockbreeding	64.4	78.7	74.4	49.9	55.8	60.2
For Manufacturing	317.2	353.1	342.7	383.6	371.2	411.7
Materials for Construction	80.2	111.3	120.7	109.8	85.8	90.5
4. Capital Goods	448.9	594.3	439.4	406.6	431.0	361.7
For Agriculture & Stockbreeding	25.9	39.6	31.6	37.4	27.8	19.5
For Manufacturing	258.1	352.5	220.2	228.4	253.7	223.5
Transportation Equipment	164.9	202.2	187.6	140.8	149.5	118.7
5. Others	3.1	2.2	1.4	4.7	5.0	2.6
Total Imports	1,491.7	1,861.7	1,791.6	1,779.3	1,774.0	1,886.9
Balance	-918.5	-1,316.5	-1,166.3	-1,174.3	-1,213.0	-1,282.4

Source Bank of Nicaragua

Table 11A-9 Fiscal Operation of Government: 1998-2003

(Unit: C$ Million)

Item	1998	1999	2000	2001	2002	2003
Revenue	**6,580.6**	**8,673.8**	**9,414.8**	**9,365.9**	**11,167.8**	**13,159.1**
1. Current Revenue	5,886.2	6,730.3	7,537.4	7,645.5	8,563.3	10,151.0
(1) Tax Revenue	5,638.9	6,483.7	7,264.3	7,354.4	8,137.6	9,851.2
1) Income Tax	810.3	985.9	1,180.4	1,302.7	1,609.8	2,447.9
2) Sales Tax	931.4	1,182.9	1,404.6	1,520.6	1,493.1	1,597.5
3) Excise & Selective Consumption	2,137.3	2,060.2	2,230.1	2,086.0	2,116.9	2,520.1
a. Petroleum	1,099.4	1,339.7	1,457.6	1,325.9	1,399.4	1,566.4
b. Rum & Beer	196.9	236.1	288.0	327.5	314.1	365.3
c. Tobacco	159.6	99.6	68.8	99.8	137.5	123.7
d. Soft Drinks	93.2	104.1	123.2	104.0	82.6	107.2
e. Others	588.2	280.7	292.5	228.8	183.3	357.5
4) Others	245.9	339.0	364.2	336.7	413.0	442.1
5) Import Duties	1,514.0	1,915.7	2,085.0	2,108.4	2,504.8	2,843.6
(2) Non-tax Revenue	247.3	246.6	273.1	291.1	425.7	299.8
2. Capital Revuue	19.4	8.6	3.5	8.4	25.8	6.3
3. Grant	675.0	1,934.9	1,873.9	1,712.0	2,578.7	3,001.8
Expenditure & Net Lending	**6,995.4**	**9,955.5**	**11,781.4**	**13,266.0**	**11,934.7**	**14,400.1**
1. Current Expenditure	4,771.3	5,282.4	6,318.4	8,215.6	8,027.4	9,100.0
(1) Wages & Salaries	1,346.6	1,682.4	1,885.8	2,251.1	2,501.5	2,811.7
(2) Goods & Services	1,052.7	1,265.0	1,420.8	1,944.9	1,359.4	1,332.9
(3) Interest Payments	1,045.4	742.7	1,044.3	1,284.9	1,694.4	2,342.0
1) Domestic	386.2	262.0	318.4	549.0	934.0	1,518.8
2) External	659.2	480.7	725.9	735.9	760.4	823.2
(4) Transfers	1,326.6	1,592.3	1,967.5	2,734.7	2,472.1	2,613.4
2. Capital Expenditure	2,224.1	4,673.1	5,463.0	5,050.4	3,907.3	5,300.1
(1) Direct Investment	1,267.1	2,544.0	3,381.2	2,710.5	2,442.1	3,403.5
1) Construction & Public Works	1,221.9	2,206.5	2,859.5	2,470.2	2,442.1	3,426.5
2) Machinery & Equipment	45.2	155.7	142.7	110.8		
3) Financial	0.0	181.8	379.0	129.5	0.0	-23.0
(2) Trensfer	957.0	2,129.1	2,081.8	2,339.9	1,465.2	1,896.6
Current Cash Balance	1,114.9	1,447.9	1,219.0	-570.1	535.9	1,051.0
Overall Cash Balance	**-414.8**	**-1,281.7**	**-2,366.6**	**-3,900.1**	**-766.9**	**-1,241.0**
Financing of Budget Deficit	414.7	1,281.8	2,366.5	3,899.8	766.8	1,240.8
External Financing (Net)	1,680.3	2,586.3	1,665.7	1,525.0	1,282.9	2,555.9
Internal Financing (Net)	-1,265.6	-1,304.5	-759.7	1,875.2	-742.7	-1,522.7
Privatization Revenue	-	-	1,460.5	499.6	226.6	207.6

Source: Banco Central de Nicaragua

Note: A fiscal year starts at the beginning of January and ends at the end of December.

Table 11A-10 Official Development Assistance: 1996-2000

(Unit: US$ Million)

Item	1998	1999	2000	2001	2002	Total
Bilateral	330.6	323.8	326.3	715.1	289.5	1,985.3
1. Spain	23.3	21.9	19.7	399.5	22.3	486.7
2. United States	65.5	64.2	72.8	100.6	66.7	369.8
3. Japan	29.0	44.8	76.5	62.0	31.4	243.7
4. Germany	49.6	28.3	26.9	31.8	34.5	171.1
5. Sweden	19.8	33.3	33.3	22.7	38.7	147.8
6. Denmark	28.5	24.4	27.2	28.0	25.0	133.1
7. Netherlands	26.0	19.4	15.6	18.5	26.0	105.5
8. Norway	16.8	17.0	13.3	14.6	9.1	70.8
9. Finland	7.5	9.7	7.9	8.7	5.9	39.7
10. Canada	12.9	6.7	2.8	6.5	7.7	36.6
11. Switzerland	8.7	8.8	6.9	4.9	6.2	35.5
Others	43.0	45.3	23.4	17.3	16.0	145.0
Multilateral	272.0	241.9	235.3	315.5	227.9	1,292.6
1. IDA	103.5	119.2	85.5	66.5	75.4	450.1
2. IDB	99.3	76.1	60.0	106.8	101.4	443.6
3. EC	30.0	26.8	42.8	31.2	33.8	164.6
4. WFP	8.8	16.5	8.4	3.6	2.1	39.4
5. IMF	22.8	-2.7	21.4	-6.5	3.8	38.8
6. UNDP	2.2	3.3	2.8	1.5	2.2	12.0
7. IFAD	1.8	1.6	3.7	2.4	1.3	10.8
8. UNTA	1.0	1.5	1.2	1.1	1.0	5.8
9. UNICEF	1.6	0.9	0.8	1.0	0.7	5.0
Others	1.0	-1.3	8.7	107.9	6.2	122.5
Total	602.6	565.7	561.6	1,030.6	517.4	3,277.9

Source: Geographical Distribution of Financial Flows to Aid Recipients, Disbursements Commitments Country Indicators 1998-2002, OECD Development Assistance Committee

Note: *1 Official development assistance is defined as grants and loans, with at least a 25% grant element, administered with the aim of promoting economic of social development. Figures indicate amounts.

Table 11A-11 External Debt: 1995-2000

(Unit: US$ Million)

Item	1997	1998	1999	2000	2001	2002
Total Debt Stocks	6,228	6,450	6,909	6,854	6,409	6,484
1. Long Term Debt	5,364	5,663	5,889	5,774	5,577	5,756
2. Use of IMF Credit	27	52	155	169	158	174
3. Short Term Debt	837	735	865	911	674	554
Debt Outstanding of Long Term Debt	5,364	5,664	5,889	5,774	5,577	5,756
1. Public and Publicly Guaranteed	5,364	5,636	5,779	5,493	5,437	5,575
a. Official Creditors	4,968	5,251	5,405	5,138	5,093	5,229
- Multilateral	2,080	2,288	2,467	2,119	2,200	2,424
- Bilateral	2,888	2,963	2,938	3,019	2,893	2,805
b. Private Creditors	396	385	374	355	344	346
- Bonds	0	0	0	0	0	0
- Commercial Banks	362	355	344	326	321	324
- Others	34	30	30	29	23	22
2. Private Non-guaranteed	0	28	110	281	140	181
Total Debt Service	326	255	187	286	337	152
1. Principal Repayment	182	86	99	188	263	104
a. Long Term Debt	182	86	96	183	258	100
b. IMF Repurchases	0	0	3	5	5	4
2. Interest Payments	144	169	88	98	74	48
a. Long Term Debt	129	91	82	90	68	43
b. IMF Charges	0	0	1	1	1	1
c. Short Term Debt	15	78	5	7	5	4
Ratios (%)						
1. Total Debt Stocks/GNP	198.8	194.3	198.1	187.5	173.1	170.1
2. Debt Service Ratio *1	33.9	24.1	16.0	21.9	26.3	11.7

Source: Global Development Finance, Country Tables 2004, March 2004, World Bank
Note: Long term debt is defined as having original maturity of more than one year.
*1 Debt service as a percentage of earnings from exports of goods and service

Table 11A-12 Consumer Price Index in Managua: 1994-2004

(Base 1999=100)

Year	Month	General Index	Food & Beverage	Clothes & Footware	Housing	Equitpment & Utensil	Medical Expense	Transport & Communi-	Entertainment	Education	Others
1994		58.8	61.0	80.7	39.5	58.7	71.5	60.0	64.4	66.5	76.5
1995		65.2	68.3	84.9	46.9	67.7	76.8	64.6	71.6	68.5	78.6
1996		72.8	76.1	84.6	60.2	72.3	82.4	73.0	73.4	69.4	82.1
1997		79.5	83.0	82.3	68.1	76.7	87.7	84.3	79.0	75.1	86.1
1998		89.9	94.8	90.3	78.5	90.1	95.7	89.7	92.3	84.4	93.0
1999		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2000		111.5	105.0	104.3	123.4	104.2	107.1	121.6	102.4	125.1	106.5
2001		113.8	112.2	106.8	121.2	107.9	111.9	122.6	112.0	117.0	109.7
2002		118.4	115.5	109.1	126.8	112.2	119.6	124.5	115.6	127.2	115.9
2003		**124.5**	**119.8**	**111.0**	**134.1**	**116.0**	**128.1**	**137.2**	**118.5**	**137.8**	**119.5**
	Jan.	121.0	116.7	110.4	129.8	113.9	124.6	132.7	116.6	130.0	117.6
	Feb.	123.2	117.6	110.5	131.4	114.5	125.8	141.3	117.5	135.8	117.8
	Mar.	123.1	117.1	110.7	133.0	114.7	126.6	140.4	115.9	136.1	118.3
	Apr.	122.8	117.2	110.8	132.6	115.0	127.2	136.5	115.6	136.5	118.4
	May	123.7	119.7	111.0	131.9	115.9	128.0	134.3	116.6	136.7	119.0
	June	125.0	121.2	111.0	134.2	116.5	128.3	134.5	119.4	139.1	119.8
	July	125.0	120.5	111.0	134.7	116.7	128.0	135.7	119.2	139.3	120.2
	Aug.	125.1	119.5	111.1	135.1	116.4	129.4	138.7	121.6	139.4	119.9
	Sep.	125.2	119.8	111.2	135.6	116.4	128.9	138.5	120.8	139.7	120.4
	Oct.	125.7	121.5	111.2	136.0	116.7	129.7	136.4	117.6	140.0	120.5
	Nov.	126.6	122.8	111.4	137.0	117.4	130.2	137.7	117.9	140.4	121.0
	Dec.	127.6	124.0	111.5	137.7	117.7	130.8	139.4	123.8	140.6	121.1
2004		**135.0**	**131.8**	**112.9**	**145.6**	**122.0**	**136.2**	**155.5**	**125.0**	**149.4**	**123.5**
	Jan.	129.8	126.6	111.8	140.1	118.3	131.2	147.3	123.1	140.9	121.6
	Feb	131.5	127.8	112.0	142.1	119.4	131.7	147.8	121.3	148.8	121.9
	Mar	132.1	128.2	112.1	142.7	120.0	131.9	149.9	123.0	149.0	122.0
	Apr	133.1	129.4	112.2	142.9	120.5	133.3	152.0	128.4	149.3	122.5
	May	134.4	130.4	112.3	143.7	121.6	135.8	158.0	123.2	149.7	122.9
	Jun	134.6	131.0	112.8	145.0	122.3	137.4	154.9	123.4	150.1	123.5
	Jul	135.4	131.7	112.8	145.6	122.5	137.7	157.2	126.0	150.4	123.7
	Aug	135.7	131.8	113.1	147.0	123.0	138.7	157.4	124.7	150.8	123.8
	Sep	136.5	133.1	113.4	148.2	123.5	139.1	158.1	125.8	150.7	124.0
	Oct	138.4	136.1	113.8	149.1	123.8	138.7	163.7	124.7	150.8	124.9
	Nov	139.5	138.3	113.9	150.3	124.4	139.2	161.8	128.5	151.1	125.2
	Dec	139.0	137.8	114.2	150.4	124.9	139.6	158.1	127.7	151.3	126.1

Source: Indice de Precios al Consumidor de la Ciudad de Managua, pro Capitulos, segun Anos y Meses

Table 11A-13 Foreign Exchange Rates: 1995-2004

(Unit: C$ at End of Period)

Month	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
C$ per US Dollar										
January	-	8.04	9.01	10.09	11.30	12.38	13.12	13.91	14.74	15.62
February	7.24	8.12	9.09	10.18	11.40	12.44	13.18	13.97	14.81	15.68
March	7.31	8.19	9.18	10.28	11.51	12.50	13.25	14.04	14.88	15.74
April	7.38	8.27	9.26	10.37	11.62	12.56	13.31	14.11	14.96	18.80
May	7.45	8.35	9.35	10.47	11.73	12.62	13.38	14.18	15.03	15.87
June	7.52	8.43	9.44	10.57	11.84	12.68	13.44	14.25	15.10	15.93
July	7.56	8.51	9.53	10.67	11.94	12.74	13.51	14.32	15.18	16.00
August	7.67	8.59	9.62	10.78	12.02	12.81	13.57	14.39	15.25	16.07
September	7.74	8.67	9.71	10.88	12.11	12.87	13.64	14.46	15.32	16.13
October	7.82	8.76	9.81	10.98	12.20	12.93	13.71	14.53	15.40	-
November	7.89	8.84	9.90	11.09	12.26	12.99	13.77	14.60	15.47	-
December	7.97	8.92	10.00	11.19	12.32	13.06	13.84	14.67	15.55	-
Average	**7.55**	**8.44**	**9.45**	**10.58**	**11.81**	**12.69**	**13.37**	**14.25**	**15.10**	**-**
Japanese Yen per C$										
January	-	13.33	13.54	12.58	10.28	8.63	8.85	9.55	8.07	6.78
February	13.40	12.89	13.29	12.50	10.47	8.86	8.83	9.58	7.95	6.95
March	12.22	12.98	13.51	12.85	10.46	8.47	9.40	9.49	8.07	6.63
April	11.35	12.67	13.70	12.76	10.27	8.48	9.27	9.07	7.99	5.86
May	11.17	12.96	12.45	13.28	10.35	8.45	8.91	8.77	7.87	6.96
June	11.25	12.98	12.12	13.33	10.23	8.31	9.23	8.38	7.94	6.80
July	11.70	12.68	12.41	13.47	9.65	8.59	9.24	8.37	7.91	7.01
August	12.92	12.62	12.41	13.12	9.22	8.31	8.77	8.20	7.68	6.82
September	12.70	12.80	12.46	12.43	8.82	8.38	8.75	8.41	7.31	6.88
October	13.01	12.99	12.23	10.60	8.59	8.43	8.89	8.43	7.06	-
November	12.87	12.87	12.88	11.15	8.36	8.56	9.00	8.38	7.08	-
December	12.90	13.00	13.00	10.33	8.30	8.80	9.52	8.17	6.89	-
Average	**12.45**	**12.89**	**12.80**	**12.37**	**9.65**	**8.49**	**9.09**	**8.80**	**7.68**	**-**

Source: International Financial Statistics, April 1995 to November 2004, IMF

Table 11A-14 Annual Expenditure by Item Group in Nicaragua and Managua City: 2001

(Unit: C$/year)

Item	Nicaragua			Managua*1
	Average	Urban	Rural	
I. Per-Capita Consumption				
1. Foods	3,582	4,202	2,715	4,826
2. Housing	1,060	1,489	460	2,212
3. Utilities	590	840	241	1,057
(1) Water	150	183	94	225
(2) Electricity	171	262	50	336
(3) Garbage	9	16	1	20
(4) Lighting	23	9	34	6
(5) Energy for Cooking	132	190	51	201
(6) Telephone	83	144	7	215
(7) Celular Phone	22	35	4	54
4. Health*2	470	573	325	585
5. Education	392	557	160	682
6. Personal Care	954	1,271	509	1,583
7. Furniture & Equipment	282	424	84	614
8. Transport*3	448	590	249	838
9. Others	3	4	1	6
Total	7,781	9,950	4,744	12,403
II. Average Household Size	5.6	5.4	5.9	5.4
III. Household Consumption				
1. Foods	20,061	22,692	16,016	26,059
2. House	5,937	8,041	2,713	11,945
3. Utilities	3,305	4,534	1,421	5,709
(1) Water	842	990	552	1,214
(2) Electricity	957	1,416	294	1,812
(3) Garbage	50	85	4	110
(4) Lighting	128	49	200	30
(5) Energy for Cooking	739	1,027	303	1,086
(6) Telephone	465	776	43	1,163
(7) Celular Phone	122	191	25	293
4. Health*2	2,631	3,094	1,919	3,160
5. Education	2,192	3,007	944	3,682
6. Personal Care	5,340	6,864	3,003	8,548
7. Furniture & Equipment	1,581	2,290	497	3,313
8. Transport*3	2,508	3,185	1,471	4,526
9. Others	16	23	6	32
Total	43,571	53,731	27,989	66,975

Source: Informe General, Encuesta Nacional de Hogares sobre Medicion de Nivel de Vida, 2001, INEC-EMNV
(General Information, National Survey of Household regarding Standard Living Measurement)

Note: *1 Data valid for Managua and its municipalities
*2 Including all expenses for taking care health in general.
*3 Including only general transportation expenses excluding expenses for school transportation and for health care.

Table 11A-15 Quintile Distribution of Annual Income in Nicaragua and Managua City: 2001

(Unit: C$/year)

Quintile	Nicaragua	Pacific Region		Managua*1
		Urban	Rural	
I. Per-Capita Income				
1. First	1,710	2,177	1,416	2,508
2. Second	3,496	3,937	2,830	5,015
3. third	5,319	5,869	4,246	7,919
4. Fourth	8,265	9,267	6,108	12,282
5. Fifth	25,264	26,670	14,597	43,984
All Quintiles	8,803	9,574	5,834	14,342
II. Average Household Size	5.6	5.4	5.9	5.4
III. Household Income				
1. First	9,576	11,753	8,355	13,546
2. Second	19,579	21,261	16,695	27,082
3. third	29,784	31,692	25,052	42,760
4. Fourth	46,287	50,044	36,038	66,324
5. Fifth	141,478	144,020	86,122	237,515
Total	49,295	51,702	34,420	77,449

Source: Informe General, Encuesta Nacional de Hogares sobre Medicion de Nivel de Vida, 2001, INEC-EMNV
(General Information, National Survey of Household regarding Standard Living Measurement)
Note: *1 Data valid for Managua and its municipalities

Table 11A-16 Annual Per-Capita Consumption of Water by Water Source in Nicaragua and Managua: 2001

(Unit: C$/year)

Item	Nicaragua			Managua*1
	Average	Urban	Rural	
I. Per-Capita Consumption (Average of Respective Sources)				
1. Piped into House	256.8	255.2	145.5	313.5
2. Piped out of House	141.4	145.4	103.5	151.8
3. Communal Tap	39.0	26.7	37.5	37.5
4. Well Public/Private	122.3	109.0	113.0	112.9
5. River, Spring or Creek	41.5	36.5	38.0	37.4
6. Truck, Wagon or Bottle	369.2	346.1	343.0	371.8
7. Bought from Neighbors	124.4	105.0	124.8	121.8
8. Others	267.4	349.0	225.2	370.9
II. Per-Capita Consumption (Average of Entire Answerers)				
1. Piped into House	59.1	98.5	8.9	136.9
2. Piped out of House	50.8	68.5	24.7	76.2
3. Communal Tap	1.4	0.3	2.4	0.1
4. Well Public/Private	25.5	7.6	40.6	1.9
5. River, Spring or Creek	4.5	0.3	8.3	0.1
6. Truck, Wagon or Bottle	2.1	3.1	8.0	5.9
7. Bought from Neighbors	5.7	4.5	6.2	2.6
8. Others	1.2	0.5	1.7	1.1
Total	150.5	183.4	100.7	224.7
III. Treatment of Water Sources for Drinking Water (%)				
1. No treatment	78.4	-	-	91.3
2. Boiled	1.1	-	-	0.5
3. Chlorine	19.8	-	-	7.4
4. Bought Purified Water	0.6	-	-	0.3
5. Others	0.2	-	-	0.5
Total	100.0	-	-	100.0

Source: Informe General, Encuesta Nacional de Hogares sobre Medicion de Nivel de Vida, 2001, INEC-EMNV
(General Information, National Survey of Household regarding Standard Living Measurement)
Note: *1 Data valid for Managua and its municipalities

ANNEX 11B

Information and Data for Economic Evaluation

Table 11B-1 Leakage Reduction Benefit of Long-term Improvement Plan

Item	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Basic Data													
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
Managua	Person	994,964	1,015,066	1,035,367	1,056,075	1,077,196	1,098,740	1,120,715	1,143,129	1,165,992	1,189,312	1,213,098	1,237,360
Ticuantepe	Person	25,651	26,526	27,434	28,374	29,350	30,361	31,410	32,497	33,625	34,795	36,008	37,266
Study Area	Person	23,086	23,912	24,770	25,660	26,584	27,543	28,538	29,571	30,643	31,756	32,912	34,111
Along C. Masaya	Person	18,469	19,207	19,976	20,775	21,606	22,470	23,369	24,304	25,276	26,287	27,338	28,432
Other Area	Person	4,617	4,705	4,794	4,885	4,978	5,073	5,169	5,267	5,367	5,469	5,573	5,679
Outside Study Area	Person	2,565	2,614	2,663	2,714	2,766	2,818	2,872	2,926	2,982	3,039	3,096	3,155
Nindiri	Person	35,319	36,366	37,453	38,584	39,758	40,978	42,245	43,563	44,931	46,354	47,832	49,368
Study Area	Person	31,787	32,823	33,900	35,020	36,183	37,392	38,649	39,956	41,314	42,726	44,193	45,718
Veracurus	Person	25,430	26,447	27,505	28,605	29,749	30,939	32,177	33,464	34,802	36,194	37,642	39,148
Other Area	Person	6,357	6,376	6,396	6,415	6,434	6,453	6,473	6,492	6,512	6,531	6,551	6,570
Outside Study Area	Person	3,532	3,542	3,553	3,564	3,574	3,585	3,596	3,607	3,618	3,628	3,639	3,650
Service Ratio		97%	97%	97%	97%	98%	99%	100%	100%	100%	100%	100%	100%
Served Population		1,018,342	1,039,648	1,061,217	1,083,252	1,117,164	1,152,039	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
Increased Served Population			21,306	21,569	22,035	33,912	34,875	35,864	24,754	25,293	25,844	26,409	26,987
Increase Number of Connection		5.4	3,946	3,994	4,081	6,280	6,458	6,641	4,584	4,684	4,786	4,891	4,998
Per Capita Consumption	lpcd	175	175	175	175	175	175	175	175	175	175	175	175
Domestic Water Consumption	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883	212,215	216,641	221,164	225,785	230,508
Non-domestic Water Consumption*	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685	37,450	38,231	39,029	39,844	40,678
Total Water Consumption	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568	249,664	254,872	260,193	265,630	271,186
II. With-project Condition													
Effective Water Ratio	%	55	56	58	59	61	63	65	67	69	71	73	75
Daily Average Water Demand	m^3/day	381,197	382,223	378,695	375,207	375,589	375,939	376,259	373,262	370,296	367,361	364,456	361,581
Daily Maximum Water Demand	m^3/day	419,317	420,446	416,565	412,727	413,148	413,533	413,884	410,588	407,326	404,097	400,902	397,739
III. Without-project Condition													
Effective Water Ratio	%	55	55	55	55	55	55	55	55	55	55	55	55
Daily Average Water Demand	m^3/day	381,197	389,173	397,247	405,495	418,190	431,244	444,669	453,935	463,403	473,078	482,963	493,065
Daily Maximum Water Demand	m^3/day	419,317	428,090	436,972	446,045	460,009	474,369	489,136	499,329	509,744	520,385	531,260	542,372
IV. Reduction of Leakage Volume													
Expected Reduction	m^3day	0	6,950	18,551	30,289	42,601	55,305	68,411	80,673	93,107	105,717	118,507	131,484
Expected Reduction	m^3/Year	0	2,536,574	6,771,270	11,055,414	15,549,279	20,186,317	24,969,891	29,445,783	33,984,081	38,586,591	43,255,166	47,991,700
Expected Reduction	US$ 1000/y	0	249	664	1,085	1,526	1,981	2,450	2,889	3,335	3,786	4,245	4,709
Expected Reduction in Economic Value	US$ 1000/y	0	201	537	877	1,234	1,602	1,981	2,337	2,697	3,062	3,433	3,808

Note: Note: *1 Consumption volume was set as 15% of the total consumption.

Table 11B-2 Energy Saving Benefit of Long-term Improvement Plan

2008	**1,829,088 kWh/year**	
	The system is inaugurated in April.	
After 2009	**2,438,784 kWh/year**	

No	Year	Financial (US$1000)	Economic (US$1000)
1	2005		
2	2006		
3	2007		
4	2008	157.57	127.43
5	2009	210.10	169.90
6	2010	210.10	169.90
7	2011	210.10	169.90
8	2012	210.10	169.90
9	2013	210.10	169.90
10	2014	210.10	169.90
11	2015	210.10	169.90
12	2016	210.10	169.90
13	2017	210.10	169.90
14	2018	210.10	169.90
15	2019	210.10	169.90
16	2020	210.10	169.90
17	2021	210.10	169.90
18	2022	210.10	169.90
19	2023	210.10	169.90

Note:

Exchange Rate:	16.2834	C$/US$
Conversion Factor	0.93	
Shadow Exchange Rate	1.15	

Electricity Unit Price

0.08615 US$/kWh *(<== Market Price)*

Table 11B-3 Potable Water Costs of Increasing Population Who Can't Get ENACAL Water Service in Long-term Improvement Plan

	Item	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1.	**Basic Data**													
	Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
	Service Ratio	%	97%	97%	97%	97%	98%	99%	100%	100%	100%	100%	100%	100%
	Served Population	Person	1,018,342	1,039,648	1,061,217	1,083,252	1,117,164	1,152,039	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
	Population of Existing Beneficiaries	Person		1,039,648	1,039,648	1,039,648	1,039,648	1,039,648	1,039,648	1,039,648	1,039,648	1,039,648	1,039,648	1,039,648
	Population without Piped Water			0	21,569	43,604	77,516	112,391	148,255	173,008	198,301	224,146	250,555	277,541
	No. of Household	Nos.			3,994	8,075	14,355	20,813	27,455	32,039	36,722	41,508	46,399	51,397
	Low-income	Nos.			1,358	2,745	4,881	7,076	9,335	10,893	12,486	14,113	15,776	17,475
	Middle-income	Nos.			2,357	4,764	8,469	12,280	16,198	18,903	21,666	24,490	27,375	30,324
	High-income	Nos.			280	565	1,005	1,457	1,922	2,243	2,571	2,906	3,248	3,598
2.	**Household Income in Informe General, Encuesta Nacional de Hogares sobre Medicion de Nivel de Vida, 2001, INEC-EMNV**													
	HH Expenditure in 2001	C$/Year	66,975	on Average in 2001 in Managua										
	CPI		2001	2004	Inflation (2001 to 2004)									
		1999=100	113.8	135.0	18.6%									
	HH Expenditure in 2004	C$/Year	79,452											
	Affordability-to-pay	%	4%											
	Average Water Expense per HH	C$/Year	3,178											
	Average Annual Water Consumption through Water Wagon													
	Unit Price	C$/m3	72											
	Water Consumption	m3/Year	44											
	Unit Consumption Rate	lpdc	22											
	Annual Cost for Potable Water Served by Water Wagon													
		C$ 1000			12,694	25,663	45,621	66,146	87,253	101,821	116,707	131,917	147,460	163,342
		US$ 1000			735	1,486	2,641	3,829	5,051	5,894	6,756	7,636	8,536	9,455

Note:

Exchange Rate:	16.2834	C$/US$
Conversion Factor	0.93	
Shadow Exchange Rate	1.15	

Table 11B-4 Financial Costs and Economic Costs of Capital Investment of Long-term Improvement Plan

Financial Cost (US$1000)

Item	Total			First Stage																	
				2005			2006			2007			2008			2009			2010		
	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local
1. Water Resource/Water Intake Faciliti	16,487	3,357	13,130	0	0	0	336	336	0	3,996	2,014	1,982	2,989	1,007	1,982	1,982	0	1,982	1,982	0	1,982
2. Transmission/Distribution Lines	36,860	14,083	22,777	1,670	0	1,670	2,735	1,044	1,691	7,992	6,265	1,727	4,898	3,133	1,765	1,925	0	1,925	1,965	0	1,965
3. Water Effective Rate Improvement	7,471	2,357	5,114	0	0	0	846	846	0	1,982	1,269	713	810	0	810	810	0	810	1,021	115	906
4. Improvement of Low-income Areas	38,520	38,520	0	0	0	0	237	237	0	969	969	0	1,352	1,352	0	7,327	7,327	0	11,692	11,692	0
Sub-Total	99,338	58,317	41,021	1,670	0	1,670	4,154	2,463	1,691	14,939	10,517	4,422	10,049	5,492	4,557	12,044	7,327	4,717	16,660	11,807	4,853
5. Engineering Services	4,257	1,386	2,871	117	0	117	274	156	118	978	668	310	609	290	319	330	0	330	348	8	340
6. Physical Contingency	5,180	2,985	2,195	89	0	89	221	131	90	796	559	237	533	289	244	619	366	252	850	591	260
7. Price Contingency	23,274	12,383	10,891	0	0	0	181	107	74	1,329	934	395	1,361	738	623	2,149	1,272	876	3,765	2,615	1,149
8. Administration	3,301	0	3,301	47	0	47	121	0	121	451	0	451	314	0	314	379	0	379	541	0	541
Grand Total	135,350	75,071	60,279	1,923	0	1,923	4,952	2,857	2,095	18,493	12,679	5,814	12,866	6,809	6,056	15,520	8,966	6,554	22,163	15,021	7,142

Second Stage																	
2011			2012			2013			2014			2015					
Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local			
1,040	0	1,040	1,040	0	1,040	1,040	0	1,040	1,040	0	1,040	1,040	0	1,040			
2,323	0	2,323	3,274	910	2,364	4,227	1,821	2,406	3,359	910	2,449	2,492	0	2,492			
325	0	325	325	0	325	502	127	375	425	0	425	425	0	425			
8,970	8,970	0	4,293	4,293	0	3,680	3,680	0	0	0	0	0	0	0			
12,658	8,970	3,688	8,932	5,203	3,729	9,449	5,628	3,821	4,824	910	3,914	3,957	0	3,957			
258	0	258	325	64	261	404	136	267	338	64	274	277	0	277			
646	449	197	463	263	200	493	288	204	258	49	209	212	0	212			
3,500	2,430	1,069	2,985	1,698	1,287	3,705	2,167	1,537	2,228	420	1,808	2,072	0	2,072			
427	0	427	318	0	318	351	0	351	191	0	191	163	0	163			
17,489	11,849	5,640	13,023	7,228	5,794	14,402	8,220	6,182	7,839	1,443	6,397	6,681	0	6,681			

Economic Cost (US$1000)

Item	Total			First Stage																	
				2005			2006			2007			2008			2009			2010		
	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local
1. Water Resource/Water Intake Faciliti	16,203	3,299	12,904	0	0	0	330	330	0	3,927	1,979	1,948	2,938	990	1,948	1,948	0	1,948	1,948	0	1,948
2. Transmission/Distribution Lines	36,225	13,841	22,385	1,641	0	1,641	2,688	1,026	1,662	7,854	6,157	1,697	4,814	3,079	1,735	1,892	0	1,892	1,931	0	1,931
3. Water Effective Rate Improvement	7,342	2,316	5,026	0	0	0	831	831	0	1,948	1,247	701	796	0	796	796	0	796	1,003	113	890
4. Improvement of Low-income Areas	37,857	37,857	0	0	0	0	233	233	0	952	952	0	1,329	1,329	0	7,201	7,201	0	11,491	11,491	0
Sub-Total	97,628	57,313	40,315	1,641	0	1,641	4,082	2,421	1,662	14,682	10,336	4,346	9,876	5,397	4,479	11,837	7,201	4,636	16,373	11,604	4,769
5. Engineering Services	4,184	1,362	2,822	115	0	115	269	153	116	961	657	304	598	285	313	325	0	325	342	8	334
6. Physical Contingency	5,091	2,934	2,157	88	0	88	218	129	89	782	550	233	524	284	240	608	360	248	836	581	255
7. Price Contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Administration	3,244	0	3,244	46	0	46	119	0	119	443	0	443	308	0	308	372	0	372	531	0	531
Grand Total	110,147	61,609	48,538	1,890	0	1,890	4,688	2,702	1,986	16,868	11,542	5,326	11,306	5,966	5,340	13,141	7,561	5,580	18,082	12,192	5,890

Second Stage																	
2011			2012			2013			2014			2015					
Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local			
1,022	0	1,022	1,022	0	1,022	1,022	0	1,022	1,022	0	1,022	1,022	0	1,022			
2,283	0	2,283	3,218	894	2,323	4,154	1,790	2,365	3,301	894	2,407	2,449	0	2,449			
319	0	319	319	0	319	493	125	369	418	0	418	418	0	418			
8,816	8,816	0	4,219	4,219	0	3,617	3,617	0	0	0	0	0	0	0			
12,440	8,816	3,625	8,779	5,113	3,665	9,287	5,531	3,756	4,741	894	3,847	3,889	0	3,889			
254	0	254	319	63	257	397	134	263	332	63	269	272	0	272			
635	441	194	455	259	196	484	283	201	254	48	206	208	0	208			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
419	0	419	312	0	312	345	0	345	188	0	188	160	0	160			
13,748	9,256	4,492	9,865	5,435	4,430	10,513	5,948	4,565	5,515	1,005	4,510	4,530	0	4,530			

Table 11B-5 Operation and Maintenance Costs of Long-term Improvement Plan

Item	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Basic Data													
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
Managua	Person	994,964	1,015,066	1,035,367	1,056,075	1,077,196	1,098,740	1,120,715	1,143,129	1,165,992	1,189,312	1,213,098	1,237,360
Ticuantepe	Person	25,651	26,526	27,434	28,374	29,350	30,361	31,410	32,497	33,625	34,795	36,008	37,266
Study Area	Person	23,086	23,912	24,770	25,660	26,584	27,543	28,538	29,571	30,643	31,756	32,912	34,111
Along C. Masaya	Person	18,469	19,207	19,976	20,775	21,606	22,470	23,369	24,304	25,276	26,287	27,338	28,432
Other Area	Person	4,617	4,705	4,794	4,885	4,978	5,073	5,169	5,267	5,367	5,469	5,573	5,679
Outside Study Area	Person	2,565	2,614	2,663	2,714	2,766	2,818	2,872	2,926	2,982	3,039	3,096	3,155
Nindiri	Person	35,319	36,366	37,453	38,584	39,758	40,978	42,245	43,563	44,931	46,354	47,832	49,368
Study Area	Person	31,787	32,823	33,900	35,020	36,183	37,392	38,649	39,956	41,314	42,726	44,193	45,718
Veracurus	Person	25,430	26,447	27,505	28,605	29,749	30,939	32,177	33,464	34,802	36,194	37,642	39,148
Other Area	Person	6,357	6,376	6,396	6,415	6,434	6,453	6,473	6,492	6,512	6,531	6,551	6,570
Outside Study Area	Person	3,532	3,542	3,553	3,564	3,574	3,585	3,596	3,607	3,618	3,628	3,639	3,650
Service Ratio		97%	97%	97%	97%	98%	99%	100%	100%	100%	100%	100%	100%
Served Population		1,018,342	1,039,648	1,061,217	1,083,252	1,117,164	1,152,039	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
Increased Served Population			21,306	21,569	22,035	33,912	34,875	35,864	24,754	25,293	25,844	26,409	26,987
Increase Number of Connection		5.4	3,946	3,994	4,081	6,280	6,458	6,641	4,584	4,684	4,786	4,891	4,998
Per Capita Consumption	lpcd	175	175	175	175	175	175	175	175	175	175	175	175
Domestic Water Consumption	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883	212,215	216,641	221,164	225,785	230,508
Non-domestic Water Consumption	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685	37,450	38,231	39,029	39,844	40,678
Total Water Consumption	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568	249,664	254,872	260,193	265,630	271,186
II. With-project Condition													
Effective Water Ratio	%	55	56	58	59	61	63	65	67	69	71	73	75
Daily Average Water Demand	m^3/day	381,197	382,223	378,695	375,207	375,589	375,939	376,259	373,262	370,296	367,361	364,456	361,581
Daily Maximum Water Demand	m^3/day	419,317	420,446	416,565	412,727	413,148	413,533	413,884	410,588	407,326	404,097	400,902	397,739
III. Without-project Condition													
Effective Water Ratio	%	55	55	55	55	55	55	55	55	55	55	55	55
Daily Average Water Demand	m^3/day	381,197	389,173	397,247	405,495	418,190	431,244	444,669	453,935	463,403	473,078	482,963	493,065
Daily Maximum Water Demand	m^3/day	419,317	428,090	436,972	446,045	460,009	474,369	489,136	499,329	509,744	520,385	531,260	542,372
IV. O&M Cost of Proposed Project													
O&M Cost at Plant Side	US$ 1000	24,774	24,840	24,611	24,384	24,409	24,432	24,453	24,258	24,065	23,874	23,686	23,499
Adjustment of Leakage Reduction	US$ 1000		203	541	884	1,243	1,613	1,996	2,353	2,716	3,084	3,457	3,836
Saving of Electric Power	US$ 1000					158	210	210	210	210	210	210	210
Total	US$ 1000	24,774	25,043	25,152	25,268	25,494	25,835	26,238	26,401	26,571	26,748	26,933	27,124
In Economic Terms	US$ 1000	**20,034**	**20,252**	**20,340**	**20,434**	**20,617**	**20,893**	**21,219**	**21,351**	**21,488**	**21,631**	**21,780**	**21,935**
V. O&M Cost of Present System													
O&M Cost at Plant Side	US$ 1000	24,774	25,292	25,817	26,353	27,178	28,026	28,899	29,501	30,116	30,745	31,387	32,044
In Economic Terms	US$ 1000	**20,034**	**20,453**	**20,878**	**21,311**	**21,978**	**22,665**	**23,370**	**23,857**	**24,355**	**24,863**	**25,383**	**25,914**

Note: *1 Consumption volume was set as 15% of the total consumption.

Table 11B-6 Replacement Costs of Long-term Improvement Plan (1/2)

With-Project Case			188,519 US$/pump		188,519 US$/well		1,631 US$/kW		24,392 conn./y		4,077,000 US$			
	TOTAL (US$1000)		1,206,523 US$/year		804,349 US$/year				365,886 US$/year		407,700 US$/year		840,886 US$/year	
	Financial	Economic					(kW)							
2015	**0**	**0**												
2016	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2017	**4,702**	**4,432**		1,206,523		804,349	660	1,076,256		365,886		407,700		840,886
2018	**4,343**	**4,094**		1,206,523		804,349	440	717,504		365,886		407,700		840,886
2019	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2020	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2021	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2022	**4,604**	**4,340**		1,206,523		804,349	600	978,415		365,886		407,700		840,886
2023	**4,604**	**4,340**		1,206,523		804,349	600	978,415		365,886		407,700		840,886
2024	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2025	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2026	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2027	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2028	**4,358**	**4,107**		1,206,523		804,349	449	732,180		365,886		407,700		840,886
2029	**3,748**	**3,533**		1,206,523		804,349	75	122,302		365,886		407,700		840,886
2030	**3,748**	**3,533**		1,206,523		804,349	75	122,302		365,886		407,700		840,886
2031	**4,066**	**3,832**		1,206,523		804,349	270	440,287		365,886		407,700		840,886
2032	**4,066**	**3,832**		1,206,523		804,349	270	440,287		365,886		407,700		840,886
2033	**4,066**	**3,832**		1,206,523		804,349	270	440,287		365,886		407,700		840,886
2034	**4,555**	**4,293**		1,206,523		804,349	570	929,494		365,886		407,700		840,886
2035	**4,066**	**3,832**		1,206,523		804,349	270	440,287		365,886		407,700		840,886
2036	**3,625**	**3,417**		1,206,523		804,349		0		365,886		407,700		840,886
2037	**4,702**	**4,432**		1,206,523		804,349	660	1,076,256		365,886		407,700		840,886
2038	**4,343**	**4,094**		1,206,523		804,349	440	717,504		365,886		407,700		840,886
2039	**3,625**	**3,417**		1,206,523		804,349	0	0		365,886		407,700		840,886
2040	**3,625**	**3,417**		1,206,523		804,349	0	0		365,886		407,700		840,886
2041	**3,625**	**3,417**		1,206,523		804,349	0	0		365,886		407,700		840,886
2042	**4,604**	**4,340**		1,206,523		804,349	600	978,415		365,886		407,700		840,886
2043	**4,604**	**4,340**		1,206,523		804,349	600	978,415		365,886		407,700		840,886
2044	**3,625**	**3,417**		1,206,523		804,349	0	0		365,886		407,700		840,886
2045	**3,625**	**3,417**		1,206,523		804,349	0	0		365,886		407,700		840,886

130 well pumps are replaced every 20 years, since their durable life is 20 years. Since the rest 70 pumps are not replaced yet as of 2015, they are replaced in consecutive order after 2016.

Wells are replaced every 30 years in consecutive order, since their durable live is 30 years

Pumps for transmission and distribution are replaced every 20 years. All pumps except Managua I and II are replaced by 2015.

House connections are replaced every 10 years. A unit price of water meter is assumed at US$15.

In order to keep the effective water ratio at the maximum level, the leakage survey and repairing leakage points are conducted every ten years.

Maintenance for piping system including valves and meters costs 0.5% of the total investment cost of the piping system.

Table 11B-6 Replacement Costs of Long-term Improvement Plan (2/2)

Without-Project Case			188,519 US$/pump		188,519 US$/well		1,631 US$/kW		19,441 conn./y		4,077,000 US$		
	TOTAL (US$1000)		1,140,541 US$/year		760,361 US$/year				291,621 US$/year		407,700 US$/year		670,210 US$/year
	Financial	Economic					(kW)						
2005	**0**												
2006	**1,063**	1,044											
2007	**6,070**	5,966											
2008	**4,009**	3,940											
2009	**2,990**	2,939											
2010	**2,882**	2,833											
2011	**1,939**	1,905											
2012	**1,717**	1,688											
2013	**1,719**	1,690											
2014	**1,721**	1,692											
2015	**1,724**	1,694											
2016	**2,863**	2,698	1,140,541	130 well pumps are replaced every 20 years, since their durable life is 20 years. Since the rest 70 pumps are not replaced yet as of 2015, they are replaced in consecutive order after 2016.	760,361	Wells are replaced every 30 years in consecutive order, since their durable live is 30 years	0	Pumps for transmission and distribution are replaced every 20 years. All pumps except Managua I and II are replaced by 2015.	291,621	House connections are replaced every 10 years. A unit price of water meter is assumed at US$15.	0	In order to keep the effective water ratio at the maximum level, the leakage survey and repairing leakage points are conducted every ten years.	670,210	Maintenance for piping system including valves and meters costs 0.5% of the total investment cost of the piping system.
2017	**3,939**	3,713	1,140,541		760,361		1,076,256		291,621		0		670,210	
2018	**3,580**	3,375	1,140,541		760,361		717,504		291,621		0		670,210	
2019	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2020	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2021	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2022	**3,841**	3,621	1,140,541		760,361		978,415		291,621		0		670,210	
2023	**3,841**	3,621	1,140,541		760,361		978,415		291,621		0		670,210	
2024	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2025	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2026	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2027	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2028	**3,595**	3,389	1,140,541		760,361		732,180		291,621		0		670,210	
2029	**2,985**	2,814	1,140,541		760,361		122,302		291,621		0		670,210	
2030	**2,985**	2,814	1,140,541		760,361		122,302		291,621		0		670,210	
2031	**3,303**	3,113	1,140,541		760,361		440,287		291,621		0		670,210	
2032	**3,303**	3,113	1,140,541		760,361		440,287		291,621		0		670,210	
2033	**3,303**	3,113	1,140,541		760,361		440,287		291,621		0		670,210	
2034	**3,792**	3,575	1,140,541		760,361		929,494		291,621		0		670,210	
2035	**3,303**	3,113	1,140,541		760,361		440,287		291,621		0		670,210	
2036	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2037	**3,939**	3,713	1,140,541		760,361		1,076,256		291,621		0		670,210	
2038	**3,580**	3,375	1,140,541		760,361		717,504		291,621		0		670,210	
2039	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2040	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2041	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2042	**3,841**	3,621	1,140,541		760,361		978,415		291,621		0		670,210	
2043	**3,841**	3,621	1,140,541		760,361		978,415		291,621		0		670,210	
2044	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	
2045	**2,863**	2,698	1,140,541		760,361		0		291,621		0		670,210	

Table 11B-7 Leakage Reduction Benefit of Priority Project

Item	Unit	2004	2005	2006	2007	2008	2009	2010
I. Basic Data								
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902
Managua	Person	994,964	1,015,066	1,035,367	1,056,075	1,077,196	1,098,740	1,120,715
Ticuantepe	Person	25,651	26,526	27,434	28,374	29,350	30,361	31,410
Study Area	Person	23,086	23,912	24,770	25,660	26,584	27,543	28,538
Along C. Masaya	Person	18,469	19,207	19,976	20,775	21,606	22,470	23,369
Other Area	Person	4,617	4,705	4,794	4,885	4,978	5,073	5,169
Outside Study Area	Person	2,565	2,614	2,663	2,714	2,766	2,818	2,872
Nindiri	Person	35,319	36,366	37,453	38,584	39,758	40,978	42,245
Study Area	Person	31,787	32,823	33,900	35,020	36,183	37,392	38,649
Veracurus	Person	25,430	26,447	27,505	28,605	29,749	30,939	32,177
Other Area	Person	6,357	6,376	6,396	6,415	6,434	6,453	6,473
Outside Study Area	Person	3,532	3,542	3,553	3,564	3,574	3,585	3,596
Service Ratio		97%	97%	97%	97%	98%	99%	100%
Served Population		1,018,342	1,039,648	1,061,217	1,083,252	1,117,164	1,152,039	1,187,902
Increased Served Population			21,306	21,569	22,035	33,912	34,875	35,864
Increase Number of Connection		5.4	3,946	3,994	4,081	6,280	6,458	6,641
Per Capita Consumption	lpcd	175	175	175	175	175	175	175
Domestic Water Consumption	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883
Non-domestic Water Consumption*	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685
Total Water Consumption	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568
II. With-project Condition								
Effective Water Ratio	%	55	56	58	59	61	63	65
Daily Average Water Demand	m^3/day	381,197	382,223	378,695	375,207	375,589	375,939	376,259
Daily Maximum Water Demand	m^3/day	419,317	420,446	416,565	412,727	413,148	413,533	413,884
III. Without-project Condition								
Effective Water Ratio	%	55	55	55	55	55	55	55
Daily Average Water Demand	m^3/day	381,197	389,173	397,247	405,495	418,190	431,244	444,669
Daily Maximum Water Demand	m^3/day	419,317	428,090	436,972	446,045	460,009	474,369	489,136
IV. Reduction of Leakage Volume								
Expected Reduction	m^3day	0	6,950	18,551	30,289	42,601	55,305	68,411
Expected Reduction	m^3/Year	0	2,536,574	6,771,270	11,055,414	15,549,279	20,186,317	24,969,891
Expected Reduction	US$ 1000/y	0	249	664	1,085	1,526	1,981	2,450
Expected Reduction in Economic Value	US$ 1000/y	0	201	537	877	1,234	1,602	1,981

Note: *1 Consumption volume was set as 15% of the total consumption.

Table 11B-8 Energy Saving Benefit of Priority Project

2008	**1,829,088 kWh/year**
	The system is inaugurated in April.
After 2009	**2,438,784 kWh/year**

No	Year	Financial (US$1000)	Economic (US$1000)
1	2005		
2	2006		
3	2007		
4	2008	157.57	127.43
5	2009	210.10	169.90
6	2010	210.10	169.90
7	2011	210.10	169.90
8	2012	210.10	169.90
9	2013	210.10	169.90
10	2014	210.10	169.90
11	2015	210.10	169.90

Note:

Exchange Rate:	16.2834	C$/US$
Conversion Factor	0.93	
Shadow Exchange Rate	1.15	

Electricity Unit Price

0.08615 US$/kWh *(<== Market Price)*

Table 11B-9 Potable Water Costs of Increasing Population Who Can't Get ENACAL Water Service in Priority Project

Item	Unit	2004	2005	2006	2007	2008	2009	2010
I. **Basic Data**			1.021	1.021	1.021	1.021	1.021	1.021
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902
Service Ratio	%	97%	97%	97%	97%	98%	99%	100%
Served Population	Person	1,018,342	1,039,648	1,061,217	1,083,252	1,117,164	1,152,039	1,187,902
Population of Beneficiaries w/o	Person		1,039,648	1,039,648	1,039,648	1,039,648	1,039,648	1,039,648
Population without Piped Water			0	21,569	43,604	77,516	112,391	148,255
No. of Household	Nos.			3,994	8,075	14,355	20,813	27,455
Low-income	Nos.			1,358	2,745	4,881	7,076	9,335
Middle-income	Nos.			2,357	4,764	8,469	12,280	16,198
High-income	Nos.			280	565	1,005	1,457	1,922

Household Income in Informe General, Encuesta Nacional de Hogares sobre Medicion de Nivel de Vida, 2001, INEC-EMNV

HH Expenditure in 2001	C$/Year	66,975	on Average in 2001 in Managua	
CPI		2001	2004	Inflation (2001 to 2004)
	1999=100	113.8	135.0	18.6%
HH Expenditure in 2004	C$/Year	79,452		
Affordability-to-pay	%	4%		
Average Water Expense per HH	C$/Year	3,178		
Average Annual Water Consumption through Water Wagon				
Unit Price	C$/m3	72		
Water Consumption	m3/Year	44		
Unit Consumption Rate	lpdc	22		

Annual Cost for Potable Water Served by Water Wagon						
C$ 1000	12,694	25,663	45,621	66,146	87,253	
US$ 1000	735	1,486	2,641	3,829	5,051	
Actual Benefit due to No Connection Pipes (60% of the total incremental connections)						
US$ 1000	294	594	1,056	1,532	2,020	

Table 11B-10 Financial Costs and Economic Costs of Capital Investment of Priority Project

Financial Cost (US$1000)

Item	Total			2005			2006			2007		
	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local
1. Water Resource/Water Intake Facilities	3,357	3,357	0	0	0	0	336	336	0	2,014	2,014	0
2. Transmission/Distribution Lines	10,442	10,442	0	0	0	0	1,044	1,044	0	6,265	6,265	0
3. Water Effective Rate Improvement	5,354	2,115	3,239	0	0	0	846	846	0	1,982	1,269	713
4. Improvement of Low-income Areas	2,870	2,870	0	0	0	0	237	237	0	969	969	0
Sub-Total	22,023	18,784	3,239	0	0	0	2,463	2,463	0	11,230	10,517	713
5. Engineering Services	1,341	1,114	227	0	0	0	156	156	0	718	668	50
6. Physical Contingency	1,168	995	173	0	0	0	131	131	0	597	559	38
7. Price Contingency	2,373	1,834	539	0	0	0	107	107	0	998	934	64
8. Administration	673	0	673	0	0	0	71	0	71	339	0	339
Grand Total	27,578	22,727	4,851	0	0	0	2,928	2,857	71	13,882	12,679	1,203

2008			2009			2010		
Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local
1,007	1,007	0	0	0	0	0	0	0
3,133	3,133	0	0	0	0	0	0	0
810	0	810	810	0	810	906	0	906
1,352	1,352	0	312	312	0	0	0	0
6,302	5,492	810	1,122	312	810	906	0	906
347	290	57	57	0	57	63	0	63
332	289	43	59	16	43	48	0	48
849	738	111	205	54	150	215	0	215
196	0	196	36	0	36	31	0	31
8,026	6,809	1,216	1,478	382	1,097	1,263	0	1,263

Economic Cost (US$1000)

Item	Total			2005			2006			2007		
	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local
1. Water Resource/Water Intake Facilities	3,299	3,299	0	0	0	0	330	330	0	1,979	1,979	0
2. Transmission/Distribution Lines	10,262	10,262	0	0	0	0	1,026	1,026	0	6,157	6,157	0
3. Water Effective Rate Improvement	5,262	2,079	3,183	0	0	0	831	831	0	1,948	1,247	701
4. Improvement of Low-income Areas	2,821	2,821	0	0	0	0	233	233	0	952	952	0
Sub-Total	21,644	18,461	3,183	0	0	0	2,421	2,421	0	11,037	10,336	701
5. Engineering Services	1,318	1,095	223	0	0	0	153	153	0	706	657	49
6. Physical Contingency	1,148	978	170	0	0	0	129	129	0	587	550	37
7. Price Contingency	0	0	0	0	0	0	0	0	0	0	0	0
8. Administration	661	0	661	0	0	0	70	0	70	333	0	333
Grand Total	24,771	20,533	4,237	0	0	0	2,773	2,702	70	12,662	11,542	1,120

2008			2009			2010		
Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local	Total	Donor Foreign	Enacal Local
990	990	0	0	0	0	0	0	0
3,079	3,079	0	0	0	0	0	0	0
796	0	796	796	0	796	890	0	890
1,329	1,329	0	307	307	0	0	0	0
6,193	5,397	796	1,103	307	796	890	0	890
341	285	56	56	0	56	62	0	62
327	284	43	58	15	43	48	0	48
0	0	0	0	0	0	0	0	0
192	0	192	35	0	35	30	0	30
7,053	5,966	1,087	1,252	322	930	1,031	0	1,031

Table 11B-11 Operation and Maintenance Costs of Priority Project

Item	Unit	2004	2005	2006	2007	2008	2009	2010
I. Basic Data								
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902
Managua	Person	994,964	1,015,066	1,035,367	1,056,075	1,077,196	1,098,740	1,120,715
Ticuantepe	Person	25,651	26,526	27,434	28,374	29,350	30,361	31,410
Study Area	Person	23,086	23,912	24,770	25,660	26,584	27,543	28,538
Along C. Masaya	Person	18,469	19,207	19,976	20,775	21,606	22,470	23,369
Other Area	Person	4,617	4,705	4,794	4,885	4,978	5,073	5,169
Outside Study Area	Person	2,565	2,614	2,663	2,714	2,766	2,818	2,872
Nindiri	Person	35,319	36,366	37,453	38,584	39,758	40,978	42,245
Study Area	Person	31,787	32,823	33,900	35,020	36,183	37,392	38,649
Veracurus	Person	25,430	26,447	27,505	28,605	29,749	30,939	32,177
Other Area	Person	6,357	6,376	6,396	6,415	6,434	6,453	6,473
Outside Study Area	Person	3,532	3,542	3,553	3,564	3,574	3,585	3,596
Service Ratio		97%	97%	97%	97%	98%	99%	100%
Served Population		1,018,342	1,039,648	1,061,217	1,083,252	1,117,164	1,152,039	1,187,902
Increased Served Population			21,306	21,569	22,035	33,912	34,875	35,864
Increase Number of Connection		5.4	3,946	3,994	4,081	6,280	6,458	6,641
Per Capita Consumption	lpcd	175	175	175	175	175	175	175
Domestic Water Consumption	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883
Non-domestic Water Consumption*1	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685
Total Water Consumption	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568
II. With-project Condition								
Effective Water Ratio	%	55	56	58	59	61	63	65
Daily Average Water Demand	m^3/day	381,197	382,223	378,695	375,207	375,589	375,939	376,259
Daily Maximum Water Demand	m^3/day	419,317	420,446	416,565	412,727	413,148	413,533	413,884
III. Without-project Condition								
Effective Water Ratio	%	55	55	55	55	55	55	55
Daily Average Water Demand	m^3/day	381,197	389,173	397,247	405,495	418,190	431,244	444,669
Daily Maximum Water Demand	m^3/day	419,317	428,090	436,972	446,045	460,009	474,369	489,136
IV. O&M Cost of Proposed Project								
O&M Cost at Plant Side	US$ 1000	24,774	24,840	24,611	24,384	24,409	24,432	24,453
In Economic Terms	US$ 1000	**20,034**	**20,088**	**19,903**	**19,719**	**19,740**	**19,758**	**19,775**
	US$ 1000		**164**	**438**	**715**	**1,005**	**1,305**	**1,614**
Saving of Electric Power	US$ 1000					**127**	**170**	**170**
O&M Cost after Arrangement	US$ 1000	**20,034**	**20,252**	**20,340**	**20,434**	**20,617**	**20,893**	**21,219**
V. O&M Cost of Present System								
O&M Cost at Plant Side	US$ 1000	24,774	25,292	25,817	26,353	27,178	28,026	28,899
In Economic Terms	US$ 1000	20,034	20,453	20,878	21,311	21,978	22,665	23,370
O&M Cost after Arrangement	US$ 1000	**20,034**	**20,453**	**20,878**	**21,311**	**21,978**	**22,665**	**23,370**

Table 11B-12 Replacement Costs of Priority Project (1/2)

With-Project Case

Year	TOTAL(US$1000) Financial	TOTAL(US$1000) Economic	188,519 US$/pump 1,187,671 US$/year		188,519 US$/well 791,781 US$/year		1,631 US$/kW (kW)		21,998 conn./y 329,973 US$/year		2,074,000 US$ 207,400 US$/year		840,886 US$/year	
2010	**0**	**0**						0						
2011	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2012	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2013	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2014	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2015	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2016	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2017	**4,434**	**4,180**		1,187,671		791,781	660	1,076,256		329,973		207,400		840,886
2018	**4,075**	**3,841**		1,187,671		791,781	440	717,504		329,973		207,400		840,886
2019	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2020	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2021	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2022	**4,336**	**4,087**		1,187,671		791,781	600	978,415		329,973		207,400		840,886
2023	**4,336**	**4,087**		1,187,671		791,781	600	978,415		329,973		207,400		840,886
2024	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2025	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2026	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2027	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2028	**4,090**	**3,855**		1,187,671		791,781	449	732,180		329,973		207,400		840,886
2029	**3,480**	**3,280**		1,187,671		791,781	75	122,302		329,973		207,400		840,886
2030	**3,480**	**3,280**		1,187,671		791,781	75	122,302		329,973		207,400		840,886
2031	**3,798**	**3,580**		1,187,671		791,781	270	440,287		329,973		207,400		840,886
2032	**3,798**	**3,580**		1,187,671		791,781	270	440,287		329,973		207,400		840,886
2033	**3,798**	**3,580**		1,187,671		791,781	270	440,287		329,973		207,400		840,886
2034	**4,287**	**4,041**		1,187,671		791,781	570	929,494		329,973		207,400		840,886
2035	**3,798**	**3,580**		1,187,671		791,781	270	440,287		329,973		207,400		840,886
2036	**3,358**	**3,165**		1,187,671		791,781		0		329,973		207,400		840,886
2037	**4,434**	**4,180**		1,187,671		791,781	660	1,076,256		329,973		207,400		840,886
2038	**4,075**	**3,841**		1,187,671		791,781	440	717,504		329,973		207,400		840,886
2039	**3,358**	**3,165**		1,187,671		791,781	0	0		329,973		207,400		840,886
2040	**3,358**	**3,165**		1,187,671		791,781	0	0		329,973		207,400		840,886

130 well pumps are replaced every 20 years, since their durable life is 20 years. Since the rest 70 pumps are not replaced yet as of 2015, they are replaced in consecutive order after 2016.

Wells are replaced every 30 years in consecutive order, since their durable live is 30 years

Pumps for transmission and distribution are replaced every 20 years. All pumps except Managua I and II are replaced by 2015.

House connections are replaced every 10 years. A unit price of water meter is assumed at US$15.

In order to keep the effective water ratio at the maximum level, the leakage survey and repairing leakage points are conducted every ten years.

Maintenance for piping system including valves and meters costs 0.5% of the total investment cost of the piping system.

Table 11B-12 Replacement Costs of Priority Project (2/2)

Without-Project Case

Year	TOTAL Financial		TOTAL Economic		Replacement After 2010													
					188,519 US$/pump		188,519 US$/well		1,631 US$/kW		19,441 conn./y		2,074,000 US$		670,210 US$/year		US$15/conn.	
					1,140,541 US$/year		760,361 US$/year				291,621 US$/year		207,400 US$/year					
									(kW)									
2005	Bfr 2010	Aft 2010	Bfr 2010	Aft 2010														
2006	**1,063**	**0**	**1,044**	**0**														
2007	**3,783**	**0**	**3,718**	**0**														
2008	**1,720**	**0**	**1,690**	**0**														
2009	**557**	**0**	**548**	**0**														
2010	**669**	**0**	**658**	**0**														
2011		**2,863**		**2,698**	1,140,541	130 well pumps are replaced every 20 years, since their durable life is 20 years. Since the rest 70 pumps are not replaced yet as of 2015, they are replaced in consecutive order after 2016.	760,361	Wells are replaced every 30 years in consecutive order, since their durable live is 30 years	0	Pumps for transmission and distribution are replaced every 20 years. All pumps except Managua I and II are replaced by 2015.	291,621	House connections are replaced every 10 years. A unit price of water meter is assumed at US$15.	0	In order to keep the effective water ratio at the maximum level, the leakage survey and repairing leakage points are conducted every ten years.	670,210	Maintenance for piping system including valves and meters costs 0.5% of the total investment cost of the piping system.
2012		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2013		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2014		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2015		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2016		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2017		**3,939**		**3,713**	1,140,541		760,361		660	1,076,256	291,621		0		670,210			
2018		**3,580**		**3,375**	1,140,541		760,361		440	717,504	291,621		0		670,210			
2019		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2020		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2021		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2022		**3,841**		**3,621**	1,140,541		760,361		600	978,415	291,621		0		670,210			
2023		**3,841**		**3,621**	1,140,541		760,361		600	978,415	291,621		0		670,210			
2024		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2025		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2026		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2027		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2028		**3,595**		**3,389**	1,140,541		760,361		449	732,180	291,621		0		670,210			
2029		**2,985**		**2,814**	1,140,541		760,361		75	122,302	291,621		0		670,210			
2030		**2,985**		**2,814**	1,140,541		760,361		75	122,302	291,621		0		670,210			
2031		**3,303**		**3,113**	1,140,541		760,361		270	440,287	291,621		0		670,210			
2032		**3,303**		**3,113**	1,140,541		760,361		270	440,287	291,621		0		670,210			
2033		**3,303**		**3,113**	1,140,541		760,361		270	440,287	291,621		0		670,210			
2034		**3,792**		**3,575**	1,140,541		760,361		570	929,494	291,621		0		670,210			
2035		**3,303**		**3,113**	1,140,541		760,361		270	440,287	291,621		0		670,210			
2036		**2,863**		**2,698**	1,140,541		760,361		0		291,621		0		670,210			
2037		**3,939**		**3,713**	1,140,541		760,361		660	1,076,256	291,621		0		670,210			
2038		**3,580**		**3,375**	1,140,541		760,361		440	717,504	291,621		0		670,210			
2039		**2,863**		**2,698**	1,140,541		760,361		0	0	291,621		0		670,210			
2040		**2,863**		**2,698**	1,140,541		760,361		0	0	291,621		0		670,210			

ANNEX 11C

Information and Data for Financial Evaluation

Table 11C-1 Water Charge to Ordinary Consumers of Long-term Improvement Plan

Item	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Basic Data													
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
Increment	Person		21,965	22,236	22,717	23,209	23,712	24,227	24,754	25,293	25,844	26,409	26,987
No. of Household	Nos.		4,068	4,118	4,207	4,298	4,391	4,486	4,584	4,684	4,786	4,891	4,998
Low-income	Nos.		1,383	1,400	1,430	1,461	1,493	1,525	1,559	1,593	1,627	1,663	1,699
Middle-income	Nos.		2,400	2,429	2,482	2,536	2,591	2,647	2,705	2,763	2,824	2,885	2,949
High-income	Nos.		285	288	294	301	307	314	321	328	335	342	350
Non-registered (Internal Figure)	Nos.		387	392	401	409	418	427	437	446	456	466	476
Water Consumed	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568	249,664	254,872	260,193	265,630	271,186
Domestic	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883	212,215	216,641	221,164	225,785	230,508
Non-domestic	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685	37,450	38,231	39,029	39,844	40,678
Water Consumed	$1000m^3$/Year	76,525	78,126	79,747	81,403	83,952	86,572	89,267	91,128	93,028	94,970	96,955	98,983
Domestic	$1000m^3$/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877	77,458	79,074	80,725	82,412	84,135
Non-domestic	$1000m^3$/Year	11,479	11,719	11,962	12,210	12,593	12,986	13,390	13,669	13,954	14,246	14,543	14,847
Water Distribution of Domestic Use	$1000m^3$/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877	77,458	79,074	80,725	82,412	84,135
Registered (High & Middle Income)	$1000m^3$/Year	40,267	41,109	41,962	42,834	44,175	45,554	46,972	47,950	48,951	49,972	51,017	52,084
Registered (Asentamiento)	$1000m^3$/Year	18,585	18,974	19,367	19,769	20,388	21,025	21,679	22,131	22,593	23,064	23,546	24,039
Non-registered	$1000m^3$/Year	6,195	6,325	6,456	6,590	6,796	7,008	7,226	7,377	7,531	7,688	7,849	8,013
Number of Registrations													
Registered	Nos.	176,020	179,702	183,431	187,239	193,101	199,129	205,328	209,607	213,979	218,446	223,011	227,675
Non-registered	Nos.	18,528	18,916	19,308	19,709	20,326	20,961	21,613	22,064	22,524	22,994	23,475	23,966
Non-domestic	Nos.	717	732	747	762	786	811	836	853	871	889	908	927
II. Water Charge		391,451	399,641	407,932	416,402	429,438	442,844	456,630	466,145	475,868	485,803	495,954	506,328
Registered (High & Middle Income)	C$1000/Year	223,297	227,969	232,699	237,530	244,967	252,614	260,478	265,906	271,452	277,119	282,910	288,827
Registered (Asentamiento)	C$1000/Year	40,834	41,688	42,553	43,437	44,796	46,195	47,633	48,626	49,640	50,676	51,735	52,817
Non-domestic	C$1000/Year	127,320	129,984	132,680	135,435	139,675	144,036	148,519	151,614	154,777	158,008	161,310	164,684
Average Unit Price	C$/$m^3$		5.57	5.57	5.57	5.57	5.57	5.57	5.57	5.57	5.57	5.57	5.57
Under Billing due to Defective Meters													
Under-billing Rate	%	20	20	18	16	14	12	10	8	6	4	2	0
Water Charge taking consideration of Under-billing due to Defective Meters													
Registered (High & Middle Income)	C$1000/Year	194,269	198,333	205,473	212,827	222,675	232,910	243,547	252,078	260,865	269,914	279,232	288,827
Registered (Asentamiento)	C$1000/Year	40,834	41,688	42,553	43,437	44,796	46,195	47,633	48,626	49,640	50,676	51,735	52,817
Non-domestic	C$1000/Year	110,768	113,086	117,157	121,350	126,965	132,801	138,866	143,730	148,740	153,900	159,213	164,684
Water Charge		21,241	21,685	22,427	23,190	24,223	25,296	26,410	27,294	28,203	29,139	30,103	31,095
Registered (High & Middle Income)	US$1000/Year	11,930	12,180	12,619	13,070	13,675	14,304	14,957	15,481	16,020	16,576	17,148	17,738
Registered (Asentamiento)	US$1000/Year	2,508	2,560	2,613	2,668	2,751	2,837	2,925	2,986	3,048	3,112	3,177	3,244
Non-domestic	US$1000/Year	6,803	6,945	7,195	7,452	7,797	8,156	8,528	8,827	9,134	9,451	9,778	10,114
Actual Revenue from Water Charge (considering Water Charge Collection Ratio)													
Total Revenue	US$1000/Year	21,241	21,685	22,427	23,190	24,223	25,296	26,410	27,294	28,203	29,139	30,103	31,095
Registered (High & Middle Income)	US$1000/Year	11,930	12,180	12,619	13,070	13,675	14,304	14,957	15,481	16,020	16,576	17,148	17,738
Registered (Asentamiento)	US$1000/Year	2,508	2,560	2,613	2,668	2,751	2,837	2,925	2,986	3,048	3,112	3,177	3,244
Non-domestic	US$1000/Year	6,803	6,945	7,195	7,452	7,797	8,156	8,528	8,827	9,134	9,451	9,778	10,114

Table 11C-2 Water Charge to Newly Registered Domestic Users of Long-term Improvement Plan

Item	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Basic Data													
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
Water Consumed	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568	249,664	254,872	260,193	265,630	271,186
Domestic	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883	212,215	216,641	221,164	225,785	230,508
Non-domestic	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685	37,450	38,231	39,029	39,844	40,678
Water Produced (With-project Condition)	m^3/day	381,197	382,223	378,695	375,207	375,589	375,939	376,259	373,262	370,296	367,361	364,456	361,581
Water Consumed	1000m^3/Year	76,525	78,126	79,747	81,403	83,952	86,572	89,267	91,128	93,028	94,970	96,955	98,983
Domestic	1000m^3/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877	77,458	79,074	80,725	82,412	84,135
Non-domestic	1000m^3/Year	11,479	11,719	11,962	12,210	12,593	12,986	13,390	13,669	13,954	14,246	14,543	14,847
Water Produced (With-project Condition)	1000m^3/Year	139,137	139,512	138,224	136,950	137,090	137,218	137,334	136,241	135,158	134,087	133,026	131,977
Water Distribution of Domestic Use	1000m^3/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877	77,458	79,074	80,725	82,412	84,135
Registered (High & Middle Income)	1000m^3/Year	40,267	41,109	41,962	42,834	44,175	45,554	46,972	47,950	48,951	49,972	51,017	52,084
Registered (Asentamiento)	1000m^3/Year	18,585	18,974	19,367	19,769	20,388	21,025	21,679	22,131	22,593	23,064	23,546	24,039
Non-registered	1000m^3/Year	6,195	6,325	6,456	6,590	6,796	7,008	7,226	7,377	7,531	7,688	7,849	8,013
II. Water Charge of Newly Registered Domestic Users													
Transferring Rate to Registered from Non-registered	%	0	5	9	14	18	23	27	32	36	41	45	50
Total	Nos. of HH	18,528	18,916	19,308	19,709	20,326	20,961	21,613	22,064	22,524	22,994	23,475	23,966
Registered	Nos. of HH	0	860	1,755	2,688	3,696	4,764	5,894	7,020	8,191	9,407	10,670	11,983
Still Non-registered	Nos. of HH	18,528	18,056	17,553	17,021	16,630	16,197	15,719	15,044	14,333	13,587	12,805	11,983
Registered	1000m^3/Year	0	287	587	899	1,236	1,593	1,971	2,347	2,738	3,145	3,568	4,006
Still Non-registered	1000m^3/Year	6,195	6,037	5,869	5,691	5,560	5,415	5,256	5,030	4,792	4,543	4,281	4,006
Expected New Income of Newly Registered Domestic Users	C$ 1000/month	0	108	220	337	463	597	738	879	1,026	1,178	1,336	1,501
	C$ 1000/Year	0	1,292	2,638	4,039	5,554	7,160	8,859	10,551	12,309	14,137	16,036	18,009
	US$ 1000/Year	0	79	162	248	341	440	544	648	756	868	985	1,106
	1000m^3/Year		287	587	899	1,236	1,593	1,971	2,347	2,738	3,145	3,568	4,006
Average Unit Price	C$/$m^3$	0	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.50	4.50
Expected New Income of Newly Registered Domestic Users	US$ 1000/Year	0	79	162	248	341	440	544	648	756	868	985	1,106

Table 11C-3 Connection Fee from New Registrants of Long-term Improvement Plan

Item	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I. Basic Data													
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902	1,212,656	1,237,949	1,263,793	1,290,202	1,317,189
Increment	Person		21,965	22,236	22,717	23,209	23,712	24,227	24,754	25,293	25,844	26,409	26,987
No. of Household	Nos.		4,068	4,118	4,207	4,298	4,391	4,486	4,584	4,684	4,786	4,891	4,998
Low-income	Nos.		1,251	1,267	1,294	1,322	1,351	1,380	1,410	1,441	1,472	1,504	1,537
Middle-income	Nos.		2,171	2,198	2,246	2,294	2,344	2,395	2,447	2,500	2,555	2,611	2,668
High-income	Nos.		258	261	266	272	278	284	290	297	303	310	317
Non-registered (Gross)	Nos.		387	392	401	409	418	427	437	446	456	466	476
Non-registered (Net)	Nos.		18	36	55	74	95	117	139	162	186	212	238
			3,698	3,761	3,861	3,963	4,068	4,176	4,286	4,400	4,517	4,636	4,760
Connection Fee													
Service Ratio	%	97	97	97	97	98	99	100	100	100	100	100	100
Low-income	C$ 1000		563	570	582	595	608	621	635	648	663	677	692
Middle-income	C$ 1000		977	989	1,011	1,032	1,055	1,078	1,101	1,125	1,150	1,175	1,200
High-income	C$ 1000		167	170	173	177	181	185	189	193	197	201	206
Non-registered (Net)	C$ 1000		8	16	25	33	43	52	63	73	84	95	107
Non-domestic Use													
Water Consumption	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685	37,450	38,231	39,029	39,844	40,678
	m^3/Year	11,478,810	11,718,970	11,962,096	12,210,480	12,592,739	12,985,847	13,390,104	13,669,130	13,954,232	14,245,553	14,543,236	14,847,432
No. of Connection	Nos.	717	732	747	762	786	811	836	853	871	889	908	927
No. of Increment	Nos.		15	15	15	24	25	25	17	18	18	19	19
	C$ 1000		52.5	52.5	52.5	84	87.5	87.5	59.5	63	63	66.5	66.5
II. Connection of New Registrants													
Total Number of Connectio	Nos.		4,083	4,133	4,222	4,322	4,416	4,511	4,601	4,702	4,804	4,910	5,017
Connection Fee	C$ 1000		1,768	1,797	1,843	1,922	1,974	2,023	2,046	2,102	2,156	2,215	2,272
	US$ 1000		109	110	113	118	121	124	126	129	132	136	140

Table 11C-4 Water Charge to Ordinary Consumers of Priority Project

	Item	Unit	2004	2005	2006	2007	2008	2009	2010
I.	**Basic Data**								
	Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902
	Increment	Person		21,965	22,236	22,717	23,209	23,712	24,227
	No. of Household	Nos.		4,068	4,118	4,207	4,298	4,391	4,486
	Low-income	Nos.		1,383	1,400	1,430	1,461	1,493	1,525
	Middle-income	Nos.		2,400	2,429	2,482	2,536	2,591	2,647
	High-income	Nos.		285	288	294	301	307	314
	Water Consumed	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568
	Domestic	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883
	Non-domestic	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685
	Water Consumed	1000m^3/Year	76,525	78,126	79,747	81,403	83,952	86,572	89,267
	Domestic	1000m^3/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877
	Non-domestic	1000m^3/Year	11,479	11,719	11,962	12,210	12,593	12,986	13,390
	Water Distribution of Domestic Use	1000m^3/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877
	Registered (High & Middle Income)	1000m^3/Year	40,267	41,109	41,962	42,834	44,175	45,554	46,972
	Registered (Asentamiento)	1000m^3/Year	18,585	18,974	19,367	19,769	20,388	21,025	21,679
	Non-registered	1000m^3/Year	6,195	6,325	6,456	6,590	6,796	7,008	7,226
	Number of Registrations								
	Registered	Nos.	176,020	179,702	183,431	187,239	193,101	199,129	205,328
	Non-registered	Nos.	18,528	18,916	19,308	19,709	20,326	20,961	21,613
	Non-domestic	Nos.	717	732	747	762	786	811	836
II.	Water Charge		391,451	399,641	407,932	416,402	429,438	442,844	456,630
	Registered (High & Middle Income)	C$1000/Year	223,297	227,969	232,699	237,530	244,967	252,614	260,478
	Registered (Asentamiento)	C$1000/Year	40,834	41,688	42,553	43,437	44,796	46,195	47,633
	Non-domestic	C$1000/Year	127,320	129,984	132,680	135,435	139,675	144,036	148,519
	Average Unit Price	C$/$m^3$		5.57	5.57	5.57	5.57	5.57	5.57
	Under Billing due to Defective Meters								
	Under-billing Rate	%	20	20	18	16	14	12	10
	Water Charge taking consideration of Under-billing due to Defective Meters								
	Registered (High & Middle Income)	C$1000/Year	194,269	198,333	205,473	212,827	222,675	232,910	243,547
	Registered (Asentamiento)	C$1000/Year	40,834	41,688	42,553	43,437	44,796	46,195	47,633
	Non-domestic	C$1000/Year	110,768	113,086	117,157	121,350	126,965	132,801	138,866
	Water Charge		21,241	21,685	22,427	23,190	24,223	25,296	26,410
	Registered (High & Middle Income)	US$1000/Year	11,930	12,180	12,619	13,070	13,675	14,304	14,957
	Registered (Asentamiento)	US$1000/Year	2,508	2,560	2,613	2,668	2,751	2,837	2,925
	Non-domestic	US$1000/Year	6,803	6,945	7,195	7,452	7,797	8,156	8,528
	Actual Revenue from Water Charge (considering Water Charge Collection Ratio)								
	Total Revenue		21,241	21,685	22,427	23,190	24,223	25,296	26,410
	Registered (High & Middle Income)	US$1000/Year	11,930	12,180	12,619	13,070	13,675	14,304	14,957
	Registered (Asentamiento)	US$1000/Year	2,508	2,560	2,613	2,668	2,751	2,837	2,925
	Non-domestic	US$1000/Year	6,803	6,945	7,195	7,452	7,797	8,156	8,528

Table 11C-5 Water Charge to Newly Registered Domestic Users of Priority Project

Item	Unit	2004	2005	2006	2007	2008	2009	2010
I. Basic Data								
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902
Water Consumed	m^3/day	209,659	214,045	218,486	223,022	230,004	237,184	244,568
Domestic	m^3/day	178,210	181,938	185,713	189,569	195,504	201,607	207,883
Non-domestic	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685
Water Produced (With-project Condition)	m^3/day	381,197	382,223	378,695	375,207	375,589	375,939	376,259
Water Consumed	$1000m^3$/Year	76,525	78,126	79,747	81,403	83,952	86,572	89,267
Domestic	$1000m^3$/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877
Non-domestic	$1000m^3$/Year	11,479	11,719	11,962	12,210	12,593	12,986	13,390
Water Produced (With-project Condition)	$1000m^3$/Year	139,137	139,512	138,224	136,950	137,090	137,218	137,334
Water Distribution of Domestic Use	$1000m^3$/Year	65,047	66,407	67,785	69,193	71,359	73,586	75,877
Registered (High & Middle Income)	$1000m^3$/Year	40,267	41,109	41,962	42,834	44,175	45,554	46,972
Registered (Asentamiento)	$1000m^3$/Year	18,585	18,974	19,367	19,769	20,388	21,025	21,679
Non-registered	$1000m^3$/Year	6,195	6,325	6,456	6,590	6,796	7,008	7,226
II. Water Charge of Newly Registered Domestic Users								
Transferring Rate to Registered from Non-registered	%	0	5	9	14	18	23	27
Total	Nos. of HH	18,528	18,916	19,308	19,709	20,326	20,961	21,613
Registered	Nos. of HH	0	860	1,755	2,688	3,696	4,764	5,894
Still Non-registered	Nos. of HH	18,528	18,056	17,553	17,021	16,630	16,197	15,719
Registered	$1000m^3$/Year	0	287	587	899	1,236	1,593	1,971
Still Non-registered	$1000m^3$/Year	6,195	6,037	5,869	5,691	5,560	5,415	5,256
Expected New Income of Newly Registered Domestic Users								
	C$ 1000/month	0	108	220	337	463	597	738
	C$ 1000/Year	0	1,292	2,638	4,039	5,554	7,160	8,859
	US$ 1000/Year	0	79	162	248	341	440	544
Average Unit Price	C/m^3$	0	4.49	4.49	4.49	4.49	4.49	4.49
Expected New Income of Newly Registered Domestic Users								
	US$ 1000/Year	0	79	162	248	341	440	544

Table 11C-6 Connection Fee from New Registrants of Priority Project

Item	Unit	2004	2005	2006	2007	2008	2009	2010
I. Basic Data								
Population	Person	1,049,837	1,071,802	1,094,038	1,116,755	1,139,963	1,163,675	1,187,902
Increment	Person		21,965	22,236	22,717	23,209	23,712	24,227
No. of Household	Nos.		4,068	4,118	4,207	4,298	4,391	4,486
Low-income	Nos.		1,251	1,267	1,294	1,322	1,351	1,380
Middle-income	Nos.		2,171	2,198	2,246	2,294	2,344	2,395
High-income	Nos.		258	261	266	272	278	284
Non-registered (Gross)	Nos.		387	392	401	409	418	427
Non-registered (Net)			18	36	55	74	95	117
			3,698	3,761	3,861	3,963	4,068	4,176
Connection Fee								
Service Ratio	%	97	97	97	97	98	99	100
Low-income	C$ 1000		563	570	582	595	608	621
Middle-income	C$ 1000		977	989	1,011	1,032	1,055	1,078
High-income	C$ 1000		167	170	173	177	181	185
Non-registered (Net)	C$ 1000		8	16	25	33	43	52
Non-domesit Use								
Water Consumption	m^3/day	31,449	32,107	32,773	33,453	34,501	35,578	36,685
	m^3/Year	11,478,810	11,718,970	11,962,096	12,210,480	12,592,739	12,985,847	13,390,104
No. of Connection	Nos.	717	732	747	762	786	811	836
No. of Increment	Nos.		15	15	15	24	25	25
	C$ 1000		52.5	52.5	52.5	84	87.5	87.5
II. Connection of New Registrants								
Total Number of Connections	Nos.		4,083	4,133	4,222	4,322	4,416	4,511
Connection Fee	C$ 1000		1,768	1,797	1,843	1,922	1,974	2,023
	US$ 1000		109	110	113	118	121	124