

# **INTER-AMERICAN DEVELOPMENT BANK**



## **ARGENTINA**

### **AGUAS ARGENTINA 1998-1999 CAPITAL INVESTMENT PROGRAM**

**AR-0238**

## **ENVIRONMENTAL AND SOCIAL IMPACT REPORT**

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## 1.0 INTRODUCTION

- 1.1 At the end of the 1970's, Obras Sanitarias de la Nación (OSN) was responsible for the provision of water and sanitation services in the major cities of Argentina. OSN was in charge of planning the expansion of the system, setting new tariffs, and establishing standards for the design and operation of the services. On January 1, 1980, to remedy significant inefficiencies in the agency's management and administration, the Government of Argentina (GOA) decentralized water and sanitation services provided by OSN. As a result, 161 water and sanitation systems were transferred to the provinces. One of the consequences of handing over those services to the provinces was a major decline in the funding of investments in infrastructure after the GOA stopped appropriations under its non-recoverable assets account, resulting in a significant reduction in the rate of expansion. In the 1980's, Argentina was undergoing a profound economic crisis as seen in the state's inability to carry out its basic functions, its growing fiscal deficit and the inefficiency of public enterprises. As a result, in 1989 the GOA launched an economic, political, administrative, and social transformation of the country which affected all sectors. Pursuant to Laws No. 23696 and No. 23697, the GOA reorganized the state and privatized the agencies in charge of public services. It introduced the participation of private enterprise into the water sector to ensure more efficient management in the provision of services and greater responsiveness to the growing needs of consumers.
- 1.2 The Government of Argentina (GOA), on April 28, 1993, awarded Aguas Argentinas, S.A. (Aguas or the Company) a 30-year Concession that grants to it exclusive rights to provide potable water and sewerage services, which were previously provided by "Obras Sanitarias de la Nación" (OSN). Aguas is the sole provider of potable water and sewerage services in the City of Buenos Aires (B.A.) and certain surrounding districts in the province of Buenos Aires (the Concession area). Aguas' major shareholders include Suez Lyonnaise des Eaux S.A., Sociedad Comercial del Plata S.A. of Argentina, Banco de Galicia y Buenos Aires, and Compagnie Generale des Eaux. Suez Lyonnaise des Eaux S.A. is the operator and manager of the Concession. The Company is regulated by the "Ente Tripartito de Obras y Servicios Sanitarios" (ETOSS), an autonomous body created to exercise policing power and regulate the supply of potable water and public sewerage services pursuant to the Concession.
- 1.3 The primary goals outlined in the Concession are: (i) the renewal of the sewerage system in the Concession area; and (ii) building a new infrastructure which will support the expansion of the water and sewerage system, thereby connecting 100% of the urban population of the Concession area to potable water and 95% of the urban population to the sewerage system, and treating 100% of the sewage produced. The Concession is structured on the achievement of gradual performance targets (rather than specific investment requirements) set for such parameters as water and sewerage coverage in terms of percentage of population served, percentage of wastewater to receive primary and secondary treatment, percentage of water and sewerage network to be renovated, maximum percentage of unaccounted-for water, service expansion, and quality of service including water pressure, continuity of supply, and water quality. As of June 30, 1998, Aguas supplied potable water to approximately 7.8 million inhabitants and provided sewage services to approximately 5.9 million inhabitants
- 1.4 Aguas has structured an investment program of US\$4.1 billion over the 30 year Concession period. The investment program is divided into six five-year programs, each consisting of specific objectives and implementation deadlines. Approximately US\$1 billion will have been invested by the end of the first five year program to expand and upgrade the potable water and sewerage

system. During this period, Aguas has also: (i) overhauled the management and the administration of the Company, its service providing scheme, its bill collection system, and its customer relations; (ii) reduced the response time for repairing water supply leaks and waste water blockages; (iii) ensured that the quality of water produced in the rehabilitated plants is in compliance with international environmental standards; and (iv) refurbished the commercial buildings.

- 1.5 Aguas is completing its first five-year program ending December 31, 1998 and will start its second five-year investment program, covering years 1999 through 2003. The second five-year program (Investment Plan) will include an aggregate investment of approximately US\$1 billion. Aguas has requested IDB's financial support to partially cover capital expenditures to be incurred from 1998 through 2001. Thus, the Company will ensure the sustainability of the goals achieved during the first five years of the Concession by continuing the improvement of service quality and efficiency. The contemplated financing will be made through an IDB A loan and a B loan funded by U.S. institutional investors and commercial banks totaling up to US\$250 million.

## **2.0 PROJECT DESCRIPTION**

- 2.1 The Concession area comprises an area with a population of approximately 9 million people, of which approximately 6 million were connected to the public water supply network and 5 million to the sewerage system at the time of the takeover by Aguas. The Concession area originally included the federal capital and 13 townships of Greater Buenos Aires. The Company was also entitled to a fee for providing sewerage collection and treatment services to the towns of Quilmes, Berzategui, and Florencio Varela. Quilmes was incorporated into the Concession area as of November 1, 1995.
- 2.2 The primary services covered by the Concession include: (i) gathering and treatment of raw water; (ii) the transportation, distribution and marketing of potable water; and (iii) the collection, transportation, treatment, disposal and eventual reutilization and/or marketing of sewerage, including industrial effluent discharged into the sewerage system. All these services must be carried out in compliance with quality standards set forth in the Concession Contract.
- 2.3 A description of the Concession facilities and operations is presented in Section 2.1. Table 2-1 provides a summary of the status of these facilities and operations prior to the Concession and a description of the principal activities

### **2.1 Concession System**

#### *2.1.1 Water Services*

- 2.4 Aguas' water supply network consists of (i) 13 pumping stations, (ii) approximately 70 km of underground aqueducts, (iii) approximately 900 km of water mains and (iv) approximately 13,900 km of distribution pipes. When the potable water leaves the plant, it is pumped through one of the many underground aqueducts which are part of the Company's water supply network. These underground rivers lead to pumping stations which direct the water flow through a network of water mains. The water mains direct the water through 13,900 km of distribution pipes, which in turn, deliver the water to each of the Company's customers.

- 2.5 The Company's water purification and distribution process consists of several steps. The first is retrieval of water from the Rio de la Plata. The city of Buenos Aires sits at the mouth of the Rio de la Plata, which provides a plentiful supply of water for the city and its surroundings. The raw water supply from the river is only negligibly affected by climatic and pollution factors, and the physical and chemical qualities of the water make it relatively easy to purify and treat. The average flow rate of the Rio de la Plata is approximately 24,000 cubic meters per second; as such, Aguas' usage represents less than 0.2% of the average flow rate of the river. The Company's remaining raw water requirements are supplied from wells. The Company retrieves water from the river using two intake pipes, which extend approximately two to three miles from the shoreline into the river. The Company receives approximately 94% of its water supply from the river.
- 2.6 Water is treated at the San Martin Plant and Belgrano treatment plants. The San Martin plant was constructed in 1913 and is located in the city of Buenos Aires. The San Martin plant has a water treatment capacity of approximately 3.1 million m<sup>3</sup>/day and is one of the largest water treatment plant in the world. The plant serves approximately 4.6 million inhabitants in the concession area and accounts approximately 63% of the total water requirements of the Company. It employs approximately 300 people. The Belgrano plant was constructed in 1974 and is located in Bernal. The plant has a water treatment capacity of approximately 1.5 million m<sup>3</sup>/day. This plant serves approximately 2.6 millions inhabitants in the concession area and processes approximately 30% the total water requirements of the Company. It employs approximately 150 people.

#### *2.1.2 Sewerage Services*

- 2.7 The sewerage system comprises four pumping stations, three main sewers, and approximately 8,600 km of network pipelines. The existing collection network is considered insufficient for adequate transportation of the quantity of sewage collected by the company. However, the investments and construction projects already completed by the Company have reduced of sewage overflows and the improvement of the scope and quality of treatment at the South West treatment plant.
- 2.8 The Company's sewage treatment process consists of several steps. The first is pretreatment, which consists of a screening procedure. The next step is preliminary decantation, which involves allowing the waste water to sit in tanks where solids and liquids separate. The third step is biological treatment, which kills the bacteria and permits the waste water to be discharged back in the river. The final step in the process is another period of secondary decantation. After these procedures chlorine is added and then the treated waste water is discharged into the river.
- 2.9 The Company's only sewage treatment plant is located in the southwestern district of the Concession area. The South West treatment plant was constructed in 1972 and employs 40 people. It has a rated treatment capacity sufficient to serve approximately 600,000 inhabitants, equivalent to 9% of the total sewage flow. The Company is currently renovating this plant to increase its treatment capacity by approximately 40% to serve 840,000 inhabitants. In addition, in 1995, the Company initiated the construction of a new sewage treatment plant, the North plant, scheduled to be completed by the end of 1998. The North plant is located in the Northern part of the city of Buenos Aires and is expected to be able to treat the sewage produced by approximately 400,000 inhabitants located in the district of Tigre, San Fernando, San Martin, and San Isidro.

#### *2.1.3 Tariff Structure*

- 2.10 The tariff structure is established in the Concession Contract and its amendments. Under the regulatory framework governing the Concession, the Company has the explicit right to earn sufficient revenues to: (i) recover its costs, (ii) cover the investments needed to achieve service improvement and expansion targets, and (iii) obtain a reasonable rate of return. The tariff structure is based on two major parameters: (i) the type of customer, of which there are three categories; residential, non-residential (industrial and commercial), and rural; and (ii), whether the service provided to the customer is metered or unmetered.
- 2.11 The original concession included, as part of the tariff, an "infrastructure charge" which was essentially a connection charge for new customers. The charge was Ps.600 for water and Ps.1000 for sewerage, paid over two years. However, since new customers are primarily from the lower economic strata, it was found they could not afford this charge. For this and other reasons, the GOA issued Decree 149/97 on February 14, 1997 which explicitly recognized the need to amend the Concession Contract to reformulate the infrastructure charge. After negotiations, it was decided to eliminate the infrastructure charge and replace it with (i) a new "Universal Service and Environmental Improvement Charge" (SUMA) and (ii) a "Service Incorporation Charge" (CIS). These new charges were put into effect by Decree 1167/97 of November 7, 1997.
- 2.12 The SUMA is to be billed every two months to every customer connected to the potable water network and/or the sewerage network. Based on the decree, it is capped at Ps.3 per bimonthly billing cycle. Its purposes are (i), for the SU portion, to finance the infrastructure improvements and the new connections required in accordance with the goals of the five-year expansion plans, through the collection of a fixed charge of Ps.2.01 for each service (to be revised every year by the Regulatory Authority until December 31, 2003, and every five years thereafter), and (ii), for the MA portion, to finance the additional investments required in accordance with PSI. The exact amount of the MA has not yet been determined, but since the SUMA maximum is \$A3 and the SU is \$A.2.01, the MA cannot exceed \$A0.99 per bimonthly billing cycle.
- 2.13 The CIS is a charge of Ps.120 billed to all new customers of the water and sewerage networks, billed over a period of 5 years at the rate of Ps.4 per billing cycle.

#### *2.1.4 Concession Company*

- 2.14 Eighty five percent of the shares of Aguas are owned by a consortium (the Consortium) formed by Lyonnaise des Eaux S.A. (LDE) of France (26.85%), Sociedad Comercial del Plata S.A. of Argentina (21.62%), Sociedad General de Aguas de Barcelona S.A. of Spain (12.73%), Meller S.A. of Argentina (5.33%), Banco de Galicia y Buenos Aires S.A. of Argentina (8.46%), Compagnie Générale des Eaux S.A. of France (7.74%), and Anglian Water plc of England and Wales (4.35%). The remainder 15% of Aguas equity is owned by its employees (7.8%) and IFC (5.12%).
- 2.15 As required under the Concession, Aguas entered into a management contract with Suez Lyonnaise des Eaux S.A. (LDE or Lyonnaise), under which LDE acts as manager and operator of the Concession. In April, 1997, LDE and the Suez Group merged to create Suez Lyonnaise des Eaux (SLE). The SLE group participates in the water, electricity, construction, and communication sectors, as well as in waste collection and treatment operations. Today, SLE is the largest water and sewerage company in the world and serves 29% of the French water and sewerage market. SLE operates with more than 175,000 employees worldwide. It supplies potable water to more than 72 million people worldwide and sewerage services to over 42 million. It operates under more

than 2,000 concessions or similar contracts. In Latin America alone, SLE is supplying water and sewerage services to more than 14 million people. It is present in Spain, the UK, the US, Italy, Southeast Asia, Latin America and Australia.

- 2.16 As of June, 1998, Aguas had approximately 4,400 employees of which approximately 94% were members of the Greater Buenos Aires Obras Sanitarias Workers Union. Since takeover, Aguas has reduced the number of employees through two programs, the voluntary personnel retirement program financed by the GOA and its own voluntary personnel retirement program. The GOA agreed to contribute up to a maximum amount of US\$37 million for this program. As of June 30, 1998, the combined total cost of the program was approximately \$A102 million, of which approximately 34% was paid by the GOA. By December, 1993, a total of 3,700 employees had opted into one of the two programs, thereby reducing the workforce by 50%. Aguas has recently established an early retirement program which offers employees that are within seven years of retirement an early retirement package. The Company expects that up to 500 employees will accept this offer over the next two years, resulting in savings to the Company.

## **2.2 Environmental Framework**

- 2.17 Various plans (documents) have been developed or actions have occurred which provide the environmental framework for the Concession Contract. A brief description of these is provided below.

### *2.2.1 Plan Director Cloacal*

- 2.18 Aguas developed the *Plan Director Cloacal* to improve wastewater collection and treatment in the Concession Area. The plan included key infrastructure developments, such as the construction of the new Planta Norte WWTP to provide secondary treatment for 1.1 million population, improvement in the Sudoeste WWTP to secondary treatment to serve population of 2.5 million, construction of the new Berazategui WWTP to provide secondary treatment to serve a population of 7 million, final sludge disposal by discharge to the Rio de la Plata via the outfall, followed by incineration later in the Concession period. Specifically related to the mentioned infrastructure, Aguas as part of the first five-year investments has performed the following (see Section 2.3 for complete description of investments): renovated the Sudoeste WWTP so that it now provides secondary level treatment for wastewater arising from a population of 400,000; and started construction on the Planta Norte WWTP with completion of the first module due in 1998 to treat wastewater arising from a population of 400,000 and the second module will be constructed in the third and fourth concession periods and will treat wastewater from 800,000 people.
- 2.19 In November 1993 Argentina became signatory to the London Convention on the discharge of wastes to sea which prohibits the discharge of wastes including sewage sludge. Consequently Aguas has had to revise its plans for sludge treatment and disposal. The first *Plan Director Cloacal* was modified as a consequence of Article 1 of the Agreement Act approved by Decree 1167/97 which sets out the general guidelines for the development of the *Plan de Saneamiento Integral* (see section 2.2.4). This allowed for modification of the first *Plan Director Cloacal* which was approved under Order 149/93.

### *2.2.2 Environmental Master Plan for the Matanza-Riachuelo-Matanza Drainage Basin*

- 2.20 An Environmental Master Plan for the Matanza-Riachuelo-Matanza Drainage Basin has been

prepared by a consortia of consultants on behalf of the *Comité Ejecutor Matanza-Riachuelo* (CEMR) which falls under the auspices of the *Secretaría de Recursos Naturales y Desarrollo Sustentable* (SRNyDS). The plan has been approved by the SRNyDS. While Aguas had no affiliation with the development of this Master Plan, a part of the Concession Area is located in the Matanza-Riachuelo basin. The Master Plan directs environmental management in the area in addition to any requirements in AASA's Concession Contract. The plan makes recommendations on the control of discharges to the Matanza-Riachuelo river, to which the Sudoeste WWTP discharges. Aguas has developed the PSI to comply with the plan's requirements.

### 2.2.3 *Plan de Mejoras y Expansión del Servicio*

- 2.21 The overall framework for planning Company development activities is guided through the five-yearly Improvement and Expansion Plans (*Plan de Mejoras y Expansión del Servicio - PMES*) which must be prepared every five years per the terms of the Concession Contract (PMES). The PMES focuses on the extension of water supply and sewerage networks and considers the capacity of existing infrastructure and surface assets, reinforcement of the assets to provide operational flexibility and security, and expansion of the system to provide for needs. These plans form the basis for forward planning to improve the security of the provision of services, protect infrastructure and reduce environmental pollution. Aguas commissions studies and specialist consultants to assist in the preparation of these plans, which are audited by the External Technical Auditors to the Concession.

### 2.2.4 *Plan de Saneamiento Integral*

- 2.22 The *Plan de Saneamiento Integral* (PSI) was required to meet changes in environmental legislation and current government guidelines on regional environmental management in the Concession area based on the Matanza-Riachuelo Environmental Management Plan which are not catered for in the Concession Contract. The PSI focuses on waste water collection, treatment and disposal and was developed based on guidelines established in July, 1997 and set out in the Agreement Act of Decree No 1,167/97. The PSI provides the framework for waste water management and provides basically a strategic environmental assessment for the Company's future waste water development plans. The PSI is based upon various studies performed and consists of four volumes.

- Document A: Executive Summary
- Document B: Main Document: Reference framework, engineering and environmental justification for the scheme; analysis of costs including the environmental monitoring program
- Document C: a separate audit by BVI on the remainder of the PSI document including a review of the environmental regulatory framework and comments on the diagnostic study and monitoring proposals
- Document D: supporting annexes on the characterization of effluents to be treated; details of the new pipelines required; details of the WWTP, sludge treatment plants and final disposal sites; outfall design and modeling; uses and water quality objectives of the receiving waters; a description of the environmental and social characteristics of the Concession Area; preliminary assessment of environmental impacts at the Planta Norte, Sudoeste, Planta Capital, Planta Doc Sud and Planta Berazategui WWTPs and sludge disposal sites with mitigation proposals; and water quality modeling of the receiving waters.
- Document E: First Phase Works

- 2.23 The initial PSI was submitted to the SRNyDS in April 1998. At the request of SRNyDS, the PSI

was analyzed by a consultant (Black and Veatch International) who produced an audit of the report presented as Document C: *Auditoria de la Memoria Tecnica y Evaluacion Estrategica de Impacto Ambiental*, in April, 1998. The SRNyDS provided additional comments on the PSI in May 1998. In September 1998, Aguas issued an additional document (Document E) to the SRNyDS to respond to the queries raised by them in May. The PSI has not yet been formally approved, however Aguas has stated that the SRNyDS verbally stated its approval. The PSI states that Environmental Impact Assessments (EIA) will be performed for the main components of the scheme, but does not specifically state which works.

- 2.24 As part of the PSI, an analysis of alternative was performed on four different issues: (i) preferred strategy to meet the new environmental (waste water) constraints, (ii) preferred location for the Planta Capital, (iii) design of the outfalls to the Río de la Plata, and (iv) phased enlargement of the WWTPs. Section 2.5 provides a description of these alternatives.
- 2.25 Under the PSI the two inland wastewater treatment plants, Sudoeste and Planta Norte, will treat a lower volume of wastewater than originally envisaged in the first *Plan Director Cloacal* with the effluent discharges to the inland rivers as before. A new interceptor sewer along the Río de la Plata will collect the dry weather flow from the most polluting streams entering the river and direct it to a new plant (Planta Capital) to be built near the mouth of the Río Matanza-Riachuelo. A second interceptor sewer will be built along the Riachuelo also to intercept dry weather flow from contaminated tributaries; intercept the 1st and 2nd Main Sewer and excess wastewater in the 3rd Main Sewer with all flows conveyed to Planta Capital. A new WWTP will also be built at Berazategui as before and the existing outfall will be extended. Sludge treatment will be provided at Sudoeste WWTP and Berazategui WWTP with on site disposal in dedicated landfill. The specific projects/works are listed below.
- Sudoeste WWTP. This plant is to be upgraded to provide nitrification to reduce ammonia levels and disinfection by ozone for the waste waters. The final discharge flow would be about  $2.0 \text{ m}^3/\text{s}$ .
  - Planta Norte WWTP. This plant was already under construction prior to the development of the PSI. The plans have been modified during the construction period so that only two of the original four modules will be constructed. This has meant that some features already under construction, such as the intake works, are over-sized for the revised estimates of effluent to be treated at the Plant. The final effluent discharge is estimated to be about  $1.8 \text{ m}^3/\text{s}$ .
  - Coastal Interceptor Sewer. A new interceptor sewer along the coast to intercept dry weather flow in streams and arroyos which carry a wastewater load equal or greater than 20,000 population equivalents (pe) and conveyance to a new WWTP located on the Río de la Plata (proposed Planta Capital)
  - Riachuelo Interceptor Sewer. A new interceptor sewer along the Río Matanza to intercept dry weather flow in streams and arroyos discharging to the river; wastewater flows in the 1st and 2nd Main Sewers; and alleviate flows in the 3rd Main Sewer and direct them to a new WWTP (Planta Capital).
  - Planta Capital WWTP. The Planta Capital will be located along the coast of the Río de la Plata in the City of Buenos Aires together. Effluent will be discharged to the river via a new 6 km outfall. Discharge is estimated to be  $17.5 \text{ m}^3/\text{s}$ . Short term sludge storage will be provided.
  - Berazategui WWTP and Outfall. A new WWTP (Planta Berazategui) will be constructed at the existing headworks of the Berazategui outfall. The outfall will be extended from 2.5 km to 7 km into the Río de la Plata. The WWTP will treat wastewater arising from 7 Million inhabitants by the Year 30. The plant will provide secondary treatment with effluent standards

of BOD5 30 mg/l and a discharge of about 17.5 m<sup>3</sup>/s.

- Sludge Treatment and Final Disposal. The sludge will be treated by thickening, stabilization through anaerobic digestion and dewatering by centrifuge and vapor drying. The sludge produced at Planta Capital and Berazategui may also be partially dried to reduce volume further for ease of transport. Sludge will be stored in the short term at dedicated landfill sites to be built on AASA land at the Sudoeste and Berazategui WWTP sites. In the longer term other sources of disposal will be considered.
- In the event agreement cannot be reached with the appropriate authorities regarding the location of the Planta Capital, consideration is also being given to the construction of a new sewer from the City to the existing Wilde pumping station (PS), extension of Wilde PS, and redimensioning of the Berazategui WWTP.

### *2.2.5 Environmental Impact Assessments*

2.26 Environment Impact Assessments (EIA) have been undertaken for the Planta Norte WWTP and the Sudoeste WWTP extensions. The Planta Norte WWTP is the first major new works to be planned and constructed by Aguas as opposed to construction of works inherited from OSN. During the project planning, it was found that the original site proposed by the national government under the Concession Contract was not available, and it was necessary to find another site. A location was identified in the San Fernando Municipality. The Municipality of San Fernando also required Aguas to undertake an EIA and obtain a Declaration of Environmental Impact as required under Decree 1741/96 implementing Law 11,459.

2.27 Aguas commissioned an EIA for the Planta Norte WWTP and the EIA was issued to the relevant authorities in late September 1998 (SNRyDS, the Province of Buenos Aires, the Municipality of San Fernando and ETOSS). The Planta Norte EIA was developed based on World Bank and Argentine guidelines and consists of seven volumes containing the following:

- A comprehensive description of the wider study area and site based on existing data and specially commissioned surveys
- A description of the proposed scheme
- An evaluation of the potential environmental impacts during construction and operation including air quality and water quality modeling studies
- Proposals for mitigation during construction and operation
- Commitment to prepare an Environmental Management Plan for the site to be based on ISO 14,000 series; an Operations and Maintenance Manual; and an Emergency and Prevention Plan
- An Environmental Monitoring Program for the Commissioning and Operation phases
- A Contingency Plan for fire prevention
- A Communications Plan to inform and maintain a dialogue with the local community and relevant national, regional and local authorities
- Supporting Annexes containing, data, modeling studies, plans, figures etc.

2.28 The legal and institutional framework governing the Planta Norte EIA, and in general to the Concession, is still not clear. For example, there is a disagreement at present between the San Fernando Municipality and the SNRyDS as to which organization has the authority to approve the EIA for Planta Norte. While neither SNRyDS or the Municipality have issued formal approval, the construction of Planta Norte has government approval since it was specifically required by the Concession Contract and by the Master Plan for the Reconquista Drainage Basin Sanitation Program which was also sponsored by SNRyDS via UNIREC and funded by the IADB.

- 2.29 Under Argentine law, the competent authority decides whether the EIA should be made available to the public and whether public meetings should be held. Regardless, Aguas has implemented separate measures to inform the affected public on the environmental aspects of the project (see Section 7).

### 2.3 First Five Years of Concession

- 2.30 Table 2-1 presents a summary of the main achievements and investments by Aguas since the Concession takeover date (Table 2-2 provides a summary of pre-takeover conditions). As of April 30, 1997, the end of the fourth year of the Concession (the Concession year was May 1 - April 30 until the amendment to the Concession Contract changed the concession year to coincide with the calendar year), the Company had met the following requirements under the Contract:

	Achieved by the Fourth Year	Concession Contract Goal for Fourth Year
Increase in population Connected to water Connected to sewerage	1,121,000 550,000	Exceeded by 83% Exceeded by 117%
Rehabilitation networks Water Sewerage	817km 180km	Exceeded by 103% Exceeded by 125%
Meters installed/replaced	250,000	Exceeded by 212%

- 2.31 The table below sets forth the expansion of the water and sewerage network and the population served by Aguas in the period between the takeover and June 30, 1998.

Water supply and waste services achievements	As of 5/1/93	As of 6/30/98	% Change
Total population (in thousands)	8,582	9,510	11
Population served in water	6,000	7,688	28
Length of water pipes (in km)	11	13,9	28
Population served with waste services	4,952	5,877	19
Length of waste pipes (in km)	7,210	8,630	19

### 2.4 Investment Plan

- 2.32 The overall framework for planning Company development activities is guided through the five-yearly Improvement and Expansion Plans (*Plan de Mejoras y Expansión del Servicio - PMES*) which must be prepared every five years per the terms of the Concession Contract.(PMES). In addition, this year the Company has also prepared the *Plan de Saneamiento Integral* (PSI) which is additional, and complementary, to the PMES. The PMES focuses on the extension of water supply and sewerage networks while the PSI focuses on improvements to wastewater collection, treatment and disposal.
- 2.33 The PMES second five-year investment plan will require up to US\$1.03 billion. The investment projections are based on annual GDP growth of 3%. The investment plan can be broken down into two different components: (i) expansion works, corresponding to new infrastructure representing approximately 50% of the Project investments; and (ii) rehabilitation of existing infrastructure, representing approximately 30% of the total Project investment. The capital expenditures that Aguas will undertake from 1998 through 2001, which cost will be partially covered with the proposed financing, are primarily in the rehabilitation and expansion of water and sewerage systems throughout the Concession area. The total cost of these works eligible for IDB financing is approximately \$360 million. The principle eligible projects/expenditures are:
- The rehabilitation of water and sewerage secondary system in the Federal capital southern parts of the concession area at an estimate eligible cost of US\$ 86 million.
  - The expansion of the water and sewage systems throughout the concession. For example in 1999 this expansion will connect approximately 143,000 people. Total eligible expansion costs are estimated at US\$ 125 million.
  - The rehabilitation and enlargement of the sewerage pumping stations, including Boca, Barracas, and Wilde.
  - The elimination of contaminated or potentially contaminated wells and the connection of these users to the network.
  - Infrastructure improvements at San Martin and Belgrano water treatment plants.
  - The construction of an underground canal between Saavedra and Morón, which is expected to be completed in the later half of 2000, enabling the western suburbs of the federal capital to be included in the water distribution network of the General San Martin plant. The canal is expected to cost approximately US\$240 million.
- 2.34 The PSI consists of additional environmental work representing a total investment of approximately US\$200 million over the second five-year period. The PSI environmental projects includes the cleaning of the Río de la Plata and its tributaries through the development of an interceptor network and the creation of a new sewage treatment facility (covering the needs of 2.3 million people equivalent). IDB eligible financing is approximately US\$ 80 million.
- 2.35 Associated with the PMES and PSI investments, the planned potable water and sewerage system access expansion targets in the federal capital and in the 13 towns of greater Buenos Aires are as follows:

<b>POTABLE WATER COVERAGE SCHEDULE</b>	<b>Year 5</b>	<b>Year 10</b>	<b>Year 15</b>	<b>Year 20</b>	<b>Year 30</b>
Federal Capital	100%				

North Buenos Aires Municipalities		91%	95%	98%	100%
South Buenos Aires Municipalities		82%	92%	96%	100%
West Buenos Aires Municipalities		85%	92%	95%	100%
<b>Total Concession Area</b>					<b>100%</b>

<b>SEWERAGE SYSTEM COVERAGE SCHEDULE</b>	<b>Year 6</b>	<b>Year 10</b>	<b>Year 15</b>	<b>Year 20</b>	<b>Year 30</b>
Federal Capital		100%			
North Buenos Aires Municipalities		83%	92%	98%	100%
South Buenos Aires Municipalities		59%	77%	92%	100%
West Buenos Aires Municipalities		59%	69%	76%	85%
<b>Total Concession Area</b>					<b>95%</b>

## 2.5 Alternative Analysis

2.36 As part of the PSI, an analysis of alternative was performed on four different issues: (i) preferred strategy to meet the new environmental (waste water) constraints, (ii) preferred location for the Planta Capital, (iii) design of the outfalls to the Rio de la Plata, and (iv) phased enlargement of the WWTPs.

### 2.5.1 PSI Strategies

2.37 Three overall waste water management strategies were analyzed in the PSI (these are reported in *Anexo III - Documento de Trabajo sobre Estrategías para el Saneamiento*).

1. The Basic Plan. The Basic Plan consists basically of the: (i) extension of the Sudeste WWTP to provide secondary level treatment to serve a population of 2.5 M people and discharge 8 m<sup>3</sup>/s to the Rio Matanza-Riachuelo; (ii) construction of the Planta Norte WWTP to provide secondary level treatment to serve a population 1.1 M people and discharge 3.6 m<sup>3</sup>/s to the Rio Reconquista; (iii) construction of a new WWTP at Berazategui to provide secondary level treatment to serve a population of 7 M people and discharge 25 m<sup>3</sup>/s to the Rio de la Plata; and (iv) disposal of sewage sludge to the Rio de la Plata for the first 15-20 years of the concession followed by incineration.
2. Strategy I - Interception and Transport. Strategy I involves reducing the capacity of the Norte and Sudoeste WWTPs and transporting excess wastewater towards the Río de la Plata where they would be treated at a WWTP at the mouth of the Riachuelo (Planta Capital) and Berazategui WWTP with final disposal of the effluent via outfalls.

3. Strategy II - Decentralized Treatment. Strategy II is aimed at minimizing the transportation of waste waters by providing a number of WWTPs. It involves maintaining the treatment capacity originally conceived for the Norte (1.1 M inhabitants) and Sudoeste WWTPs (2.5 M inhabitants), but treating the flows that were to be directed to the Sudoeste WWTP at four plants serving Sudoeste, González Catán, OSBA and Esteban Echeverría. The four modules would be constructed in phases at Planta Norte as originally intended. The Planta Capital and Planta Berazategui would also be constructed as for Strategy I.
- 2.38 The Basic Option was no longer considered appropriate by Aguas considering the changes in environmental requirements which have occurred since the beginning of the Concession (e.g., see Section 2.2). Strategies I and II would both cost considerably more than the Basic Option, requiring a re-examination of financing and the deadlines prescribed under the Concession Contract. The three strategies were submitted to SRNyDS for consideration who approved Strategy I. The Basic Plan was no longer acceptable as it did not meet the new environmental guidelines established by SRNyDS. Strategy II would have cost considerably more than Strategy I and would require agreements with sectors outside the control of SRNyDS.

#### 2.5.2 *Planta Capital Site Selection*

- 2.39 Aguas requested the City of Buenos Aires to recommend a site for a WWTP along the coastline within the City (Planta Capital). The city in turn requested complementary information on the WWTP for consideration so that the issues could be debated in a Public Audience prior to approval for the site under legislation. The City also put forward six options for the site which have been by Aguas and reported to the City in July 1998 in the document *Ubicación de la Planta Depuradora Capital (PDC)*. The six options are: A - Zona Ciudad Universitaria, B - Zona Portuaria, C - Reserva Ecológica, D - Obrador (lies in the Ecological Reserve where a construction fabrication site for the motorway construction is located), E - Dock Sud, and F - Parque J. Roca. Sites A-E lie along the coast from north west to the south east. Site E lies outside of the jurisdiction of the City of Buenos Aires. Site F lies inland on the Río Matanza-Riachuelo. Site B corresponds to the North Alternative, Sites C and D approximate to the Central Alternative, and Site E to the South Alternative which were evaluated for the outfall design (see section 2.5.3).
- 2.40 These options have been reviewed by Aguas in the light of environmental issues (access, landscape, compatibility with other land uses, odor and noise generation, recreation and ecology) and technical-financial issues (geotechnical conditions, topography of the wastewater collection system, impact on the potable water in-take works, and outfall location and impact on the receiving waters). A summary of the site advantages and disadvantages is presented in Table 2-4. Based on this analysis, Aguas identified two suitable sites D (Obrador) and E (Dock Sud), with the preferred site being D the existing construction fabrication site in the south east corner of the Ecological Reserve. No final decision has been taken at this time. The construction for Planta Capital WWTP is programmed for the 3rd five year period between the years 2008 and 2013. In the event that a site for the Planta Capital cannot be agreed, the infrastructure to be built at an early stage would allow additional flexibility to for an alternate location to the plant including the option to transfer all wastewater to a single outfall to be located at Berazategui.

#### 2.5.3 *Outfall Design*

- 2.41 Aguas has considered variations in the location and design of the outfalls from the new plants to be built along the coast of the Río de la Plata. The results are reported in the study *Prefactibilidad de*

*Ubicación de un Emisario en la Zona Costera de Capital Federal.* The evaluation of outfall location and design has been based on the effects of the discharged plume on water quality along the coast, and on the in-take works of the San Martín and Belgrano WTWs. An internationally known two-dimensional mathematical model MIKE 21 has been used to predict water quality in the Río de la Plata for different hydrodynamic conditions (winds, tides, water elevation) and outfall design. The modeling study was undertaken by EIH under the supervision of the Danish Hydraulic Institute (DHI) who developed the model. The following locations for the outfalls were modeled:

- North Alternative. WWTP located in Darsena Norte with an outfall extending 6 km to the coast to 1 km of the Emilio Mitre shipping canal.
- Central Alternative. WWTP located in or near the Ecological Reserve, La Boca (i) Option 1 with a 3.5 km outfall extending to the junction of the North and South shipping canals, and (ii) Option 2 with a 6 km outfall extending under and to 1 km beyond the Emilio Mitre shipping canal.
- South Alternative. WWTP located in Dock Sud (i) Option 1 with a 6 km outfall extending south of the confluence of the North and South shipping canals and (ii) Option 2 a 10 km outfall south of the confluence of the truck Access channel and Emilio Mitre.
- Berazategui. WWTP located at Berazategui with (i) a 5 km (ii) a 7 km, (iii) 8 km, (iv) 10 km outfall.

- 2.42 In each case diffusers were assumed to be located along the last 1500 m of the outfall to assist in dispersion and dilution. The North Alternative, Central Alternative (i), and South Alternative (i) and (ii) were run to simulate a four day period under ‘normal’ hydrodynamic conditions. The results suggested that the North Alternative would not affect the Belgrano in-take works although it may affect San Martín in-take works during onshore winds. The Central Alternative was likely to have the greatest effect on sedimentation in the shipping canals due to the relatively low current velocities in the area of the diffusers, and on water quality of the inshore waters due to proximity to the coast. Alternative South 1 has less effect on the shipping channels, but could affect the Belgrano in-take works under certain meteorological conditions. Finally, Alternative South 2 provided the best hydrodynamic conditions and is the furthest from the shore resulting in a low potential impact on shipping channels and the water in-take works. Central Alternative (ii) was modeled in conjunction with Option (i) for Berazategui for ‘normal’ hydrodynamic conditions and during a ‘sudestada’ (see Section 4 for description of this weather event). Under these scenarios the Central Alternative performed well with no impact on the water in-take works or inshore waters. However, the Berazategui outfall could affect the Belgrano in-take works during a sudestada. This impact was reduced for the 7 km outfall, and unlikely for the 8 km and 10 km outfalls.

#### 2.5.4 Phased Enlargement of the WWTPs

- 2.43 Aguas has considered options on phasing the construction programs for the WWTPs, in particular with Planta Capital. The basic model is to construct the plant in a series of modules, each one providing the full level of treatment for the discharge to be treated. The alternative is to construct preliminary treatment and an outfall in the first phase, increasing the level of treatment in each subsequent phase. According to Aguas, the second alternative provided environmental improvements more quickly while making efficient use of capital.

### 3.0 INSTITUTIONAL AND LEGAL FRAMEWORK

### **3.1 Institutional**

- 3.1 The *Ente Tripartito de Obras y Servicios Sanitarios* (ETOSS), created by Law 23.696/89, is the regulatory entity for the water and sanitation sector. ETOSS is an autonomous agency reporting to the SRNyDS and is formed by a tripartite agreement between the Nation, the Province of Buenos Aires, and the Municipality of the City of Buenos Aires. ETOSS is responsible for the regulation and control of the Aguas Concession apart from issues related to water contamination which were passed to SRNyDS under Art. 76 of the Regulatory Framework. The ETOSS' powers and duties include: (a) complying with and enforcing the regulatory framework and the Concession Contract; (b) monitoring Aguas by reviewing the reports required under the Concession Contract; (c) providing general notices of approved expansion plans and tariff schemes; (d) approving service improvement and expansion plans in the Concession area; (e) verifying compliance by Aguas with the approved improvement and expansion plans and the investment, operation, and maintenance plans proposed by Aguas, to efficiently meet service goals and expansion targets; (f) reviewing the annual report filed by Aguas and giving notice to the public of ETOSS' conclusions; (g) investigating customer complaints regarding inadequate service or excessive billing, and issuing decisions in connection with any such claims; (h) verifying the adequacy of revisions and adjustments to tariffs, and approving tariff schemes and prices for the services rendered by Aguas; and (i) imposing penalties established in the Concession Contract in the event of a default by Aguas in carrying out its obligations.
- 3.2 All aspects of environmental protection under the Concession Contract come under the control of SRNyDS, under the terms of Article 76 of the Regulatory Framework. SRNyDS is responsible for resolving any queries which are not covered in the regulatory framework or in the Concession Contract. They approve plans put forward by AASA, and should be responsible for authorizing EIAs. SRNyDS retains responsibility for the pollution prevention in receiving waters, with the exception of matters concerning the control of contamination which are the responsibility of the INAA.
- 3.3 The *Instituto Nacional del Agua y el Ambiente* (INAA) is a self governing body created in 1996 under the auspices of SRNyDS. INAA is responsible for exercising policing powers regarding water contamination.
- 3.4 The *Comité Ejecutor Matanza-Riachuelo* (CEMR) is an organization which has been centralized and incorporated within the auspices of SRNyDS. This institution is also based on a tripartite agreement between the Nation, the Municipality of the City of Buenos Aires, and the Province of Buenos Aires. The CEMR is a river basin authority, responsible for undertaking the Environmental Management Plan of the Matanza-Riachuelo river. Part of the Concession Area lies within this basin (catchment). As part of their Environmental Management Plan, CEMR has assessed the planning of the sewer expansion works and discharges to the river in general. CEMR is participating in the re-negotiation of the Concession Contract.
- 3.5 At provincial level, it is the Secretariat for Environmental Policy in the Province of Buenos Aires, and within the City of Buenos Aires, it is the environmental section of the City Government.

### **3.2 Legal**

- 3.6 The State Reform Law (Law No. 2.3.696 dated August 18, 1989) establishes the principles for Argentina's water privatization program. The regulatory framework governing the Project Concession (which was approved by the GOA pursuant to Decree No. 999/92) sets out the basic guidelines to ensure that the services provided meet the required quality and efficiency standards, and specifies the tariff structure and the rights and obligations of customers, service providers, and the GOA with respect to the Concession. The Company is also regulated by: (i) Law No. 13,577, as amended, which established OSN; (ii) the bidding documents for the Concession; (iii) the bid submitted by the Aguas shareholders in the tender; (iv) Decrees Nos. 2074/90, 14431/91, 2408/91 and 787/93; and (v) the Concession Contract. Aguas is required to cooperate with the GOA in the preservation of the public water supply.

### 3.2.1 Decree 999/92

- 3.7 The regulatory framework for the Concession set out in Decree 999/92 defined the administrative regulation of the various aspects of water supply and sewerage of OSN which were granted to AASA via Law 23,696 and includes the clauses listed below.

- Industrial effluents can only be discharged to sewer under consent from the Concessionaire.
- Connection of industrial effluent to the sewerage system can only be allowed if there is sufficient hydraulic capacity in the network
- Effluent discharge standards from the sewer system will be fixed by the SRNyDS, meanwhile those specified in the Concession Contract will apply for the time being (Decree 674/89).
- The environmental regulation of the Concessionaire and ETOSS will be determined by SRNyDS under the terms of Art. 76. The principal control is related to resolution 634/98 determining receiving waters on a federal district-wide basis. The SRNyDS approves all discharge requests.
- When infringements have been committed by the users which lead to contamination of water sources or prejudice the services and installations, the Concessionaire has to demand cessation of the infringement. In the case the discharge does not stop, the Concessionaire can ask ETOSS for authorization to remove the cause of pollution and apply to the courts.
- The Concessionaire has to abstract surface waters from national and provincial sources and groundwater to provide services required under the concession without limitation on volume or a charge.
- The Concessionaire has the right to discharge wastewater effluents to water sources without charge and in agreement with the standards in Chapter 6 of the Regulatory Framework
- The Concessionaire has to improve the wastewater treatment systems to meet the effluent standards.
- The effluents which the Concessionaire discharges to the receiving waters have to meet required standards (see section 3.2.4).
- The Concessionaire has to maintain, operate and register a regular and emergency monitoring regime for effluent discharges in different parts of the system.
- The Concessionaire has to receive discharges from tankers servicing industrial and domestic sites which meet appropriate standards.
- The Concessionaire has to undertake the analyses required to preserve the installations.
- Users have a right to drinking water quality established under the Concession Contract.
- Users can complain to ETOSS regarding any irregular conduct or omission on the part of the Concessionaire which could affect their rights, prejudice the services, or the environment.
- The Concession Contract does not include activities to control contamination and preservation of the water resources which in effect is the responsibility of SRNyDS (via the INAA).

### 3.2.2 *Concession Contract*

- 3.8 On April 22, 1993, by Decree 787/93, the GOA granted the Concession to Aguas. Pursuant to the Concession Contract, the GOA transferred to Aguas a tenancy in the land and fixed assets of OSN, as well as the existing OSN employees. The Concession Contract provides that title to any assets transferred, acquired or built by the Company shall remain in the name of the GOA, and that all such assets will revert to the GOA upon termination or expiration of the Concession Contract. The Company is permitted to bill and collect tariffs directly from its customers for providing water and sewerage services.
- 3.9 The Concession Contract calls for service improvements and expansion of the system, the objectives of which include the renovation of 45 percent of the existing 11,000 km water distribution network, the expansion of the 7,200 km sewerage network and the construction of a new water treatment plant, pumping stations, underground rivers, and sewerage infrastructure concurrent with the expansion. The Concession Contract requires that, prior to the end of the Concession period, (i) 100% of the population in the Concession area be connected to a water supply system, (ii) 95% of the population be connected to the sewerage system, and (iii) 100% of the sewerage collected by Aguas be effectively treated.
- 3.10 The Concession Contract was amended to provide for, among other things, a new tariff adjustment mechanism and the elimination of the infrastructure charge that had originally been assessed on new customers, but which many new customers, owing to their low income, could not afford to pay. The infrastructure charge was replaced by (i) a Universal Service and Environmental Improvement Charge (the "SUMA") established to finance infrastructure improvements, new connections to services, and investments required under the Concession's environmental plan, to be paid by all customers, and (ii) a Service Incorporation Charge to be paid only by new customers, which is substantially lower than the previous infrastructure charge. The amendments to the Concession Contract also included the expansion of Aguas' investment program to include (i) additional environmental projects in a "Plan de Saneamiento Integral" to be financed through the existing tariff and the new MA charge, (ii) the dollarization of the tariff, meaning that if legislation is promulgated which modifies the Convertibility Law, the tariff structure will be automatically revised to mirror such change and (iii) the settlement of all prior claims between Aguas and the GOA.
- 3.11 In April of this year, an Argentine court issued a preliminary injunction against the collection of the SU Charge (the Universal Service portion of the SUMA charge) based on constitutional grounds by the "Defensor del Pueblo" of Argentina. At such time, Aguas halted certain elements of its expansion program. The preliminary injunction was appealed by the GOA, and on October 15, 1998, an appellate panel lifted the preliminary injunction, permitting Aguas to collect the SU Charge pending the final resolution of the underlying constitutional challenge. As a result of the lifting of the preliminary injunction, Aguas intends to proceed with its postponed investments.
- As provided in Decree 149/97, Aguas is currently negotiating with the GOA concerning the terms of the second five-year plan of the Concession and with respect to the impact of its curtailment on investments during 1998 on its overall required infrastructure targets.

### 3.2.3 *Environmental Legislation*

- 3.12 The following are principal direct or indirectly related federal environmental legislation:

- The National Constitution (Article 41) grants all inhabitants the right to enjoy a safe environment suitable for human development and also requires compensation against environmental damages.
  - The National Civil Code prohibits the discharge of untreated wastewater to rivers in Argentina: OSN never had an implicit waiver to discharge untreated effluents.
  - Decrees 674/89 on industrial effluent discharges to sewer or receiving waters and 776/92 on policing powers. These decrees set out to control pollution of receiving waters and to protect sewerage installations and the sanctions regime for water contamination.
  - Law 24,051 on Dangerous Substances and its implementing Decree 831/93 govern the disposal of dangerous substances including wastewater and sewage sludge. Under Decree 831/93 the competent authority (now SRNyDS) had to establish uses and environmental quality standards for receiving waters within three years, extendable for another two years.
  - Law 24,089 on approval of the MARPOL Convention on the prohibition of the discharge of contamination from boats. This also prohibits disposal of waste water sludge to sea.
- 3.13 The following are principal direct or indirectly related environmental legislation of the Province of Buenos Aires:
- Provincial Constitution (Article 28) states that the population has a right to enjoy a safe environment, to be conserved and protected for future generations. The province is deemed to have prime control of the environment and natural resources within its jurisdiction. Everyone is obliged to take all measures to avoid degrading the environment.
  - Law 11,720 on the generation, handling, manipulation, storage, transport, treatment and final disposal of special wastes.
  - Law 11,723 on the protection, conservation, improvement and restoration of the natural resources and the environment. This law implements Article 28 of the constitution.
- 3.13 The principal project related environmental legislation for the City of Buenos Aires is the Organizational Statute on the Institutions of the City of Buenos Aires. This statute guarantees the right to health by satisfying needs for food, housing, work, education, clothing, culture and environment.
- 3.2.4 *Water Standards and Criteria*
- 3.14 The applicable waste water discharge standards for the Concession are listed in Table 3-1. However, Decree No 1,167/97 acknowledges that there is presently some confusion over the standards to be applied to wastewater (namely 674/89, 776/89, 999/92 and 831/93) and allows for the SRNyDS to assess and re-define, if necessary, the applicable standards.
- 3.15 Law No 2405, and its Regulation No 831/93, requires the SRNyDS to establish uses for surface waters, to determine water quality standards applicable for that use, and to grant discharge permits to ensure that the discharges do not prejudice the standard and use of the water body. The definition of uses for the Río de la Plata and Río Matanza-Riachuelo have recently been determined (August 6, 1998, the SRNyDS Resolution 634) as follows:
- Coastal fringe of the Río de la Plata - Water supply for human consumption with conventional treatment, protection of aquatic life and direct contact recreation. River water quality has to meet the appropriate standards required for these uses by the year 2008.

- Río Matanza-Riachuelo - (i) Upper catchment to Ricchieri Motorway: direct contact recreation, and (ii) Lower catchment from the Ricchieri Motorway to the mouth: recreation without direct contact. Water quality has to meet the appropriate standards required for these specified uses by the year 2003.
- 3.16 No uses were prescribed for the Río Reconquista due to a dispute as to which authority is responsible for prescribing uses.
- 3.17 Article 3 of the Resolution states that discharge permits to the receiving bodies mentioned have to take into consideration the uses, the environmental quality objectives and the environmental quality guide levels given in Decree No 831/93. This change in emphasis from prescribing effluent standards for discharges to receiving water, to setting effluent discharge standards on the basis of the assimilative capability of the receiving waters, has required a reconsideration of effluent discharge quality and quantity. This particularly affected the proposals for the Concession Sudoeste and Planta Norte Waste Water Treatment Plants.

### 3.2.5 *Environmental Impact Assessments*

- 3.18 There is no generic national Argentine law related to Environmental Impact Assessments (EIA), although there are specific laws requiring EIAs for certain types of projects such as the construction of reservoirs, hydroelectric dams, final disposal of dangerous residues and mining and waste water treatment plants (Law 24051, Art. 34, and Decree 831/93, Art. 34).
- 3.19 Provincial Law 11,723 on the environment requires an EIA for works or activities which produce or are capable of producing negative impacts on the environment of Buenos Aires or its natural resources. Annex II of the law identifies projects which qualify for an EIA including, at the Provincial level, administration of urban and suburban waste waters, distribution and treatment of water, and plants for the treatment and final disposal of dangerous wastes. In addition to those works listed in Annex II, the Municipality can require EIAs for other works. The EIA has to be submitted for evaluation to the Secretary of Environmental Policy of the Province for large projects, or to the Municipalities for smaller projects. The developer presents the EIA to the competent authority together with the project documents. The competent authority evaluates the EIA, makes available the publication of the EIA and receives comments from the public, and will organize a public audience if the authority considers it appropriate. The authority issues a Declaration of Environmental Impact either approving the EIA with or without conditions, or opposing the development. The authority is responsible for ensuring compliance with the monitoring and mitigation measures promised in the EIA.
- 3.20 The Organizational Statute of the Institutions of the City of Buenos Aires includes a clause to establish the obligatory evaluation of EIAs of all public and private projects and discussion at a public audience. Decree 1151/97 sets out the procedures for a public audience. The audience has to be convened through a decree published at least 20 days in advance. The public audience is presided over by the Head of Government or his representative and attended by local civil servants versed in the subject of the audience. The public audience is consultative by nature, and not linked to the decision-making process of the Executive Power. All those involved in the subject of the public audience can participate orally, but the general public have to make written representations and submit them to the President of the public audience.

### 3.2.6 *Health and Security*

3.21 Listed below are the main relevant health and safety legislation related to the Concession:

- Law 19,587 and its implementing instrument Decree 351/79 on hygiene and safety in the workplaces of the nation has objectives to (i) protect life, and preserve and maintain the well being of workers (ii) prevent, reduce, eliminate or isolate risks in the work place and (iii) stimulate and develop a positive attitude towards preventing accidents or illnesses. The law deals with minimum hygiene and security services, to institutionalizing health and safety in the work place, and investigating and reporting accidents and illnesses. This law applies to all places of work within Argentina. Decree 351/79 is the statutory instrument implementing the law. Decree 1,338/96 modified Article 5 of the law, requiring companies to provide medical, hygiene and security services in the workplace.
- Law 24,557 created the *Aseguradores de Riesgo de Trabajo* (ART) in 1997. Companies are required to take out private insurance against accidents occurring in the workplace to pay for the medical costs. AASA is a member of Liberty ART.
- Decree 911/96 is similar to Decree 351/79, but focuses on construction sites. A building contractor would have to comply with Decree 911/96, whereas a service provider would comply with Decree 351/79.
- Law 11,459 and its implementing Decree 1,741/96 are concerned with health and safety conditions in industries located within the Province of Buenos Aires. Every industry which comes under the scope of this law has to obtain a Certificate of Environmental Aptitude from the provincial authority or municipality.
- Law 11,720 on the use of protective equipment.
- There are also a number of local laws concerned with health and safety in the workplace. For example Buenos Aires Province has passed Resolution 231/96 on the use of compressors in the workplace. This law would only legally affect that part of the Concession Zone outside the City of Buenos Aires.

### 3.3 Project Compliance and Status

#### 3.3.1 Compliance

3.22 Aguas has stated that they are in substantial compliance with its investment obligations as of the end of the fourth year of the Concession, its legal obligations both with regards environmental and social legislation and the requirements set out in the Concession Contract. The principal areas of non-compliance are listed below (see section 5 for additional details):

- Deficiencies in drinking water quality occur mainly related to the supply system due to problems such as turbidity during renovations, insufficient residual chlorine, fluctuations in the crude water supply;
- Groundwater well supply exceeding water quality standards (over the period of the concession, these exceedances have decreased);
- Not all the contaminated groundwater supply wells have been taken out of service;
- Closure of Combined Sewer Outfalls required in the first five years has not yet been completed;
- Effluent discharges from the Sudoeste WWTP have exceeded allowable limits (these have been greatly reduced due to recent plant modifications);
- Limited non-compliance with effluent limits at the Berazategui outfall;
- Widespread non-compliance with industrial discharges to sewer (note: these have not resulted

- in significant exceedances of discharge standards at the Berazategui outfall).
- 3.23 The planned improvements in the Concession period set out in the investment program (PMES and PSI) will minimize these non-compliance's.
- 3.24 Aguas does not need permits to abstract water for supply or discharge effluent to receiving waters at present. The SRNyDS will likely be introducing discharge permits for in the future. Aguas has obtained the required authorizations regarding construction of works, such as change in land use, to develop a sludge disposal site, and on commissioning of works.
- 3.25 Aguas commissioned an Environmental Impact Assessment (EIA) for the Planta Norte WWTP and the EIA was issued to the relevant authorities in late September 1998 (SNRyDS, the Province of Buenos Aires, the Municipality of San Fernando and ETOSS) (see Section 2.2.5 for details on EIA). The legal and institutional framework governing the Planta Norte EIA, and in general to the Concession, is still not clear. Presently there is a disagreement between the San Fernando Municipality and the SNRyDS as to which organization has the authority to approve the EIA for Planta Norte. While neither SNRyDS or the Municipality have issued formal approval, the construction of Planta Norte has government approval since it was specifically required by the Concession Contract and by the Master Plan for the Reconquista Drainage Basin Sanitation Program which was also sponsored by SNRyDS via UNIREC and funded by the IADB. Under Argentine law, the competent authority decides whether the EIA should be made available to the public and whether public meetings should be held. Regardless, Aguas has implemented separate measures to inform the affected public on the environmental aspects of the project (see Section 7).

### 3.3.2 Status

- 3.26 The *Plan de Saneamiento Integral* (PSI) was initially submitted to the SRNyDS in April 1998. Aguas issued an additional document (Document E) to the SRNyDS to respond to the queries raised by them in May. The PSI has not yet been formally approved, however Aguas has stated that the SRNyDS verbally stated its approval. Once the PSI is formally approved, Aguas will initiate the required future works and studies (including EIAs).

## 4.0 ENVIRONMENTAL AND SOCIAL CONDITIONS

### 4.1 Environmental

#### 4.1.1 Setting and Location

- 4.1 The Concession Area is located on the south east coast of the Río de la Plata. It consists of the City of Buenos Aires and 14 of the surrounding 'partidos' of the Province of Buenos Aires. The four regions of the Concession Area consist of:
- The City of Buenos Aires
  - North Region - Vicente López, San Isidro, San Fernando and Tigre
  - West Region - San Martín, Tres de Febrero, Morón, Hurlingham, Ituzaingó and La Matanza
  - South Region - Esteban Echeverría, Ezeiza (formerly part of Echeverría), Monte Grande (formerly part of Echeverría), Almirante Brown, Lomas de Zamora, Lanús, Quilmes and Avellanada.

#### 4.1.2 *Climate*

- 4.2 The climate of Buenos Aires is humid sub-tropical with low winter rains and a prolonged warm season. A semi-permanent anticyclonic center in the South Atlantic, is responsible for the dominant winds from the north east. Wind velocities and the number of windy days is highest in the spring and lowest in autumn. Mean monthly temperatures vary by about 14°C over the year, with the lowest mean temperatures in July (10-12°C) and the hottest in January (22-24°C). Relative humidity is high all year, reaching maximum values in winter.
- 4.3 Persistent rain is brought by strong spring winds from the south and south east: the *sudestales*. Less frequently winds from the southwest, the *pampero* bring cold wet weather. Mean annual rainfall in Buenos Aires is 900-1000 mm. Rainfall distribution is bimodal with peaks in the spring (170mm in October) and summer months (100-120mm January-April). Drier conditions occur in winter months (45-50mm June-July) and in late spring (100-80mm in November-December).
- 4.4 Atmospheric conditions in Buenos Aires are dominantly neutral or unstable. Principal sources of air pollution are vehicle exhaust emissions. Levels of air pollution are below values for other South American cities, due to the onshore winds and atmospheric conditions.

#### 4.1.3 *Topography, Geomorphology, Geology*

- 4.5 The Concession Area is located on the low pampa of the northeastern plains of the Province of Buenos Aires. This can be divided into three morphological zones:
- The floodplain or low terrace. This comprises the lowest lying land in a narrow belt along the Río de la Plata and its main tributaries (Luján, Reconquista and Matanza-Riachuelo). This terrain is characterized by low gradients drained by meandering rivers with numerous abandoned channels and a relatively high water table.
  - The intermediate floodplain. This covers the greater part of the Concession Area. Relatively steeper slopes allow more rapid runoff and improved infiltration into the soils.
  - The high floodplain. This occupies the highest parts of the Concession Area mainly to the south west in Alte Brown. Low slopes favor ponding and there is poor hydrological integration with the rest of the catchment.
- 4.6 The Precambrian basement lies at about -286 m and comprises impermeable gneiss and granite. This is overlain by the Olivos Formation (-286 to -73 m) comprising Oligocene sandstones and conglomerates interbedded with mudstones, gypsum and limestones (-286 to -73 m), overlain by calcareous mudstones and gypsum. Miocene rocks of the Paraná Formation (-73 to -56 m) comprise medium to coarse quartzite sands overlain by plastic green-blue clays with ferruginous concretions. The Puelche Formation (-56 to -30 m) consists of Plio-Pleistocene sands, overlain by Pleistocene-Holocene sands, silts and clays.
- 4.7 Seismic activity in Argentina is classified into five risk zones from 0 to 4. Buenos Aires is located in Zone 0 - defined as a very reduced risk. Construction standards for each risk zone are determined by Regulation INPRES-CIRSOC 103 of November 1983.

#### 4.1.4 *Surface Water Resources*

- 4.8 The Río de la Plata, through its principal tributaries of the Paraguay, Paraná and Uruguay rivers, drains a catchment some 3.1 M km<sup>2</sup> extending from southern Brazil into Uruguay, Paraguay, and northern Argentina. In the area of Buenos Aires, the Río de la Plata is about 50 km wide, generally 2-5 m deep, and discharges about 20,000 m<sup>3</sup>/s. The Río de la Plata estuary is tidal, with a range of about 1m. Winds have a significant effect on water levels and circulation with strong winds changing water levels by up to +/- 1.2m. Sometimes the combination of the tides and *sudestal* winds creates high water levels in the estuary, causing flooding along the coast. Water quality of the Río de la Plata has been characterized through the *Franja Costera Sur* study. While much of the river water is of good quality, contamination occurs along the coastal fringe. The Río de la Plata is the principal source of drinking water for Buenos Aires, and the principal conduit for waste disposal. See Annex A for details on water quality.
- 4.9 The Río Reconquista rises outside the Concession Area flowing through rural countryside, passing into the more densely populated areas in the north of the Concession Area, and discharges into the Río Tigre, a tributary of the Río de la Plata. Middle and lower reaches of the river pass through a mixture of residential and industrial land uses. The area at the confluence with the Río Tigre lies near the delta of the Río de la Plata, and is an important tourism center, with clubs, facilities for water sports, recreation etc. The river is polluted with industrial and domestic wastewater discharges estimated to amount to one third of flow during low flow conditions. Domestic wastewater include untreated septic tank wastes, wastewater from the Bella Vista and Moreno WWTPs outside the Concession Area, direct wastewater discharges and inflows from contaminated streams. Industrial wastes include discharges from metallurgical industries, chemical industries, rubber manufacture, leather preparation, and slaughterhouses. The river is also polluted with solid wastes. See Annex A for details on water quality.
- 4.10 The Matanza-Riachuelo river is considered to be the most polluted river in the Metropolitan area. Its main use is to transport solid and liquid wastes: other uses such as navigation, sports, fishing, water supply are virtually non-existent. The upper catchment still drains rural land while the lower part of the rivers drains the most populated part of the study area with long established residential and industrial areas. The environment of the river is severely degraded with frequent abandoned industries, low quality housing lacking basic facilities and subject to flooding, and fly-tipping. See Annex A for details on water quality.
- 4.11 A number of small tributaries flow into the Río de la Plata along the Concession Area. Some of the larger ones are the arroyos Medrano, Irigoyen, Vega, White, Sarandí, Santo Domingo, and Giménez. Many of these streams have low natural base flows but carry domestic and industrial waste waters.
- 4.1.5 *Groundwater Resources*
- 4.12 The principal groundwater resource is the Puelche sub-aquifer, which is partially confined by the overlying clay and silt deposits. Transmissivity varies from 150 m<sup>2</sup>/day to 1200 m<sup>2</sup>/day. In the upper and middle floodplains, salinity concentrations are low to medium (usually 600 to 800 µmhos/cm) with low levels of chlorine and sulphates (10-30 mg/l), low total hardness (as CaCO<sub>3</sub> 50-80 mg/l) and sodium around 200 mg/l. Saline intrusion in areas of over-exploitation has caused an increase in salinity and water hardness. In the low floodplain areas, salinity increases from 5-20 g/l at the 'saline front'.
- 4.13 The Epipelche Subaquifer occurs in overlying Holocene sediments. It is present in several

(usually two) layers, and is largely unconfined. Hydraulic conductivity lies between 0.1 and 1 m/day, rarely reaching 5 m/day. The aquifer is only suitable for low rates of abstraction. Salinity ranges from 900 to 1500  $\mu\text{mhos/cm}$  below the intermediate floodplain to 2000 and 5000  $\mu\text{mhos/cm}$  on the low floodplain. In areas of over exploitation of the Puelche Subaquifer, part or all of the overlying Epipuelche Subaquifer disappears, but recharges on the cessation of pumping.

- 4.14 The Hypopuelche Aquifer is found in the lower Olivos Formation and the lower Paraná Formation, both of which are confined by the overlying strata. Little information is available on the behavior of this aquifer.
- 4.15 The Puelche Subaquifer is exploited for industrial use in Buenos Aires City and surrounding partidos. It is also exploited for human consumption particularly in the west (Tres de Febrero, Morón, La Matanza) and south (south of Lomas de Zamora, Monte Grande and Quilmes). The majority of the population in the Concession Area not served by AASA obtains drinking water from the Epipuelche subaquifer, with the remainder exploiting the Puelche subaquifer.
- 4.16 Residential wastewater discharges to wells have contaminated these resources with microbes, ammonia, nitrates, nitrites, and detergents. In industrial areas traces of chrome and organic solvents have been found. The Epipuelche Subaquifer is most severely affected, but the Puelche subaquifer has also been affected, particularly in areas of over pumping. Nitrates in the Puelche Subaquifer reach 150-200 mg/l in the densely populated areas of Buenos Aires City.

#### 4.1.6 Ecology

- 4.17 The natural vegetation of the Concession Area is subtropical savannah but most of it has been removed either through urbanization or conversion to pasture. Within built up areas there are a number of parks such as Palermo, with short, recreational grass, ornamental beds and trees. The Ecological Reserve in the port area is a stretch of low-lying land surrounding water bodies, providing semi-natural habitats for a variety of flora and fauna, particularly birds and coipos.
- 4.18 The naturally turbid Río de la Plata estuary supports species typical of soft substrate environments which feed off silts, muds, and detritus such as river clams (*Corbicula fluminea*) and the fish sábalo (*Prochilodus platensis*). The benthic fauna forms a significant component of the biomass in the estuary and is an important indicator of pollution. In areas of organic enrichment such as the Berazategui outfall, there is a particular assemblage of a small number of species. In some areas the benthic fauna has disappeared altogether. In coastal waters benthic fauna are dominated by shellfish of the *Corbicula* genera. These species were introduced from Asia in the 1960s and spread rapidly. The freshwater hard-substrate mussel *Limnoperna fortunei* is also an exotic species introduced from Asia at the beginning of the present decade. See Annex A for details on aquatic ecology.

## 4.2 Social-Economic

### 4.2.1 Population and Demography

- 4.19 The last Census, in 1991, reported the population of the total Concession Area at 9,100,259. This represents some 80.4% of the population in the Metropolitan Area of Buenos Aires and more than a quarter of the population of Argentina. The study area includes the greatest extent of urbanization and the highest population densities in the country. Almost a third of the population

of the Concession Area live in the city of Buenos Aires. A little over a quarter of the total population live in the west and southern regions, with only about 11% living in the northern zone. Some 30% of the population is located in the Federal Capital with mean population densities of 14,800 inhabitants/km<sup>2</sup>, reaching 34,500 inhabitants/km<sup>2</sup>. The partidos of La Matanza and Morón in the west and Lomas de Zamora and Quilmes in the south have lower densities. Population growth is described in Annex A.

#### 4.2.2 *Land Use*

- 4.20 Urban development has extended from the coast inland with few physical barriers apart from the river tributaries. Existing land uses reflect periods of expansion, infill and consolidation. The result is a mixture of commercial and residential or residential and industrial land uses (see Annex A).
- 4.21 Coastal land uses in built up parts of the Concession Area include port and associated uses, warehouses, residential development, sports facilities, the ecological reserve and two potable water treatment plants. In rural areas around the Berazategui outfall land uses include semi-natural vegetation, landfill organized by CEAMSE, and relict woodland.

#### 4.2.3 *Principle Economic Activities and Incomes*

- 4.22 The 1994 National Economic Census provides the most up-to-date information on the structure of the economy. The total value of production in the Concession Area is \$78,123,348,000. Over half, \$42,812,483,000 corresponds to Capital Federal with the highest proportion in the industrial sector (40.5%), followed by services (39.3%) and commerce (20.3%). In the Regions the industrial sector provides a much higher proportion of value (about 70-79%), with the commercial and service sectors providing similar percentages (10-15%).
- 4.23 The proportion of the economically active population (PEA) is similar across the Buenos Aires conurbation varying between 56-59%. Unemployment rates (as a proportion of the working population) also tend to be similar across the Buenos Aires conurbation and have risen from 7% in 1991 to about 20% in 1996 (this has since fallen to c14%).
- 4.24 The service sector accounts for the largest proportion of the labor force, with 42% of all jobs, compared to 33% in manufacturing and 25% in commerce. There is significant spatial variation, with services accounting for most jobs in Capital Federal (52%) and manufacturing accounting for most jobs in the West Region (52%).

#### 4.2.4 *Standard of Living*

- 4.25 The 1991 Census provides the main source of information on the standard of living. The indicator NBI (basic needs index) is an index of poverty based on five variables: deficient housing, more than three people per room (overcrowding), absence of bathroom with water discharge, presence of a child of school age who does not attend school, and more than four people per employed person and whose head of household has not completed primary education.
- 4.26 Using the NBI, the greatest concentration of poverty is in the southern zone (18.9%), followed by the north (15.2%), and west (14.7%) regions. The lowest level of poverty is the City (8.1%). This indicates that over 1 million people in the Concession Area are officially living in poverty. Data on income levels is provided in Annex 2.

- 4.27 The 1991 Census also provides information on water supply and sewerage in the house. In 1991, 56.3% of private houses had a piped water supply and sewerage, varying from 95.7% in Capital Federal to 25.2% in the South Region.

#### 4.2.5 Education

- 4.28 The 1991 Census records 26% of the population of the Concession Area had completed their secondary education, with the rate exceeding 40% in Federal Capital. Data from the *Encuesta Permanente de Hogares* shows that the highest socio-economic groups enjoy the highest level of education.

#### 4.2.6 Public Health

- 4.29 Data on public health is available from the *Dirección de Epidemiología de Ministerio de Salud y Acción Social de la Nación*. The latest data available relate to Capital Federal and the Province of Buenos Aires disaggregated into zones for 1996 and 1997. This shows that the incidence of infant diarrhoea is much lower for Capital Federal compared to the Province, but has increased slightly from 1996 to 1997 in both areas. It should be noted that such trends can be due to many factors, such as increased reporting, as well as a real increase in incidence.

Location	Reported cases of diarrhea in children less than 5 year old			
	Cases 1996	rate ‰	Cases 1997	Rate ‰
Capital Federal	12,085	35.3	14,049	41.1
Total for Province of Buenos Aires	88,640	82.20	91,210	84.6

- 4.30 There are few reported cases of typhoid fever, less than 1 per 100,000 in 1996 and 1997. The number of cases of hepatitis A are low, with rates of incidence of 45 per 0/0000 for Capital Federal and 68.6 per 0/0000 in the Province in 1997. Incidence of cholera is very low, with 2 cases reported in Capital Federal in 1997 and 26 cases in the Province of Buenos Aires.
- 4.31 Infant mortality rates are in the order of 19.6/1000 live births in the Concession Area, but range from 13.9/1000 live births in Capital Federal to 30.1/1000 live births in Avellaneda. The highest rates of infant mortality occur in the least developed areas.

#### 4.2.7 Waste Disposal

- 4.32 Practices for domestic and industrial waste collection and treatment have created a large number of environmental problems in recent years. The MANLIBA produces approximately 4 M T/yr of domestic waste and 0.9 T/yr of industrial solid and semi-solid waste. There are no systems for recycling domestic waste, which is disposed of to landfill sites organized by CEAMSE or to uncontrolled waste dumps, many along river courses or on land at risk of flooding. According to legislation, industrial solids and semi-solid waste have to be treated until it is innocuous, not harmful to health and will not alter further in the final disposal site. In fact, there is little control on the disposal and treatment of these wastes, except for those which, due to their toxicity, are disposed of by CEAMSE.

- 4.33 Industrial effluent discharged to sewer has to meet prescribed standards prior to discharge (see Table 3.1). To meet these standards industries often need to provide pre-treatment. However, an unknown proportion of industries make clandestine discharges to surface waters, the storm water drainage system and the sewer systems.

## **5.0 ENVIRONMENTAL AND SOCIAL IMPACTS**

### **5.1 Negative Impacts**

- 5.1 The description of potential negative impacts presented consists of an identification of any existing significant or major existing impacts or problems and a description of principal potential impacts that may result from the implementation of future projects. The impacts have been grouped into the following areas: water abstraction, water treatment, water quality, water supply and waste water collection, waste water treatment, and waste water discharges/outfalls. Many of the impacts presented may not be directly related to the projects, works, or activities (i.e., future activities) that will be financed by IDB, but are presented given the nature of the Concession and inter-relationships and similarities among the different projects, works, or activities.

#### *5.1.1 Water Abstraction*

- 5.2 The abstraction of water from the Río de la Plata has no significant impact on the volume of resource available, since daily abstraction of  $3.9 \text{ M m}^3/\text{d}$  is about 0.2% of the flow in the Río de la Plata (about  $1,728 \text{ M m}^3/\text{d}$ ).
- 5.3 Over-exploitation of some groundwater wells in the past has led to problems such as saline intrusion in coastal areas, disappearance of the Epipelche subaquifer, and increasing contamination of the Puelche subaquifer as contaminated waters from the Epipelche aquifer mixed with the Puelche subaquifer. However, this impact results from both Aguas ground water extraction and the effects of other (private, industrial) ground water wells and domestic and industrial discharges to groundwater via absorption wells. It is likely that some of Aguas activities of water supply and sewerage extension could be contributing to a net improvement in groundwater resources by reducing the reliance on groundwater supplies and discharges via septic tanks and absorption wells.
- 5.4 Aguas has had problems regarding the collection of debris around the in-take works for the two water treatment plants. A study was performed to identify sources of floating debris and found several locations where municipal waste was being dumped. This information was mapped and Aguas held discussions with the local authorities on controlling dumps.
- 5.5 The entrance of shellfish into the WTW has caused problems with treatment in the past. Shellfish colonization in the in-take pipes is currently controlled by chlorine dosing and in 1997 Aguas started a number of studies on larvae production, effects of pre-chlorination, and settling rates.

#### *5.1.2 Water Quality*

- 5.6 The main adverse social impact resulting from Aguas's current operations is related to public health concerns on the supply of drinking water. The crude water quality of the Río de la Plata

varies seasonally for some parameters, for example ammonia peaks in May, October and November. These peaks are higher in water abstracted from the Belgrano WTW than the San Martín WTW, possibly due to the proximity to pollution sources such as the Berazategui outfall and the tributaries along Avellanda.

- 5.7 Aguas has undertaken special monitoring campaigns to examine ammonia levels around the Belgrano in-take works. In 1997, 18 such campaigns were undertaken when ammonia levels exceeded 1.5 mg/l. They found that elevated ammonia levels tended to occur under certain meteorological conditions when water levels in the Río de la Plata fall following a period of strong south westerly winds. The winds artificially raise water levels along the Buenos Aires coast, impounding the discharge of the tributaries such as the Matanza-Riachuelo causing local flooding. When the winds fall, the river level of the Río de la Plata falls quickly, allowing contaminated waters from the tributaries to extend further offshore towards the in-take works of the Belgrano WTW.
- 5.8 During short term periods of high ammonia levels in the crude water at the WTW, chlorine dosing is increased automatically to break down the ammonia. As a result the residual free chlorine in the treated water may be low or zero due to consumption of chlorine in the treatment process. However, the total chlorine will be higher due to the presence of monochloramines formed by the reaction of free chlorine and ammonia which also act as a disinfectant. Any risk to human health is short term, occurring during a short period of particular hydrodynamic/water quality conditions in the Río de la Plata.
- 5.9 In areas served by groundwater supply, there are concerns related to the potential impact of the consumption of poor quality groundwater, particularly with regards to nitrates and salinity, and to a lesser extent microbiological quality, pesticides and organic compounds. An Audit (No AA/NS/98/012) by the External Technical Auditors for the Concession in September 1997 reviewed water quality data from 68 wells in the West Region out of some 235 wells operated by the Concession in August 1997. The main findings were:
- Some 46% of nitrate analyses of raw groundwater samples exceeded the standards for nitrate of 45 mg/l with a significant number exceeding 100 mg/l.
  - There were a small number of exceedances of bacteriological standards data (1.1% of samples analyzed for total coliforms MPN/100ml).
  - There were exceedances of pesticides and organic compounds (e.g., Total DDT (16% of samples analyzed), aldrin (19%), hexachlorobenzenes (19%), monochlorobenzenes (16%), 1,4 dichloro-benzenes (16%) and 1,2 dichlorobenzenes (16%)).
- 5.10 Other past problems include exceedances of arsenic (reaching values of 60 µg/l) due to natural present sources of arsenic and insufficient chlorination of well water. The potential health risks are greater in areas where groundwater quality cannot be improved by mixing with water from other sources.
- 5.11 Water quality data for the San Martín and Belgrano Raw Water WTW for the month of July 1997 illustrate the extent of potential pollution with total coliform values of about 9,500 and 12,500 NMP/100 ml and fecal coliform values of about 1,500 and 4,000 NMP/100 ml respectively. During the same period ammonia nitrogen varied between 0.6 and 0.05 mg/l for the San Martín WTW and 3.52 and 0.1 mg/l at the Belgrano plant.

### *5.1.3 Water Treatment*

- 5.12 The return of sludge and backwash water from the two water treatment plants to the Río de la Plata is considered to have a negligible impact on river water quality. Waste water returns are in the order of 126 m<sup>3</sup>/s. The returns have been analyzed and consist of material abstracted from the river (water, inorganic compounds, organic matter) and minor levels of chemicals added during the treatment process (aluminum and lime).
- 5.13 Some of the electrical transformers at the water treatment plants contain polychlorinated biphenyl compounds (PCBs).
- 5.14 There are potential risks associated with chlorine usage and general health and safety of the work force.
- 5.15 Miscellaneous wastes are generated at the plants, including screenings from pumping stations and laboratory wastes.

### *5.1.4 Water and Waste Water Supply and Collection*

- 5.16 There are potential public health issues associated with the lack of sufficient water for cleaning and sanitation in the poorer areas without a piped water supply.
- 5.17 In areas not served by the sewerage system, there are potential health hazards due to poor sanitation in the home and around the house. The drainage of wastes from septic systems (collection pits, absorption wells etc.), creates pollution of groundwater resources.
- 5.18 Wastewater is analyzed at forty monitoring points in the main sewers and manholes. Of the 540 samples analyzed in 1997, Aguas reported that 16.5% exceeded applicable limits, which is an improvement from 1994 when 56.1% of 221 samples exceeded the limits.
- 5.19 The renovation of existing drinking water and sewerage networks will have minor environmental and social impacts, including disposal of wastes such as grits and sludge from the pipes or sections of replaced pipe, need for short term cuts in water or sewerage services during renovation works, possible temporary reductions in water quality mainly due to the resuspension of sediments within the piped network, minor nuisances to local residents, and worker health and safety (e.g., confined space entry).
- 5.20 The extension of drinking water and sewer networks may result in the following environmental and social impacts: right-of-way access, land (soil, vegetation) disturbance, dust generation and air emissions, noise generation, soil erosions and storm water runoff, waste disposal, nuisances to residents, such as pedestrians and road users due to temporary severance or road closure, loss of access, noise, dust, dirt on the roads, and accidental spillage during pipe connections.

### *5.1.5 Industrial Waste Water*

- 5.21 AASA has a database of discharge effluent and register of industries. At present there are some 4,714 registered commercial discharges to sewer of which some 1000 are non-industrial sources such as restaurants, dry cleaners and hospitals. Aguas has analyzed more than 5,000 samples for routine monitoring of industrial waste waters in the first five years of the Concession. The degree

of compliance by industry to the standards for wastewater discharge to sewer is poor. In Year 5 of the Concession only 4% of 1,613 samples complied with the legal standards. Aguas has identified a number of reasons for non-compliance: some of the standards are very strict and not realistic; the economy has been depressed for some time with many industries unable to afford to invest in pre-treatment; small but highly polluting industries such as leather do not have sufficient funds to invest; penalties are low compared to investment and maintenance costs in pre-treatment; and there are no financial incentives for companies. Aguas offers training and advice on pretreatment to industry.

- 5.22 Industrial effluent discharges to sewer have to meet standards prescribed in Argentine legislation. Under the Concession Contract, Aguas has responsibilities for controlling the discharge of industrial effluent to sewer by permitting consents, monitoring effluents and imposing sanctions. Given that the majority of industry does not comply with the waste water discharge standards prescribed in Annex B of the Regulatory Framework, Aguas has actually awarded relatively few discharge permits to industry. The process for sanctioning industries has proved to be time consuming, but recently several industrial sites have had their discharge license revoked. These refer to particularly hazardous discharges such as cyanide and hydrocarbon.

#### 5.1.6 Waste Water Treatment

##### Existing Plants

- 5.23 The Sudoeste WWTP discharges about 1.5 m<sup>3</sup>/s of wastewater to the Río Matanza. No actual data on river discharge is available for this location, but assuming a width of 5m, depth of 1m and a flow of 1m/s gives a discharge of about 5 m<sup>3</sup>/s. Given the low flow volumes, and the appreciable contamination in the river already present from upstream discharges, there is little dilution of the wastewater in the river. The number of water quality samples exceeding the allowable limits has fallen from 100% of the 9 samples analyzed in 1994 to 56.0% of the 50 samples analyzed in 1997 and to almost 0% at the end of 1998. Following the recent improvements to the secondary percolators at the plant earlier this year, effluent discharge standards should improve considerably.
- 5.24 The effluent from the Berazategui outfall generally complies with the wastewater discharge standards. However, Aguas has recorded non-compliances (e.g., one exceedance of settleable solids in 1997, one exceedance for phenols, and two for pH in 1997 and 1998). The average discharge from the Berazategui outfall is approximately 22 m<sup>3</sup>/s. While this volume is small compared to the flow in the Río de la Plata, field studies and investigations have shown that there is a detectable plume of contaminated water around the outfall and inland along the coast of Avellanda where three particularly contaminating tributaries discharge - the Arroyo Vega, Río Sarandí and the Río Matanza-Riachuelo. This plume is most notable for bacteriological data, for example total coliforms reaches 1.0E+07 MPN /100ml. Ammonia nitrogen exceeds 0.5 mg/l near the outfall and falls to about 0.1 mg/l in less polluted waters. The discharge of sludge from the outfall has led to localized changes in sediment type, and benthic fauna found in the bottom muds. There is an increase in organic matter in the bottom sediments around the Berazategui outfall. However there seems to be little accumulation of heavy metals and other toxins in the muds around the outfall as indicated by very low concentrations of these parameters.
- 5.25 The Planta Norte WWTP construction is starting up. Impacts on the natural environment are limited in magnitude and area, and include minor changes in elevation to the terrain, minor changes in hydrology following land raising, storm water runoff pollution of the stream crossing the site

particularly from sediments, and minor disturbance to the Río Riachuelo during construction of the discharge.

#### Future Plants

- 5.26 Given the Concession timetable for project construction and implementation of waste water treatment works, only the Sudoeste WWTP extension and the Planta Norte WWTP have been completely assessed (i.e., EIA completed). Since governmental approval of neither the next 5-year investment program (PMES) or the environmental investment program (PSI) has been obtained, the final details related to the other projects are not defined and thus specific EIAs have not been developed.
- 5.27 Extensions to the Sudoeste will have limited environmental or social impacts. The surrounding land use consists of open fields, the Gral. Ricchieri motorway, a recreational center, and sludge receiving site. The recreational center near the entrance to the site attracts a large number of visitors, but seems to be little affected by existing operations at the plant. Access to the site is direct from the Gral. Ricchieri Motorway. Noise generated on the plant site is masked by traffic noise from the adjoining motorway. There have been odor problems, although this has been associated with the adjoining septic tank receptor site.
- 5.28 The general principal adverse impacts associated with the construction and operation of the proposed waste water treatment plants are: landscape impact, effects on future land use development in the surrounding area, potential for the production of odors, disturbance to residents from noise (e.g., due to 24 hr pumping, the flow of wastewater, movement of heavy goods vehicles delivering chemicals and carrying away sludge), and increased operational traffic potentially affecting local residents, and other road uses on the local road network.
- 5.29 Table 6-2 presents a summary of key environmental impacts and mitigations, based upon the PSI, for the Planta Capital or Planta Dock Sud Waster Water Treatment Plant (i.e., two sites are being considered) and the Berazategui Waste Water Treatment Plant and Outfall. These are also described below.
- 5.30 The Planta Capital WWTP preferred site, based upon the PSI, is located in the ecological reserve area currently used for the fabrication of concrete blocks for the new motorway. It is surrounded by the ecological reserve to the east and north, an ex-sports ground to the south and the South Coast Promenade to the west. Developers are interested in redeveloping the sports ground for high value residential use. This site is located in a sensitive environment from the social point of view and is likely to face opposition particularly on the grounds of impacts on landscape, amenity value, odors, and prejudicing redevelopment on nearby sites. Although construction and operation of the site will result in heavy vehicles on the main access roads, this may be little different to existing conditions as the site manufactures concrete components for the construction of the 9 July Motorway. The alternative site for Planta Capital at Dock Sud, located on the right hand bank of the Río Matanza-Riachuelo in an area of port-related commercial activities and large oil storage facilities. The natural environment in this area is greatly altered, although there are areas of relict, degraded riverine woodland. Overall the ecological value is considered to be low and of little conservation value. Therefore impacts on ecology are not considered to be significant. However, the poor ground conditions in this area could pose problems for construction from a geotechnical point of view and there are potential health and safety risks due to explosions and fires associated with the oil storage facilities. Access is already suitable for heavy goods vehicles with good access

from the City and the plant would generate an increase in heavy traffic. The potential impacts on landscape are low, again given the industrial setting. The site is already affected by noise and odor pollution given its location and AASA consider that the impacts of the site operations on the environment are unlikely to be significant.

- 5.32 The Planta Berazategui site is located at the head-works of the existing outfall to the south east of Buenos Aires where Aguas owns approximately 100 hectares between the Buenos Aires motorway and the coast. The terrain is low lying falling gently from about 14 m by the motorway to sea level, and is subject to periodic flooding. The site is rural in nature, covered with semi-natural vegetation including marshy vegetation, relict grasslands and relict degraded riverine woodland, which has been considerably altered and degraded by pasture. According to Aguas, the maximum known flood level is 15.91 m. The flood height with a 50 year return period is 15.69 m. Inundation of the plant and sludge storage facilities in particular could cause widespread contamination of floodwaters. Land raising to protect the facilities could also result in a worsening of flooding on surrounding low-lying areas. Sludge disposal on site would result in a change in land use, and potential to contaminate soils, groundwater and surface water from leachate and sludge. Tests on the sludge show that they contain some heavy metals, but would be suitable for disposal on agricultural land based on international practices/legislation. In the absence of national legislation governing disposal to land, the treated sludge will be initially disposed at dedicated landfill sites. The rural location for Planta Berazategui implies relatively low impacts on the human environment. Some ten squatters or *intrusos* have built poor quality houses on Aguas's land along a strip of slightly higher terrain adjoining the river and head works and there is a small settlement to the south of the site. The squatters would probably have to be relocated to construct the works and further mitigation would be required to reduce impacts on the settlement. Some families use the access road to the site to visit the river side for recreation. This is not a suitable place for bathing given the extent of contamination of coastal waters in this location, and people should be discouraged from doing so. Movement of heavy vehicles to the site is unlikely to have significant impacts on road users given the good access from the Buenos Aires motorway. There are potential health and safety issues concerned with the sludge treatment and final disposal, for example, handling sludge, leachate and gas control.
- 5.33 The construction of new outfalls may result in the following environmental and social impacts:
- The temporary deterioration in water quality particularly with regards turbidity. To some extent this is offset by the naturally turbid conditions of the estuary, however dredging of fine clay sediments can create extensive plumes which may affect the quality of water at in-take works.
  - There will be some loss of benthic ecology along the working width during construction. However the fauna is not particularly rich and the outfall corridor would be recolonized. Mobile organisms such as fish would avoid the area if conditions were unfavorable.
  - There is a potential risk of diseases in fauna from toxicity of contaminants or microbes in the effluent although the effect should reduce significantly with increased treatment and disinfection.
  - Potential risks of worker accidents during construction.
  - Distribution to shipping during construction should be relatively low for the Berazategui outfall as it does not cross the international shipping lines. There is a greater potential impact for the Planta Capital site which is closer to the main port and shipping lines.
- 5.34 Water quality modeling of the performance of the outfalls shows the behavior of the discharge

plumes over tidal cycles for different weather conditions. The plumes of contamination for the preferred designs are unlikely to affect the water in-take works or shoreline.

#### 5.1.7 Receiving Water Quality

- 5.35 Aguas has undertaken a number of diagnostic studies to evaluate existing water quality of the Río de la Plata in order to design and implement mitigation measures and longer term engineering solutions for environmental clean up.
- 5.36 In 1989, the *Franja Costera Sur* Study (FCS) was initiated with the support of OSN, the *Administración General de Obras Sanitarias de la Provincia de Buenos Aires* (AGOSBA) and the *Servicio de Hidrografía Naval* (SHN) to undertake a diagnostic study of the water quality of the Río de la Plata. In 1993, Aguas decided to continue its involvement replacing OSN, and other research organizations participating in the scheme.
- 5.37 A water quality monitoring program was developed for the coastline between San Fernando and Magdalena and up to 10km offshore. Three water quality programs were initiated: offshore waters along transects and at different depths, inshore recreational waters and the main discharge points. Aguas has prepared a database containing all the measurements carried out from 1989 to 1995 inclusive, with plans to update the database for the last two years in 1998. The database contains physio-chemical, biological, meteorological, tidal and flow rate data. Various maps have been produced to show the spatial variations of the water quality parameters monitored. Data from the period 1994-1995 was published by the Permanent Council Controlling South Coastline Water Quality.
- 5.39 Aguas has evaluated the proportion of contamination in the receiving waters which could be attributed to their wastewater discharges and other sources of contamination. An inventory was prepared of drainage channels and known discharges to the Riachuelo, Reconquista and Río de la Plata based on aerial photography, aerial film footage, and land-based inspections. Observed discharges were categorized according to their importance, sampled to evaluate discharge quality and flow rate, and mapped. Between 1994 and February 1997 a total of 76, 55 and 29 discharges were identified entering the Río de la Plata, Riachuelo and Reconquista respectively. The BOD load from all the discharges to the main rivers was estimated. On this basis, the sewer system was estimated to contribute 38.4% of the BOD load (225,5 tn/d) compared to the storm water drainage network (268.9 tn/d) and discharges outside the limits of the Concession (93.5 tn/d). This shows that while AASA is a significant polluter of surface waters, there are major contributions from other sources.

## 5.2 Positive Impacts and Benefits

- 5.40 The project will bring important socio-economic benefits for households served by the water and wastewater systems which will be installed (new users) or which will be maintained (i.e. not lost over time) for existing users (See Table 2-1). Many of the new hookups will be for households in the lower socio-economic strata. The availability of direct pipe connections to bring water to residences, eliminating the need to obtain water through deliveries or by trips to a central spigot, brings a degree of modernity which is so important that it is no longer thought of simply as a convenience but is universally viewed as a precondition for an acceptable quality of life. The expense and/or drudgery of obtaining water by an alternative means will be eliminated. The availability of direct connections to the sanitary sewer network will have very important public

hygiene and environmental benefits. In addition to the convenience afforded by these direct connections, water and sanitation service facilitates improved personal hygiene and leads to a significant improvement in public health. As such, there is a large direct economic impact (reduction in medical costs and improved mortality) as well as indirect economic impact (increased tendency for local development of commerce and industry). Aguas has developed a connection charging procedure which provides financing over a 5 year period with very low bimonthly payments (maximum of 4\$) to enhance the accessibility for persons. Property values are also greatly enhanced by the provision of public water and sewerage services.

- 5.41 Similar benefits as those noted above will be also captured by persons who are already served by the water and/or sewage system, as a result of the project investments, because those investments will prevent the loss of benefits which would otherwise occur in the "without project" condition as the existing system loses its capacity to perform the necessary service.
- 5.42 The implementation of the investments would have a major impact on decontaminating the water resource environment in the City of Buenos Aires. It should lead to significant improvements in the quality of the receiving waters, including the Reconquista, Matanza-Riachuelo, Río de la Plata and storm drainage channels. This in turn would assist in the recovery of the aquatic life of these waters. The scheme should promote the protection of surface water resources by controlling and treating wastewater. In the longer term, increased wastewater treatment could lead to the reuse of sludge or biosolids as a resource in agriculture.
- 5.43 The works will improve the flexibility of wastewater transport via new pipelines so that waste waters can be diverted during main sewer repairs. This would help to reduce the risk of emergencies such as the 3rd Main Sewer incident.
- 5.44 Aguas has been involved in the re-habilitation of three urban recreational lakes, the Regatas Lake and Paseo del Rosedal Lake in Palermo Park and Coipos Lake in the Ecological Reserve. The programs for these environmental enhancements lie outside the requirements of the Concession Contract. The rehabilitation program involved activities such as improving water quality by introducing water to the lakes (from the Belgrano WTW in the case of the lakes in Palermo and groundwater wells for the lakes in the Ecological Reserve), closure of clandestine discharges to the lakes, removal of excessive weed growth and solid waste.

## **6.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT**

- 6.1 The basis for the environmental and social management of the Aguas operations and activities consists of the following components:
  - Implementation of various control and mitigation measures related to both existing and future works (see Section 6.1), and in addition many of the future works will actually result in improved environmental and social conditions (e.g., see Section 5.2 and 2.4);
  - Implementation of various environmental monitoring programs, including water quality, waste water, and for future works (see Section 6.2);
  - Implementation of Contingency and Emergency Response plans and procedures (see Section 6.3);
  - Implementation of health and safety programs, procedures, audits, and training (see Section 6.4); and

- Implementation of environmental management system components, including training (see Section 6.5), staffing and definition of responsibilities (see Section 6.6.3).

## 6.1 Control and Mitigation Measures

### 6.1.1 Water Abstraction

- 6.2 Aguas implements various measures to protect the quality of water entering the two water in-take works on the Río de la Plata for the San Martín and Gral Belgrano WTW, including:
- the in-take pipeline and tower at the San Martín plant has been extended;
  - the Prefecture (coastguard) warns Aguas of pollution events (e.g., dredging, shipping accidents);
  - Aguas also receives warnings from third parties;
  - Aguas uses floating barriers to place around the in-take towers during emergencies;
  - the fresh water mussel *Limnoperna fortunei* which colonizes raw waterpipes for the WTW plants are controlled with chlorine dosing, when required;
  - the grids on the in-take works periodically clog with floating debris which is removed by divers;
  - Aguas has used water quality modeling as a tool to evaluate the impacts of other operations (e.g., dredging on the water quality entering the intake works to bring pressure on third parties to alter their operations); and
  - Aguas undertook a study to identify sources of floating debris and found several locations where municipal waste was being dumped. This information was mapped and Aguas held discussions with the local authorities on controlling dumps.
- 6.3 In the longer term, the implementation of the PMESs and the PSI will help protect water resources from pollution by reducing the number and location of uncontrolled industrial and domestic wastewater discharges to surface waters, providing treatment to secondary level, and reducing groundwater contamination by the extension of sewerage systems.

### 6.1.2 Water Treatment and Distribution

- 6.4 Crude water from the Río de la Plata is generally of acceptable quality for drinking water following the conventional treatment as presently performed. Drinking water quality standards are maintained by:
- operating and maintaining the WTWs according to procedures prescribed in Operation and Maintenance Manuals;
  - monitoring water quality of the crude and treated water as it passes through the plant and adjusting chemical dosing automatically in response to fluctuations in water quality; and
  - health and safety risks associated with the operation of the plant are controlled by plans, procedures and membership of the ART scheme (see Section 6.4).
- 6.5 Over the last five years AASA has improved the capacity of the San Martín and Belgrano WTWs, and the level of water quality treatment to improve the quality and security of supplies. The chlorination systems in the WTWs (and WWTPs) have been overhauled to improve dosing and safety for the workforce. Neither the San Martín nor the Gral Belgrano WTW are sufficiently large to supply the whole Concession Area in the case of failure of one of the plants. However,

through the PMES, Aguas is improving the flexibility of the distribution of treated water. The Company also has capability to supply water using a fleet of tankers in the case of a localized emergency.

- 6.6 Aguas has undertaken diagnostic studies of the groundwater aquifers in order to develop rationale strategies for the exploitation of this resource. Aguas has characterized the groundwater that is abstracted from several hundred wells and which serves approximately 7% of consumers, and is aware of pollution problems, particularly due to nitrate and salinity. In the first five years of the Concession, Aguas has taken many of the worst contaminated wells out of service. Water from these contaminated wells is mixed with cleaner water (e.g., from surface water sources or uncontaminated wells) in order to improve overall water quality. Aguas is currently building a major distribution main (the Villa Adelina-Morón-Tres de Febrero Río Subterráneo) which will enable replacement of groundwater with surface water supply in one of the more contaminated groundwater areas. Under the Nitrates Plan, Aguas is also building other new distribution systems to allow mixing of ground and surface waters to improve water quality. These activities have resulted in a demonstrable decrease in non-conformities in water quality in the wells and distribution systems.
- 6.7 The following are the principal measures used to control and minimize impacts due to routine rehabilitation and expansion works:
- The Company informs the local public in advance of the proposed works (see section 7) in order to maintain good relations with the public and reduce potential inconveniences due to water shortages, road closures, etc. In the case of prolonged water shortage, the Company provides water via its fleet of water tankers. The Company has also prepared special brochures to guide people on procedures to connect households to the water supply/sewerage network.
  - The equipment used to clean pipe networks was selected to minimize the area for above ground support and associated nuisances to road users and pedestrians. The system consists of a covered container installed above ground near a manhole, and an extension which is lowered into the pipes to dislodge debris and vacuum it into the container.
  - Routine operation and maintenance activities are performed based upon applicable health and safety and emergency plans and procedures.

#### *6.1.3 Control of Industrial Discharges*

- 6.8 Industrial effluent discharges to sewer have to meet standards prescribed in Argentine legislation. Under the Concession Contract AASA has responsibilities for controlling the discharge of industrial effluent to sewer by permitting consents, monitoring effluents and imposing sanctions. ETOSS resolution of 166/95 sets out procedures to be followed by industry in order to obtain sewage discharge permits operated by AASA. These permits require the following: (i) a study of the hydraulic feasibility of receiving the discharge volume that the industry wishes to discharge; (ii) submission of drawings of the industry's facilities for water, sewage and storm water networks to verify that these systems operate separately; (iii) a copy of the drawing and calculation sheet regarding the pretreatment facilities provided on site and approved by the SRNyDS; and (iv) results of wastewater sampling by AASA to check that the wastewater meets the required standards. These procedures have been audited by the External Technical Auditor to the Concession and found to be acceptable.

- 6.9 Aguas has a database of discharge effluent and register of industries. At present there are some 4,714 registered commercial discharges to sewer of which some 1000 are non-industrial sources such as restaurants, dry cleaners and hospitals. Industrial effluent discharges are controlled by a monitoring program administered by Aguas (see section 6.2.2). When industries exceed their discharge standards, Aguas informs the industry requesting them to correct the situation, as well as ETOSS and SRNyDS. In some cases industries have been closed down, particularly for those discharging cyanide.

#### *6.1.4 Control of Septic Tank Discharges*

- 6.10 Aguas has implemented a rigorous system to control septic tank discharges the Aguas reception sites at Sudoeste WWTP or Wilde PS. The system includes: purchase of tickets in advance, completion of waste manifest, authorization from Aguas personnel, and real-time analysis of waste water quality prior to discharge. The sample of the wastewater is taken from the tanker and is analyzed at an on-site laboratory for compliance with prescribed effluent standards. Each sample is tested for pH, sulfur, temperature, chromium, cyanide, lead, hydrocarbons and sedimentable solids (in 10 minutes) using simple quick methods such as a pH and temperature probe, visual observation (hydrocarbons), and colourmetric tests. Two further analyses are undertaken to complete the records (arsenic and COD). These procedures have been audited by the External Technical Auditor to the Concession and found to be acceptable.

#### *6.1.5 Wastewater Treatment*

- 6.11 The Sudoeste WWTP is operated and maintained according to procedures prescribed in the Operations and Maintenance Manual. The program for routine maintenance tasks is computerized, with maintenance tasks linked to the cumulative operational time of the pumps. The treatment performance is checked via a monitoring program (see Section 6.x). and the performance of the WWTP is also checked independently by ETOSS and the External Technical Auditors to the Concession. In terms of expansions, landscape and visual impacts should be reduced by planting a vegetation screen along the motorway. Planting should also be considered along the other boundaries. Mitigation measures to reduce noise will include controlling vehicle movements on and off site and noise insulation. Additional odor mitigation is not considered necessary.
- 6.12 Aguas commissioned a comprehensive environmental impact study for the Planta Norte WWTP. The EIA was developed based on World Bank and Argentine guidelines and consists of seven volumes containing the following:
- A comprehensive description of the wider study area and site based on existing data and specially commissioned surveys
  - A description of the proposed scheme
  - An evaluation of the potential environmental impacts during construction and operation including air quality and water quality modeling studies
  - Proposals for mitigation during construction and operation
  - Commitment to prepare an Environmental Management Plan for the site to be based on ISO 14,000 series; an Operations and Maintenance Manual; and an Emergency and Prevention Plan
  - An Environmental Monitoring Program for the Commissioning and Operation phases
  - A Contingency Plan for fire prevention
  - A Communications Plan to inform and maintain a dialogue with the local community and relevant national, regional and local authorities

- Supporting Annexes containing, data, modeling studies, plans, figures etc.

6.13 Aguas is committed to implementing mitigation measures and an environmental monitoring plan. Some of the mitigation measures were incorporated into the design of the plant (noise insulation, odor control, use of methane in generating electricity, treatment of waste waters to secondary level) while others were implemented during construction (tree planting around the site, selection and agreement of access routes for vehicles with local residents etc). Aguas also provided 'enhancements' to the local community such as leveling a football pitch and filling in potholes on the access roads. The Company is also committed to preparing a number of documents to improve the environmental management of the plant. The monitoring proposals cover wastewater quality, air quality and noise.

6.14 Aguas has performed extensive water quality monitoring and modeling to assess the impacts associated with waste water discharges (e.g., see Sections 6.2 and 5, respectively, for details).

#### 6.1.6 *Solid Waste Disposal*

6.15 Aguas routinely disposes, in accordance with Argentine law, solid wastes generated from operations, including grit and sludge from sewers, sludge from WTWs, screenings and sludge from the Sudoeste WWTP and Wilde PS, excess oils and greases, used laboratory chemicals, and hazardous waste. Screenings from wastewater treatment and solid chemicals from the laboratory are disposed at landfill sites managed by CEAMSE. Sludge from drinking water treatment and wastewater treatment are discharged to the Río de la Plata at present, although with the implementation of the PSI, the wastewater treatment sludge will be disposed at the sites (e.g. secure cells) to be developed at the Planta Berazategui and Southeast. Waste petroleum products and hazardous materials are disposed of using companies authorized to transport and dispose of such materials. By the end of 1997, Aguas reported an 85% reduction in used oil stocks inherited from OSN. Aguas keeps records of the types and volumes of wastes arising during its operations and the disposal routes.

6.16 Aguas is currently developing a program to replace and eliminate transformers containing PCBs. The program is assessing feasible methods for the appropriate use of authorized companies for the removal, transportation and disposal.

6.17 Aguas has replaced extinguishers containing Halon (which are affected by legislation on CFC use).

#### 6.1.7 *Emergency Mitigation Measures*

6.18 During the emergency caused by the failure of the 3rd Main Sewer, Aguas put into effect a number of temporary environmental protection measures. These included deviating the wastewater from the sewer to a storm drainage channel, placing bar screens on the exit of the sewer to screen debris, placing floating barriers around in the storm outlet to the Riochuelo river, and collecting solid and floating debris. They also undertook river water monitoring and water quality modeling to assess the impact of the incident on the water quality of the river.

#### 6.1.8 *Environmental Protection for New Projects*

6.20 Environmental protection for new projects is based upon the following:

- Development and implementation of Environmental Impact Assessments for major projects, in conformance with Argentine legislation and multilateral financial institution guidelines;
- Incorporation into the project design specific environmental protection equipment and measures, such as pipe cleaning equipment to minimize above ground activities and associated nuisances, noise control and reduction, odor control, landscaping, etc.;
- Requirement for construction contracts to include specific measures and procedures related to environment, health and safety protection, including dust and soil erosion control, re-habilitation of work area, etc.;
- Implementation of activities to inform the public in advance of the planned projects/works (see Section 7);
- Implementation of numerous written Operation and Maintenance Manuals which describe appropriate measures for environmental management (e.g., waste collection, storage, and disposal at authorized sites; proper use of chemicals; etc.);
- Implementation of various monitoring programs (see Section 6.2, especially 6.2.3);
- Implementation of health and safety and emergency response plans and procedures (see Sections 6.3 and 6.4);
- Implementation of environmental, health and safety audits of both construction and operation activities by both internal Aguas staff, External Technical Auditors of the Concession, and external insurance auditors (see Section 6.5); and
- Presence of trained environmental, health and safety Aguas personnel (see Section 6.6).

6.21 Since governmental approval of neither the next 5-year investment program (PMES) or the environmental investment program (PSI) has been obtained, the final details related to many projects are not available. Thus specific EIAs have not been developed for the major projects to be performed. However, Table 6-2 presents a summary of key environmental impacts and mitigations, based upon the PSI, for the Planta Capital or Planta Dock Sud Waster Water Treatment Plant (i.e., two sites are being considered) and the Berazategui Waste Water Treatment Plant and Outfall.

## **6.2 Monitoring Programs**

### *6.2.1 Drinking Water*

6.22 The minimum requirements for drinking water quality monitoring are defined in the Concession Contract and Regulatory Framework and is summarized in Table 6-3. The quality of crude water entering the WTWs and the treated water leaving the WTWs are monitored automatically for pH, turbidity, ammonia and residual chlorine. Point samples are also taken at various stages of the treatment process at 2 hour or 8 hour periods depending on the parameter to be monitored. Water in the distribution system is monitored at some 400 sampling points.

6.23 Water quality in groundwater wells is analyzed for up to 70 parameters. The suite of parameters analyzed is greater in areas where contamination is known or expected. Frequency of monitoring depends on the usage of the ground water well.

### *6.2.2 Wastewater and Sludge*

6.24 The minimum monitoring programs for wastewater discharges are defined in the Concession Contract. The waste water quality standards are provided in Table 3-1. All the parameters indicated in the standards have to be analyzed three times a year in the case of wastewater

discharges to sewer and twice a year with regards wastewater discharges to receiving waters. At present there are two wastewater discharge points: the Sudoeste WWTP which discharges to the Río Matanza-Riachuelo and the Berazategui outfall which discharges to the Río de la Plata.

- 6.25 Wastewater influent and effluent is analyzed at the Sudoeste WWTP. Effluent quality is sampled automatically at 5 locations throughout the plant every hour. The locations are, (i) the screened effluent, (ii) in the divider before the primary sedimentation tanks, (iii) the exit from the primary percolators, (iv) the exit from the secondary percolators, and (v) the exit from the plant. The samples are analyzed for temperature, pH, redox potential, settleable solids in 10 minutes, settleable solids in 2 hours, total settleable solids, total volatiles, turbidity, consumed oxygen, BOD, COD, DO, chlorine demand and ammonia nitrogen. Point samples are also taken from the same sites, but are only analyzed for DO, redox potential and temperature. Once a week duplicate samples are analyzed by the Aguas laboratory on site and the central laboratory, which also undertakes analyses for chromium and cyanide. Duplicate samples are also taken about once a month and analyzed by ETOSS and Aguas.
- 6.26 Aguas analyses industrial wastewater discharges to sewer as part of the licensing procedure and subsequently monitors discharges. The Company has carried out more than 5000 samples for routine monitoring of industrial waste waters in the first five years of the Concession.
- 6.27 Wastewater is analyzed at forty monitoring points in the main sewers and manholes. Automatic measuring instruments are used to obtain 6 hr and 24 hr measurements three times a year at each point.

### 6.2.3 Proposed PSI Monitoring

- 6.28 The PSI proposes a monitoring program for the sewer network, drainage channels, treatment plants, and receiving waters and is summarized below.
  - The sewer network monitoring program would involve permanent flow measures at 30 strategic points. There would also be a monthly sampling program to analyze organics, bacteriological parameters and heavy metals.
  - Sampling would be undertaken at 17 points in the drainage channels to measure discharge and water quality every two months.
  - At each WWTP, a continuous monitoring system would be installed to measure discharge of the influent and effluent. Daily samples will also be undertaken to measure physical and chemical parameters (organic contaminants, bacteriological parameters and heavy metals). Further details of these monitoring programs would be developed for each plant.
  - Three monthly samples of sludge will be taken with the parameters to be defined by the appropriate authority.
  - The quality of the Río de la Plata will be monitored by 6 campaigns a year. The monitoring network will consist of 8 sites around the two outfalls: Planta Capital and Berazategui, 15 transects at 400m from the coast (all 6 campaigns) and at 3000 m from the coast (3 times a year). Two of the transects will be located within 500 m of the two water in-take towers. The parameters to be analyzed will include organic contaminants, bacteriological parameters and heavy metals.
  - Sampling will also be undertaken along the rivers Reconquista and Matanza-Riachuelo. Samples will be taken in the upper catchment to characterize water quality upstream of the WWTP discharges, one location in the area of influence of the WWTP discharges and one

location in the lower catchments near the confluence's with the Río de la Plata. These samples will be taken every two months.

#### 6.2.4 *Workplace Environment*

- 6.29 Aguas monitors air quality and noise levels in the work place. Particular procedures are in place for monitoring air quality in confined spaces and the equipment used is calibrated and checked.

#### 6.2.5 *Emergency Operations*

- 6.30 If necessary, Aguas implements emergency monitoring programs. For example, following the damage to the 3rd Main Sewer, an emergency monitoring program was undertaken during the repair works which involved measurements of: toxic gases; water quality of the waste waters in the sewer, the water in the storm channel used to divert the waste waters and the receiving waters; and increased monitoring at the two WTWs. The results were presented in monthly reports which were issued to the SRNyDS, ETOSS and External Technical Auditors to the Concession.

### 6.3 **Contingency and Emergency Response**

- 6.31 Aguas has prepared and implemented an Emergency Prevention Plan (PPE), which has been audited by the External Technical Auditors to the Concession. A Master PPE was prepared applicable to all Aguas operations, and subsequently the Master PPE has been modified and made specific to numerous specific facilities and operations.
- 6.32 The Master PPE includes: a description of the plan, a listing of all the types of risks that can occur, 142 fiches one for each of the risks which scores 3-9 (9 is highest risk), and an organization chart for the contingency management structure. The central office is currently in the process of formalizing the PPE with a set of written procedures explaining the use of existing fiches. The central office also holds a file on each of the Regions containing (i) information on sensitive sites such as contacts for hospitals, schools; (ii) companies or organizations to be mobilized in the case of an emergency, such as police, medics, fire brigade, electricians, local government contacts; and (iii) maps of water supply and sewerage infrastructure. The information on the sensitive sites is provided by the regional authorities at regular intervals, about every two months, or more frequently if the information has changed.
- 6.33 Each regional office, district office, and major installation (WTW, WWTP, pumping stations, principal groundwater wells etc) has a site copy of the PPE containing information pertinent to their operation and locality (44 sites). One person at each site is responsible for keeping the PPE up to date, and sending the information to the central office. There are periodic meetings to discuss updates to the PPE, results of audits, etc. The site PPEs include the following information:
- Organogram showing who is responsible for different activities during a crisis
  - Contact names for people identified in the PPE;
  - Contact names for people or organizations who might be called upon during an emergency;
  - Plans of the offices or works: information on how to stop certain plant;
  - Rota for guards at the plant itself and the guard rota for other sites in the company;
  - A *Libro de Abordo* for recording day-to-day events;
  - Various blank forms to be used during an emergency;
  - A form to record the nature of the risk (*Escala de Gravedad*);

- A form to record hourly progress (*Ficha de reflexión*);
- A form to record communications (*Comunicación de obras y trabajos*);
- Forms to control filter telephone calls and esquires from the press;
- A description of the phases of crisis management;
- A list of potential risks identified for the particular site; and
- Copies of fiches for the risks with a score between 3 and 9 describing the risk, the preventative and corrective actions to be taken, solutions, communications with the principal actors, and comments.

- 6.34 Aguas undertakes its own internal audits related to risk identification and contingency planning. For example, the company is currently auditing the La Matanza emergency during which a water supply pipeline 1100 mm diameter broke in a multi-exit chamber causing reduced water pressure in the water mains for some 77,000 people. Auditing is also carried out by the External Technical Auditors to the Concession who make recommendations and identify areas of non conformity with the PPE. These reports are sent to Aguas and ETOSS. Within Aguas the reports are circulated to the people responsible for the PPE in the Regional and Site offices with a request for them to consider the reports and take appropriate action. Regular meetings are held to follow up on issues identified in the audit reports. The External Auditors also check for follow up actions.
- 6.35 Aguas provides training on PPEs. The company is currently training managerial and other staff nominated in the PPEs. The PPE representatives will then train personnel in the regional offices. The course consists of a 3 hour workshop presented by the person with responsibility for PPEs in Aguas. A training manual has been prepared for the course which is presented to attendees. In 1997 training courses were provided on instruments and procedures in several districts amounting to 412 hours training for 80 people. Aguas has undertaken simulation exercises to monitor crises management under 'controlled' conditions.

#### **6.4 Industrial Health and Safety**

- 6.36 Aguas is a member of the Liberty ART insurance group (Liberty Mutual affiliate). The ARTs (insurance companies) classifies companies into four grades according to the level of compliance with the health and safety legislation as described below:
- Class 1: no compliance with health and safety legislation
  - Class 2: some compliance with the legislation, with the company working to an improvement plan agreed with the ART
  - Class 3: full compliance with the legislation
  - Class 4: companies with health and safety measures which exceed the legal requirements.
- 6.37 Aguas is currently classified as Class 2 and is implementing an agreed upon improvement plan in order to obtain Class 3 status by December 31, 1998. The plan requires a program of activities to be undertaken by set dates which are audited and verified by the ART. The ART performs inspection of work places, including facilities and construction sites, in order to assess compliance with the improvement plan and make recommendations to the company to improve health and safety conditions.
- 6.38 For many Aguas construction works, construction companies are contracted. Both Aguas and the construction company would be member of an ART, but not necessarily the same one. Aguas supervises construction sites and carries out their own audits to assess construction progress and

site health and safety. All construction sites could also be inspected by the ART of either Aguas or the contractor.

6.39 AASA is currently formalizing a manual of written procedures for dealing with different types of situations, including:

- NHS - *Normas Higiene y Seguridad*, including general policy, basic guidelines, fire prevention, use of personnel protection equipment, working with chlorine, and requirements for contractors;
- POS - *Procedimientos Operative Seguro*, including confined space work, transport of liquid combustible materials, chlorine tanks, working in hot environments; and
- PPE - *Procidimientos Para Emergencias*, including evacuation procedure.

6.40 According to Aguas, many of these procedures are routine and already understood by the workforce (e.g., working in confined spaces) but have not been formalized in a written format. Once prepared the norms will be circulated to the Health and Safety representatives in the regional offices for comment and then revised and issued to the *Auditoria de Procedimientos* within AASA for formatting and distribution to staff.

6.41 AASA has produced a booklet for staff on health and safety issues called *Accidentes... ¡Prevención! Manual de Seguridad e Higiene en el Trabajo*. The booklet is written in simple, straightforward language illustrated with cartoons describing common problems and advice on how to avoid them. This was distributed to staff last year, with each member having to sign for a copy.

6.42 Other health and safety related activities performed by Aguas include:

- Aguas provides staff with health and safety equipment including summer and winter uniforms, reflective jackets, security boots, gloves, hard hats, air tanks, anti-acid dust guards, protective glasses, etc.
- Health and safety training has been provided to staff since the beginning of the Concession (in 1997, training amounted to some 8110 hours for 3289 participants).
- Records are maintained related to work related accidents.
- Under Decree 351/979, Aguas provides provide annual medical checks for all staff.
- Health and safety campaigns (e.g., current campaign is concerned with reducing vehicle accidents).

## **6.5 Environmental Management System**

6.43 Aguas does not presently operate a formal Environmental Management System (EMS) which is certified by ISO 14000 ISO 14,000 series. However, Aguas has stated there intent to develop and initiate implementation of an EMS compatible with ISO 14001 during 1999. Aguas presently is implementing and performing various EMS components, including implementation of various environmental-related procedures which control, mitigate, and monitor to both existing and future works (e.g., refer to Sections 6.1, 5.2, 2.4, and 6.2) and various plans and procedures related to contingency and emergency response and health and safety (refer to Sections 6.3 and 6.4). In addition, presented below is a summary of other EMS components that the company has already implemented (see also section 6.6.3 for staff responsibilities).

- 6.44 In terms of training, Aguas provides training for its staff on the main issues related to the provision of its services. Specific details on training programs on health and safety of workforce, and the emergency prevention plans are described in sections 6.3 and 6.4.
- 6.45 Aguas operations are audited related to environment, health and safety issues by both internal and external groups as follows:
- The Company's own internal auditing procedures, for example, health and safety audits of construction site and the implementation of the emergency prevention plans in actual emergency cases.
  - The External Technical Auditors to the Concession undertake numerous regular audits of the Company's operations. Recent audits in the current year related to environmental and social issues include drinking water quality, quality of groundwater resources, quality of waste waters discharged to sewer, wastewater quality at the Sudoeste WWTP, and water quality of effluent discharged from the Berazategui outfall.
  - Health and safety issues are audited independently by Liberty ART, a private health and safety insurer (see section 6.4). The activities of the ART are also monitored by that industry's own government watchdog, the Superintendent for Risks in the Workplace.
  - ETOSS regulates customer service, fixed assets which have not been transferred to the ownership of the Concessionaire, general compliance with the contract and relations with other parties.
- 6.46 AASA keeps copies of all the existing relevant environmental legislation in the legal department. AASA receives the Official Gazette, and also participates in various activities to keep abreast of developments in environmental legislation. For example, AASA is a member of the *Concejo Empresario Argentino para Desarrollos Sustentables* which meets every 15 days to discuss environmental interests and analyze international, national and provincial laws. AASA is also a member of the *Cámara Argentina de Comercio* which has meetings to discuss environmental themes. Representatives of government are invited. AASA is currently meeting with the *Ministerio de Salud* and SENASA to discuss future regulation on the reuse of sludge in agriculture.

## 6.6 Cost, Schedule and Responsibilities

### 6.6.1 Cost

- 6.47 The total 1998 estimated cost for environmental, health and safety is approximately US\$ 3.2 million, including for example, average of 200,000 for monitoring, approximately \$300,000 for various specific mitigations (these are not project related) and US\$ 1.5 million for various studies (e.g., PSI, EIA, etc). The costs associated with project/work specific environmental and social mitigation measures are included directly in the construction costs and are not separately available. Additional related costs for 1998 include: US\$ 970,000 for industrial waste water, US\$ 450,000 for waste water control and monitoring, and US\$ 810,000 for ground water evaluation and control. The environmental department has been operating with an annual budget of about 0.5 M pesos a year. Funds were supplied to other areas, such as the emergency of 3rd Main Sewer collapse (e.g., US\$ 500,000), lake rehabilitation programs (US\$ 800,000).
- 6.48 The PSI provides estimates of the costs for proposed monitoring program consisting of equipment to be purchased and operational costs for the Aguas laboratory. The equipment to be purchased includes gauges, samplers, and two small launches amounting to 5.45 M pesos. The annual

operation costs are estimated to be about 0.6 M pesos a year excluding the costs of monitoring at the WWTPs.

- 6.49 In terms of health and safety classification, an estimated US\$ 428,000 will be spent during 1998 to allow Aguas to obtain Class 3 ART level. Aguas spent approximately US\$ 748,000 over 18 months to obtain Class 2 level in December 1997.

#### 6.6.2 Schedule

- 6.50 The routine or ongoing measures described herein are being implemented continuously each year. The PMES and PSI will be implemented according to the finalized schedule agreed with the government (see Section 2), and thus the associated measures will be implemented according. Aguas plans on obtaining a Class 3 ART health and safety classification by December 31, 1998.

#### 6.6.3 Responsibilities

- 6.51 Aguas is directly responsible for all related environmental protection and control activities. The Environmental Department, which forms part of the Water and Sanitation Division of AASA (*Dirección de Agua y Saneamiento*), is divided into three sections: industry and wastewater, groundwater resources, and receiving waters. The department is staffed by 16 specialists and technicians. The specialists consist of three qualified to PhD level in biology, oceanography, geochemistry and three qualified engineers in industrial engineering, chemistry and sanitation, and agronomy. The technicians are mainly employed in monitoring tasks.
- 6.52 The Department is responsible for undertaking (or supervising consultants undertaking) environmental studies to support the provision of services in drinking water supply and sewerage and in investment planning. As such the Department generates studies and provides technical assistance both for central management and the regional units (the *Unidades Operativas de Servicio* or UOS). The key activities of the Environmental Department are:
- routine tasks associated with the provision of services, such as procedures to control industrial discharges;
  - commissioning, evaluating and appraising environmental studies associated with existing or planned investment activities of the Company, such as the PSI, studies on sludge disposal to agricultural land;
  - implementing environmental monitoring program;
  - implementing and monitoring environmental and social mitigation measures;
  - design and implementation of extraordinary environmental programs associated with unforeseen events (e.g., environmental monitoring program implemented during the 3rd Main Sewer incident); and
  - the Head of the Environmental Department prepares annual budgets to plan for routine and special studies to be undertaken in the coming year.
- 6.53 Issues related to wastewater and industrial effluent are the responsibility of the Process and Quality Department (*Departamento de Procesos y Calidad*) in the Water and Sanitation Division. Analytical services for clean and dirty water are provided by the Central Laboratory. AASA has been investing in its laboratory services and is currently in the process of working towards certification for ISO 25. The Environmental Department undertakes projects related to water, wastewater and industry such as developing control strategies, criteria and procedures. The control

of industrial wastewater discharges is undertaken within each of the UOS.

- 6.54 The Health and Safety Department forms part of the Human Resources Management division (*Gerencia de Recursos Humanos*). This department defines and controls H&S issues at a central level which are implemented at a regional level. There is a nominated Health and Safety coordinator in each of the five Regions (UOS) and at the main installations.
- 6.55 Central responsibility for emergency and contingency planning lies with one person who works in the Division of Provision of Services (*Dirección de Explotación de los Servicios*). He is responsible for issues such as maintaining central records for emergency plans and disseminating information to the regional offices. Again each region and major installation has a member of staff nominated with responsibility for maintenance and implementation of these Plans.
- 6.56 Legal issues, including all environmental and social legislation, are dealt with by the Legal Department (*Gerencia de Regulación Jurídica*) which forms part of the Division for Planning and Regulation (*Dirección de Planificación y Regulación*). This Division has responsibility for planning future projects, including the design and implementation of the PSI.

## **7.0 PUBLIC CONSULTATION**

### **7.1 Routine Activities**

- 7.1 AASA has prepared a variety of material to issue to its consumers regarding the activities of the company as identified below:
- Annual Report. The Annual Report is made available to the public by providing copies for inspection in key places, such as commercial offices. The Annual Report contains on drinking water quality and waste water compliance.
  - Quarterly Newsletter. The newsletter is sent to all customers with their bills and contains information on how to pay the bill, recent developments and on-going problems, and a contact number for enquiry's.
  - Information Packs. AASA has prepared information packs consisting of folders with fiches on a variety of information about the company (e.g., the history of the concession, water quality) are sent to large consumers and made available for public inspection, for example at the commercial offices.
  - Leaflets. AASA has a variety of leaflets on different themes which are available to the public (e.g., methods of payment, explanation of bills, technical information, water use in the home, advice on reducing wastage, metering).

### **7.2 Renovation Works and Extension of Services**

- 7.2 AASA has specific procedures to inform the public in advance of renovation works or expansion of services within an area. Each region has one member of staff responsible for communications within the region. When renovation works are required within an area, AASA employs a variety of means to warn the public of possible nuisance and severance of services for example, postal or hand delivery of letters, announcements in the press and by radio. The publication of water supply cuts is prescribed by a Resolution from the Regulator. According to AASA the public is informed of all programmed cuts to service. During emergency cuts, the public is to be informed as quickly

as possible, especially by radio. Where cuts in service last for more than 18 hours, Aguas is obliged to provide alternative potable water from tankers. The company informs the public where to find the tankers.

7.3 AASA has prepared a number of brochures and leaflets to inform people of expansion of services within their area, for example:

- *Bienvenidos a la Red* - a brochure on the expansion of potable water distribution system which provides information on the Concession, extension of the network, water supply, environment, water cycle, explanation of the bills, typical water consumption in a household
- *Misión Vital* - a brochure on the expansion of sewers including information on the investment costs, benefits, schematic diagram of household connections, advice on connections and what to do with the abandoned cess pit.

7.4 These brochures are normally delivered by hand to households in the area. In recent months, the programs for the extension of services, both for potable water and sewerage, have been paralyzed due to the renegotiations of the contract. Consequently the company is not issuing the brochures mentioned above at present.

### **7.3 Emergencies**

7.5 Additional measures are provided during emergencies to inform the relevant government authorities and the public at large. During the crisis provoked by the collapse of a section of the 3rd Main Sewer, AASA organized various means of informing the public of the situation, including letters were sent to people living in the immediate area to explain the situation to them, frequent meetings were held with the local community to discuss progress, a representative of Aguas was based on site in a temporary office specifically to answer queries from the public, and local residents were given guided tours of the site to observe the extent of the problem.

### **7.4 Environmental Education**

7.6 Aguas is undertaking a number of programs on environmental education, including:

- Visits of school parties to water treatment works;
- Visits by Aguas staff to schools in the expansion areas to explain the construction activities, where the water comes from, use of water in the home, etc; and
- Aguas plans to participate in the creation of a children's 'city' in a shopping mall which is to include a bank, water company etc.

### **7.5 Feedback and Complaints**

7.7 Aguas is monitoring customer satisfaction indices through DIAPASON which is public information program which has been audited by the External Technical Auditors to the Concession. Aguas operates a telephone service for receiving queries and complaints. All calls are logged, and statistics are collected on the nature of the calls, resolution of problems etc. The company aims to resolve problems within 48 hours. The system for registering complaints is being updated using a new system called RITA.

### **7.6 EIA and Public Consultation**

7.8 Aguas meets its obligations under the existing law and the Concession Contract for public consultation. AASA provides the public with general information on their plans to extend water supply and sewerage services to the Concession Area. The Annual Reports include information on proposed activities for the coming year, which is circulated to the *Municipios* who in turn have responsibility for informing the public. Members of the public receive information about imminent program to expand services in their area from AASA as described in 7.1 above. AASA has developed a network of contacts including government bodies, NGOs, university and research organizations etc. These have arisen for example through sponsorship of research programs or conferences and provides a venue for discussion of environmental studies, potential impacts of the PSI and requirements for developments in sludge legislation.

7.9 Public consultation associated with the Planta Norte WWTW project included:

- Discussions with the Municipality of San Fernando to agree on a change of land use at the proposed site for the works, and necessary mitigation issues such as extending the sewerage network to surrounding neighborhoods.
- Informal discussions with local residents to provide some appropriate mitigations, such as improving a local football pitch and filling potholes on the access road, and to resolve complaints arising during construction (e.g., HGVs using unapproved approach routes through residential areas).
- The EIA was issued to the SRNyDS, Provincia de Buenos Aires, City of Buenos Aires and Municipality of San Fernando in September 1998. The competent authority determines whether to make the document available and if a public hearing should be held. The Municipality of San Fernando has requested Aguas to publish the Existing Conditions section of the EIA for use as a baseline for other organizations contemplating an EIA.

## **8.0 RECOMMENDATIONS**

8.1 The IDB will require, as part of the Loan Contract, that Aguas Argentinas (Aguas) comply with the following (see also paragraphs 8.6 and 8.7 for requirements throughout the term of the loan): (i) all applicable environmental, health and safety Argentine regulatory requirements, including without limitation, the Concession Contract and all related decrees, any environmental, health and safety related permits, authorizations or licenses that apply to the Project; (ii) the applicable environmental and social IDB policies and guidelines, including guidance on environmental impact assessments, resettlement policy, and disclosure of information policy; and (iii) full implementation of any mitigation measures, monitoring programs, or other actions or activities identified in any project related environmental, health and safety document, including without limitation, environmental impact assessments, audit reports, emergency and contingency program, and health and safety.

8.2 Prior to project financial closure, the following conditions are required to be fulfilled by Aguas:

1. After approval of the PMES and PSI by the government, present a complete list and time schedule for all projects for which an Environmental Impact Assessment (EIA) will be prepared during the next five year investment program.
2. Provide evidence that a Class 3 ART classification has been obtained for all Aguas facilities and operations.

3. Provide, subject to IDB approval, a formulized set of standard written procedures to ensure environment protection and control during activities for which an Environmental Impact Assessment is not performed (e.g., pipeline maintenance, small pipeline installation, routine operations, etc.).
4. Provide, subject to IDB approval, a formulized set of standard written environment protection and control requirements for construction contracts, including requirements for bid submittals and for construction contract.

8.3 Prior to first disbursement, Aguas must:

1. Provide, subject to IDB approval, a formulized single Corrective Action Plan which presents the specific actions to be taken to correct any existing environmental, health or safety non-compliance with legal requirements. The plan must include a brief description (or reference) of the required action, an estimated cost, proposed time schedule (start and completion), and responsibility for implementation.
2. Present to IDB a finalized complete set of all necessary and appropriate written health and safety procedures related to *Normas Higiene y Seguridad (NHS)*, *Procedimientos Operative Seguro (POS)*, and *Procedimiento Para Emergencias (PPE)*. In addition, present a proposed plan to ensure adequate implementation of these procedures, including staff responsibilities, equipment, and training.
3. Provide, subject to IDB approval, a plan for the complete elimination and proper disposal of all fluids containing poly-chlorinated biphenols compounds (PCBs) in any equipment directly associated with Aguas facilities. The plan must include a complete inventory, description of proposed actions, time schedule, responsibilities, and estimated costs.

8.4 Prior to December 31, 1999, Aguas must to IDB a complete written Environmental Management System which is consistent with ISO 14001.

8.5 The following conditions are required to be fulfilled by Aguas prior to each disbursement:

1. Certification of compliance by with all environmental and social loan requirements, including presentation of copies of all necessary environmental, health and safety regulatory permits/authorizations for projects/works which will be financed by the given disbursement.
2. Description of any non-compliance with any environmental and social loan requirement and an action plan to correct such non-compliance.
3. Description of any environmental, social, or health and safety non-compliance or problem identified as part of the External Technical Audits to the Concession and an action plan to correct such non-compliance or problem.
4. Description of any known environmental and social liability, including without limitation environmental claim, or material compliant, or unforeseen environmental, health or safety impact or risk.

8.6 During the term of the loan, Aguas must comply with the following requirements:

1. An Environmental Impact Assessment (EIA) will be developed and fully implemented for all applicable projects to be initiated during the next five-year investment program. Each EIA must fully comply with all applicable Argentine regulatory requirements and IDB guidance on EIAs. All EIAs must be adequately made available to the affected population well in advance of the start of any construction activity and appropriate and sufficient public consultation

- activities performed before construction, during construction, and during operation.
2. For projects or works that do not require an EIA, fully implement all necessary and appropriate standard and any project-specific environmental, health and safety protection and control requirements.
  3. Require as part of all construction contracts (including bid submittals), the implementation of necessary and applicable environment, health and safety protection and control requirements.
  4. Ensure compliance by construction or other contractors with all the Loan Contract Environmental Requirements.
  5. If any resettlement actions are required associated with Aguas activity, then the required actions will fully comply with the Bank's Policy on Involuntary Resettlement (dated August 1998).
  6. Implement a formalized Environmental Management System (EMS) which is consistent with the ISO 14001 principles and requirements.
  7. Provide written notification, within 30 days after the Company becomes aware, of any material non-compliance with environmental and social loan requirements, environmental health or safety material affect, environmental claim, or material complaint related to environment health or safety related to the Project or Properties, including a description of the situation (extent, magnitude, impact, etc.), the cause, proposed corrective or remedial actions, actions taken, and a proposed schedule for future actions.
- 8.7 During the term of the loan, Aguas must prepare and submit an Annual Environmental and Social Compliance Report, which will be due 60 days after the close of each Fiscal Year. The report must include, as a minimum, the following:
1. Certification that the company is complying with all environmental and social requirements.
  2. Description of any material non-compliance with any environmental and social guarantee requirement which occurred and a description of measures taken to correct the non-compliance.
  3. Description of any changes in the company's operations which may have a material environmental or social effect, the reasons for such changes and any actions taken to mitigate their impact.
  4. Description of any material environmental or social problem (accident, unplanned event, etc.) and a description of the actions taken to resolve the problem and the measures taken to prevent the event from occurring in the future.
  5. Description of any contact by a third party (including governmental agency, public, non-governmental organization, company employee, etc.) regarding environmental, social or health and safety issues.
  6. Description of planned environmental and social related activities to be performed during the next year, including estimated cost, schedule, and responsibility, including any environmental impact assessment to be developed.
  7. Summary of environmental, social, or health and safety non-compliance or problem identified as part of the External Technical Audits to the Concession during the previous year and an action plan to correct such non-compliance or problem.
  8. Copy of any environmental and social document or report written to comply with any governmental regulatory requirements, including any environmental impact assessment.
  9. Summary description of monitoring results performed in the last year.
  10. Description of any known environmental and social liability, including without limitation environmental claim, or material complaint, or unforeseen environmental, health or safety impact or risk.



**Table 2-1. Summary of the main achievements and investments by Aguas since the Concession takeover date.**

The number of inhabitants in the Concession area receiving potable water service increased from 6,000,000 to 7,688,000, an increase of 28%.

Aguas has made major investments in the rehabilitation of its two water treatment plants. These investments have increased plant production capacity and enabled the plants to meet World Health Organization standards. Aguas's improvements have increased the plant production capacity by approximately 29% and 61% at the San Martin and Belgrano plants respectively. The total potable water production capacity of Aguas increased from 3,550,000 m<sup>3</sup>/day to 4,910,000 m<sup>3</sup>/day, an increase of 38%.

With respect to wells, Aguas and ETOSS have agreed to accelerate the term for closing certain wells because of the poor quality of the well water and the number of wells which are contaminated. Nevertheless, Aguas achieved a 22% increase in water production from wells by improving the pumping systems in safe wells.

Aguas has reduced the response time for repairing leaks of water distribution pipes and sewerage blockages from several weeks to approximately one day.

The problem of low water pressure in the secondary network has been successfully addressed. As of December 31, 1997, approximately 95% of served population of the city of Buenos Aires and approximately 48% of the greater Buenos Aires area population had an optimal level of water pressure compared to 15% and 13%, respectively, at the takeover.

The rehabilitation of the water distribution network has required the Company to identify and repair leaks in the network. From the takeover to June 30, 1998, approximately 473,000 leaks had been repaired and 1,088 km of the network had been replaced or revamped. Moreover, approximately 1,800 km of pipes were added to the network.

The number of inhabitants with access to sewerage service was increase from 4,950,000 to 5,877,000, an increase of 19%.

The Company has added approximately 700 km to the sewerage system and waste water collection network allowing 670,000 inhabitants to be serviced by the system. As of June 30, 1998, a total of 240 km of pipes have been upgraded and 900,000 blockages have been eliminated. These efforts significantly reduced the incidence of waste water overflows, an environmental and health hazard.

The Sudoeste Waste Water Treatment Plant is presenting being renovated to increase its treatment capacity by approximately 40% to serve 840,000 inhabitant. The final effluent meets BOD standard of 30 mg/l with discharge of 1.5 m<sup>3</sup>/s to the Rio Matanza.

In 1995, the Company initiated the construction of a new sewage treatment plant, the Planta Norte, scheduled to be completed by the end of 1998. The North plant is located in the Northern part of the city of Buenos Aires and is expected to be able to treat the sewage produced by approximately 400,000 inhabitants located in the district of Tigre, San Fernando, San Martin, and San Isidro. The final effluent will meet BOD standard of 30 mg/l with discharge of 1,8 m<sup>3</sup>/s to the Rio Reconquista.

Aguas has improved the customer billing process, focussing its policy on the reduction of unpaid bills.

At the takeover, approximately 31,000 of an estimated 200,000 installed meters were working. Aguas has begun a program for water meter installation and/or replacement to allow for billing of charges for services to be based largely on consumption. In the first year of the Concession Period, Aguas installed or replaced approximately 240,000 meters, mainly focusing on the largest industrial and commercial customers. By June 30, 1998, approximately 340,000 accounts were metered.



**Table 2-2. Summary of the Concession facilities and operations prior to the Concession Contract.**

The provision of water and sewerage services in the City of Buenos Aires was historically the responsibility of OSN. Founded in 1870 to provide potable water to the City of Buenos Aires, OSN increasingly expanded its operations and by 1980 it was responsible for potable water supply and sewerage services in the City of Buenos Aires and throughout most of the urban centers in the Argentine provinces. In 1980, provincial operations and facilities were transferred to the respective local governments, leaving OSN with responsibility for the provision of water and sewerage treatment services in the City of Buenos Aires and thirteen districts of its surroundings area.

By the early 1990's, the greater Buenos Aires area was experiencing increased industrialization and sustained population growth. In addition, the water distribution and sewerage collection networks managed by OSN had deteriorated and urgently required rehabilitation and expansion to meet the region's increasing demands. At the time of takeover by Aguas Argentinas, OSN was producing an estimated 3.6 million m<sup>3</sup>/d of potable water in order to service its customers. The Concession area consists of approximately 1,200 km<sup>2</sup> of urban area with 8.6 million inhabitants, of which 70% were connected to a poorly maintained and unreliable water distribution network operated by OSN. The remaining 30%, approximately 2.6 million inhabitants, were not connected to the water distribution system at all and many had dug their own wells. The combination of population growth, a high per capita water consumption, and a deteriorated water distribution network caused repeated water shortages during the summer months and inadequate service pressure in many parts of the system throughout the year.

Prior to takeover, the sewerage system consisted of one treatment plant and a network of mains and collection pipes extending over an area of approximately 400 km<sup>2</sup>. The network included approximately 700,000 connections serving approximately 58% of the population, or about 5.0 million inhabitants, leaving approximately 3.6 million inhabitants unserved. The system was steadily approaching maximum capacity and was experiencing sewerage overflows due to poor maintenance and sewerage blockages.

**Table 2-3. Aguas Investment Program (1998-2003)**  
(in discussion with the SRN and DS)

<b>Investment Plan (in millions of US\$)</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
REHAB./REST. PLANTS & BUILDINGS	3,4	9,2	8,5	8,0	3,8	3,6
Water Supply	0,8	4,6	3,5	0	0	5,4
Water Distribution	3,1	2,8	2,1	2,3	0,3	0,4
Waste Water Treatment						
Rehab./Rest. Plants & Buildings Total	7,3	16,6	14,1	10,3	4,2	9,4
REHABILITATION/RESTORATION						
Potable Water Network	9,2	66,3	67,4	35,5	34,5	33,6
Storm Drainage Network	3,7	10,5	10,5	10,5	10,5	10,5
Ground Water Wills	6,8	3,9	3,9	3,9	3,9	3,9
Pumping Stations	0,2	7,8	9,1	6,8	6,0	6,0
Rehab./Rest. Total	19,9	88,5	90,9	56,6	54,9	54,0
EXPANSION						
Water Primary Networks	9,1	1,1	1,0	1,1	1,1	1,2
Water Secondary Networks	4,7	12,1	12,1	12,1	12,1	12,1
Sewerage Primary Networks	13,4	4,3	4,3	13,1	13,2	17,9
Sewerage Secondary Networks	20,4	18,7	18,7	18,6	18,7	18,8
Underground River	13,7	3,0	3,0	3,1	2,9	2,9
Water Treatment Plant	3,0	5,2	0	1,1	4,9	5,1
Large Works-Sewerage	3,1	3,4	3,4	56,7	57,9	59,5
Expansion Total	67,4	47,8	42,5	105,9	110,8	117,5
Studies Total	5,6	3,0	3,0	3,0	3,0	3,0
Commercial Plan Investment Total	4,6	2,0	2,0	2,0	2,0	2,0
Systems & Equipment Const. Total	19,5	27,0	30,0	8,0	7,0	7,0
<b>Charged to PPE</b>	<b>9,0</b>	<b>10,1</b>	<b>11,6</b>	<b>11,1</b>	<b>11,1</b>	<b>11,1</b>
<b>Indirect costs</b>	<b>11,0</b>	<b>15,0</b>	<b>15,0</b>	<b>15,0</b>	<b>15,0</b>	<b>15,0</b>
<b>EXT. &amp; INT. COSTS TOTAL</b>	<b>144,3</b>	<b>210,0</b>	<b>209,1</b>	<b>212,0</b>	<b>208,0</b>	<b>192,6</b>

**Table 2-4. Summary of the Advantages and Disadvantages of the Planta Capital Site**

<b>Site</b>	<b>Advantages</b>	<b>Disadvantages</b>
A	<ul style="list-style-type: none"> <li>- Existing sympathetic landscape of a few buildings surrounded by open areas</li> </ul>	<ul style="list-style-type: none"> <li>- Poor access</li> <li>- Conflict with plans to open a public coastal walkway and University land use</li> <li>- Potential odor problem due to proximity to intensive human use</li> <li>- Potential noise impact</li> <li>- Poor geotechnical conditions: site not large enough and would require landfill</li> <li>- Poor connection to the sewerage system</li> <li>- Potential impact on WTW in-take works</li> </ul>
B	<ul style="list-style-type: none"> <li>- Existing sympathetic landscape of a few buildings surrounded by open areas</li> <li>- Scope to improve the existing industrial land use</li> <li>- Least odor impact due to good air circulation</li> <li>- Least noise impact due to surrounding industrial activities</li> <li>- Acceptable geotechnical conditions</li> </ul>	<ul style="list-style-type: none"> <li>- Poor access</li> <li>- Potential conflict with private concessions related to port activities</li> <li>- Poor connection to the sewerage system</li> <li>- Potential impact on WTW in-take works</li> </ul>
C	<ul style="list-style-type: none"> <li>- Acceptable connection to the sewerage system</li> </ul>	<ul style="list-style-type: none"> <li>- Difficult access</li> <li>- Existing landscape unsympathetic to a WWTP</li> <li>- Change of land use not compatible with ecological and tourism use</li> <li>- Potential odor problem due to proximity to intense human use</li> <li>- Potential noise impact</li> <li>- Least suitable geotechnical conditions</li> <li>- Potential impact on WTW in-take works</li> </ul>
D	<ul style="list-style-type: none"> <li>- Site located in Plan for the Re-cooperation of the South Coast</li> <li>- Scope to improve the existing industrial land use</li> <li>- No conservation use</li> <li>- Low odor impact due to air circulation</li> <li>- Low noise impact</li> <li>- Acceptable geotechnical conditions</li> <li>- Good connection to the sewerage system</li> <li>- Least impact on WTW in-take works</li> <li>- Scope for extension of conservation activities from the Ecological Reserve</li> <li>- Scope to centralize the permanent monitoring program at this location</li> <li>- Scope to transport sludge from here to Berazategui</li> </ul>	<ul style="list-style-type: none"> <li>- Poor access</li> </ul>

**Table 2-4. Summary of the Advantages and Disadvantages of the Planta Capital Site (continued)**

<b>Site</b>	<b>Advantages</b>	<b>Disadvantages</b>
E	<ul style="list-style-type: none"><li>- Good access</li><li>- Existing sympathetic landscape of a few buildings surrounded by open areas</li><li>- Scope to improve quality of existing industrial environment</li><li>- Least odor impact due to good air circulation</li><li>- Least noise impact due to surrounding industrial use</li><li>- Good connection to the sewerage system</li><li>- Least impact on WTW in-take works</li></ul>	<ul style="list-style-type: none"><li>- Least suitable geotechnical conditions</li></ul>
F	<ul style="list-style-type: none"><li>- Low odor impact due to air circulation</li></ul>	<ul style="list-style-type: none"><li>- Poor access</li><li>- Existing landscape unsympathetic to a WWTP</li><li>- Change in land use in conflict with proposals for urbanization and infrastructure development</li><li>- Potential noise impact</li><li>- Poor geotechnical conditions</li><li>- Very poor connection to the sewerage system requiring investment in sewerage to divert waste waters</li><li>- Receiving waters unsuitable</li></ul>

**Table 3-1. Standards for wastewater discharges under the Concession Contract (Decree 999.92)**

Parameter	Standards for discharge of effluent to sewers (controlled by Concessionaire)	Discharge to Receiving Waters (controlled by SRNyDS and ETOSS)		
		Without Treatment	With primary treatment	With secondary treatment <sup>1</sup>
pH	5.5-10	6.5-8	6.5-8	6.5-8
SSEE	100 mg/l	100 mg/l	100 mg/l	100 mg/l
Sulfur	1mg/l	-	-	1.0 mg/l
SS 10°	0.5 ml/l	-	0.5 mg/l	0.5 mg/l
Temperature	45°C	45°C	45°C	45°C
BOD	200 mg/l	300 mg/l	180 mg/l	30 mg/l
Consumed oxygen KmnO <sub>4</sub>	80mg/l	120 mg/l	70 mg/l	20 mg/l
Cyanide	0.1 mg/l	0.1 mg/l	0.1 mg/l	0.1 mg/l
Hydrocarbons	50 mg/l	100 mg/l	100 mg/l	50 mg/l
Chromium	0.2 mg/l	0.2 mg/l	0.2 mg/l	0.2 mg/l
SRAO detergents	5.0 mg/l	5.0 mg/l	5.0 mg/l	3.0 mg/l
Cadmium	0.1 mg/l	0.1 mg/l	0.1 mg/l	0.1 mg/l
Lead	0.5 mg/l	0.5 mg/l	0.5 mg/l	0.5 mg/l
Mercury	0.005 mg/l	0.005 mg/l	0.005 mg/l	0.005 mg/l
Arsenic	0.5 mg/l	0.5 mg/l	0.5 mg/l	0.5 mg/l
Phenols	0.5 mg/l	0.5 mg/l	0.5 mg/l	0.05 mg/l <sup>2</sup>
Plaguicides and herbicides	-	As crude water	As crude water	As crude water
Chlorine demand		-	0.1 mg/l	0.1 mg/l

(1) To be complied with 90% of the time

(2) Effluents in a radius less than 5 km from a drinking water intake works  
Primary treatment to be provided by 31 December 1998 and secondary treatment by 31 December 2005.

**Table 6-2. Preliminary Summary of Environmental Impacts and Mitigations for Future Projects based upon Plan de Saneamiento Integral (note: complete environmental impact assessments have not been completed)**

*Planta Capital*

Given the proximity of the site to existing ecological and recreational facilities and potential high quality redevelopment proposals, it will be necessary to plant a buffer of vegetation around the plant for visual screening. It may be possible to extend the South Coast Promenade by providing new recreational access to the river front, and plan for rest or recreational areas with benches and tables, and suitable lighting for the security of pedestrians. There is also scope for ecological enhancement such as improving the coastline, planting native species. The landscaping proposals would be integrated with the City of Buenos Aires' plans for enhancing the Ecological Reserve and South Coast Promenade.

Noises generated on site from turbines, flowing waste waters and plant are expected to be low. Nonetheless various measures could be taken in the plant design and construction to reduce noise, such as noise insulation on ventilators, location of compressors within acoustic sheds, paying attention to the location of noise generating activities in the plant layout and allowing noisy activities between set hours such as 0800-2000.

More significantly is the noise from lorries delivering chemicals and taking away sludge, and construction traffic which can generate significant increases in noise at greater distances. While this may not be significantly different from existing conditions various measures can be taken to reduce impacts such as: optimization of itinerary for vehicle movements and working hours, avoid parking of site vehicles on public highways, and fixing vehicles with silencers.

Odors will arise on site particularly at the inlet works and preliminary treatment site (screenings), settlement tanks, and sludge treatment sites. Consequently it is proposed to cover odor generating sites and extract the air through odor control units.

The construction and operation of the plant will result in an increase in slow moving heavy vehicles to and from the site. While it will be necessary to take mitigation measures, these will not be able to reduce the impacts completely.

The City of Buenos Aires' plan to improve the South Coast Promenade would exclude the circulation of heavy traffic in the area, although there is also an agreement with the City of Buenos Aires to permit access by heavy vehicles to the plant site. It will be necessary to select an access route which has least impact on the city and avoiding displacement of site traffic to secondary roads. One option is to access the site from the far south via the Av Dellepiane and Av España along the ex-sports ground.

*Planta Dock Sud*

It is considered that, given its industrial setting, the requirements for environmental mitigation is reduced compared to other sites such as Planta Capital. It is not considered necessary to plant a vegetation buffer around the site to reduce the visual impacts of the site, although some planting on site would improve views from the site.

Although the site will generate some noise, it is located in a noisy location already given the surrounding port, other transport and industrial activities. Some mitigation measures would be adopted, for example, selecting an appropriate itinerary for heavy goods vehicles, avoid stationary vehicles on public roads, and using quite plant or fitting plant with noise attenuation measures.

Particular odor mitigation measures have not been recommended at this stage. Under normal operating conditions, odors at WWTP are usually localized to the site. Furthermore the surrounding area is not sensitive to odor pollution.

Traffic impacts will be reduced by identifying suitable access routes and operating schedules.

#### *Planta Depuradora Berazategui*

There will be the need to resettle the 10 or 12 families who have built houses on their land and any mitigation measures required to reduce the impacts on remaining households. The Company has not developed a strategy for their approach at present.

It will be necessary to plant a fringe of trees around the site to mitigate landscape and visual impacts under Law 11,720 of the Province of Buenos Aires as the site is to be used for sludge waste disposal.

The need for noise mitigation is less critical near the Buenos Aires motorway, however the small settlement to the south of the site is more sensitive to noise pollution. Mitigation will involve on locating noise generating activities away from sensitive sites.

While odor would be generated in the immediate vicinity of the works, the open terrain and good atmospheric dispersion would reduce the potential impacts on the small number of receptors nearby. However given the possibility of growth of the settlement to the south, further consideration needs to be given to odor control. This might require enclosing odor generating sites and evacuating the air via a chimney.

Traffic impacts would be mitigated through measures to rationalize vehicle itineraries, agreeing access routes, avoid parking on the public roads, etc.

To avoid the impacts of flooding on the site and groundwater contamination, the sludge disposal sites should be located on land either naturally or artificially raised above the flood level. (It should be noted that CEAMSE is operating a landfill site nearby on similar terrain.)

The permanent sludge disposal sites need to be designed to minimize contamination of the environment. Design criteria are established in Decree 806/97, an implementing instrument for Law 11,720. This includes:

- restrictions on the types of materials to be disposed of
- prohibits landfill sites in zones subject to flooding or used for water supply
- a minimum distance of 3 m between the landfill and phreatic ground water level
- locations of landfill 5 km from the periphery of urban areas unless approval is sought from the competent authority based on a technical justification
- maintain a 50 m buffer between the landfill and site boundary for planting and re-contouring
- security fencing and controlled access
- requirements for impermeable lining on the floor and slopes
- collection of leachate
- drainage
- impermeable cover
- a final cap of soil and to be re-vegetated
- system to control and monitor gas production
- groundwater monitoring system around the landfill site

Aguas has designed a cellular landfill system for disposing of the treated sludge in line with the legal requirements. The Company is also considering long term options for disposal to agricultural land, and has been undertaking agricultural trials in association with the Agricultural University of Buenos Aires. Characterization studies of the sludge are reported to show that heavy metal contents are within acceptable limits for disposal of sludge to agricultural land determined by international guidelines. At present there is no legislation on biosolid disposal to agricultural land, and until such time, this method of disposal is not viable. Aguas has recently sponsored an international conference on this theme with a view to initiating discussion on legislation.



**Table 6-3. Summary of the Drinking Water Quality Monitoring Program (per Concession Contract)**

Sample Type	Type of Parameter	Frequency
Crude water from surface water supply	Pesticides	Every 3 months
	Chemical analysis, DBO, OC, HC, phenols	Every 4 months
	Chemical analyses, heavy metals, phenols, hydrocarbons, detergents	Monthly
	Bacteriological analysis	Daily
	Basic data: pH, turbidity, alkalinity	Every 2 hours
Crude water from groundwater supplies	Chemical analysis	Every 6 months
	Bacteriological analysis	Every 3 months
Treated water leaving the WTW	Basic data: pH, turbidity, alkalinity	Every 2 hours
	Bacteriological analysis	Every 2 hours
	Chemical analysis, BOD, OC, HC, phenols, and heavy metals	Monthly
Potable water in the distribution system	Bacteriological analysis	Monthly sampling for every 10,000 inhabitants. The sampling points will be divided into fixed points (schools, hospitals, public buildings) and variable ones
	Chemical analysis	Residual chlorine to be measured for all the samples undertaken for bacteriological analysis. In 20% of the bacteriological samples, analyses will also be undertaken for turbidity, pH, hardness, conductivity, ammonia nitrogen, nitrite, nitrate, iron, manganese etc.

## **Annex A**

### **Existing Conditions Data**

#### **1. Water Quality**

##### *1.1 Water Quality in the Río de la Plata River.*

Río de la Plata river water is neutral with a pH about 7.0-7.4. Mean water temperature is about 20°C with minimum and maximum temperatures of 5°C and 28°C respectively. Mean salinity levels are about 250µS/cm. Suspended sediment levels are high, oscillating about 100 mg/l, but can vary considerably with hydrological conditions and dredging operations. Dissolved oxygen levels are generally about 5 mg/l, but fall in polluted inshore waters off Avellaneda, Quilmes and parts of Berazategui. BOD5 and COD values are low in uncontaminated areas, but rise in inshore waters. Measurements of pesticides taken in 1995 and 1996 did not exceed the detection limits. The most significant of the heavy metals found was chrome (reaching 60 µg/l) followed by lead which were adsorbed on suspended particles. Other heavy metals generally registered values at or below the sensitivity of the analytical methods. Ammonia nitrogen levels exceed 0.5 mg/l around the Berazategui outfall and along the coasts of Avellaneda and Quilmes but fall to 0.1-0.2 mg/l offshore. The bacteriological quality of the inshore waters is worse along the coast. Values for total coliforms range from 1.0E+04 to 1.0E+07 NMP/100ml.

The river sediments tend to be fine and silty, decreasing in particle size down stream with some areas of sand near the coast. Organic matter content is relatively low and highest around the mouth of the Riachuelo and the bay by the Berazategui outfall. Levels of heavy metals were very low, and assumed to be absorbed onto fine suspended particles and dispersed throughout the estuary. Traces of pesticides and PCBs were found in sediments near the coast, especially around Berazategui, but the levels were very low e.g. 0.02 mg/kg for PCBs.

##### *1.2 Water Quality in the Río Reconquista*

The upper part of the river suffers from some pollution with dissolved oxygen levels about 4.6 mg/l, ammonia nitrogen about 4 mg/l, BOD5 about 10 mg/l and total coliforms in the order of 1E+05 NMP/100ml. The water quality in the lower part of the river is very poor. Dissolved oxygen falls to about 0.5 mg/l which is insufficient to support aquatic life, ammonia nitrogen remains about 4 mg/l, BOD5 rises to over 20 mg/l, total hydrocarbons reach 2 mg/l and total coliforms are in the order of 1E+06 or +07. Unsavory odors are common around the river near the port

##### *1.3 Water Quality in the Matanza-Riachuelo*

The water quality in the river is very poor. Dissolved oxygen levels in the upper catchment are only 2.6 mg/l, falling to below 0.5 mg/l in the lower part of the catchment. Levels of total coliforms (3.75E+04 to 9.5E+06 NMP/100ml) and ammonia nitrogen (4.5 to 16.0 mg/l) are high indicating contamination from sewage. Similarly levels of hydrocarbons (1.1 to 9.7 mg/l) and detergents (0.2 to 2.1mg/l) indicate industrial contamination. Unsavory odors are common in the lower reaches of the river.

**Table 1 Water quality in tributaries of the Río de la Plata**

Location	Discharge m <sup>3</sup> /s	BOD mg/l	Chrome µg/l	Hydrocarbons mg/l	Total coliforms NMP/100ml
Río Lujan	192	4.1	20.9	1.16	1.65E+05
Arroyo Medrano	1.98	48.26	38.32	22.46	4.36E+07
Arroyo Vega	0.23	104.6	3.71	18.13	3.91E+07
Riachuelo (Avellanda Bridge)	66.73	26.12	100.6	6.3	4.50E+06
Canal Sarandí	5.67	119.4	537.7	46.3	1.30E+07

Source: PSI Document D, Annex 6

## 2. Aquatic Ecology

Oligochaetes (aquatic worms) are dominant in soft sediments in the coastal zone south of the Riachuelo river up to 3 km from the coast. The dominant genera is *Limnodrilus* which together with nematodes are frequently found in areas of organic enrichment. The crustaceans include harpacticoides and cyclopoides copepods, ostracodes, and cladoceros. The Tanaidaceas are represented by *Sinelobus standordi*, whose distribution is closely linked to the Berazategui outfall.

Areas with coarse sand substrate are colonized by *Temnocephala iheringi*, *Urnatella gracilis*, and isolated examples of *Trichoptera*, such as *Hydra sp* and *Heleobia sp*.

There is little information on the phytoplankton of the Río de la Plata estuary. Recent studies along the coast from Avellaneda to Ensenada by IIED-AL in 1996 identified 45 genera and 59 species of phytoplankton. Abundancies are relatively low and there is no indication of eutrophication.

The main species of fish belong to a small number of major groups such as the Characiforms, Siluriforms and to a lesser extent Clupeiforms and Atheriniforms. While these groups include fish which occupy a range of niches, many of them are iliofages feeding off organic matter in the bottom muds. These would be susceptible to heavy metals and other pollutants in the sediments. A significant number of fish species also feed off small shellfish, insects, seeds and vegetable matter. Both relatively 'sedentary' and migratory fish are found in the estuary. Today small scale commercial and recreational fishing is carried out in the estuary. Declared volumes of fish catches are in the order of 4-5 T/month.

Fish surveys undertaken in 1996 point to the increase of iliofage species around the Berazategui outfall, especially *sábalo*. Anecdotal evidence from fishermen points to fish mortalities linked to industrial discharges directly to the Río de la Plata. A fish kill of approximately 12,000 species was reported by the Instituto Limnológico Platense (ILPLA) in March 1993 which was associated with DO below 1.0 mg/dm<sup>3</sup> in the Punta Colorada area.

A histopathological and parasitological study of 50 fish caught at ten monitoring stations off the coast of the City of Buenos Aires showed that the majority had suffered lesions common to fish under 'natural' conditions. At two sites off Puerto Olivos, fish suffered lesions which could be linked to heavy metals while at five sites fish showed signs of damage from fishing. The majority of fish caught off Olivos and Arroyo Sarandí and Segba-Boca del

Riachuelo had levels of mercury in excess of the limits allowed by SENASA of 0.05 mg/kg for fish for human consumption reaching 0.29 mg/kg. One fish had a concentration of chrome of 51.8 mg/kg (no Argentinean standard) compared to less than 2.0 mg/kg for the other examples. One fish also had a value of lead of 59.8 mg/kg well above the SENASA limit of 20 mg/kg of lead in solids.

Bird eating fish such as *Podiceps sp*, *Pdoilimbus sp*, *Sterna sp* and *Phalacrocorax olivaceus* are supported by the estuary. The number of species feeding in open waters is low, and most species are found mainly around the beaches and intertidal areas of the estuary. The estuary also provides temporary feeding ground for passerines.

### 3. Human Environment

#### 3.1 Population Growth

Up to 1970, population growth was well above the national average. Growth rates started to slow, and in the period 1980/91 were 7.6/1000 compared to a national average of 14.7/1000. The lowest growth occurred in the City, while the highest rates occurred in the outlying partidos. In the future, population growth is likely to be stagnant or decrease in the City and surrounding partidos, with expansion continuing in the outlying partidos. This is due to various factors: saturation of land in inner zone, land prices, improved transportation access and services, proliferation of new urbanization's and '*barrios cerrados*' for middle and upper income sectors. It should be noted that plans for the redevelopment of the Puerto Madero includes an urbanization for 10,000 people in the City near the waterfront.

#### 3.2 Land Use Information

Land Use of the Concession Area has been identified on the basis of Landsat imagery and a number of published surveys and reports.

The Metropolitan Area of Buenos Aires (MABA) is structured around a nucleus represented by the Federal Capital or City of Buenos Aires. A series of radial axes extend outwards from this nucleus forming the main transport corridors. The nucleus is surrounded by concentric rings of urban development.

In the Federal Capital are found company head offices, financial and banking services, national administrative functions etc.

The first group of partidos surrounding the Federal Capital - Avellaneda, Lanús, Vicente López, Tres de Febrero and San Martín - represent well established urban and industrial areas. Densities vary between 6,000 and 10,000 inhabitants/km<sup>2</sup>.

A second group of partidos, consisting of Quilmes, Morón, Hurlingham, Ituzaingó, San Isidro and San Fernando, are also well established areas of urbanization and industrialization. Densities are lower varying between 4,000 and 6,000 inhabitants/km<sup>2</sup> and there is scope for limited expansion.

The partidos located on the outlying ring of the MABA are expanding most rapidly. Those within the Concession Area are Almirante Brown, Esteban Echeverría, Ezeiza and Tigre. These areas are characterized by a number of suburban traits related to recreation (second homes, clubs, and recreational grounds) and primary production (horticulture, vineries and quarries).

La Matanza is atypical in that it shows a number of traits from the inner, second and outer rings. The area closest to the Capital Federal shares characteristics with the well-established urbanized and industrialized zones. In contrast, there are areas of rapid expansion.

#### 3.3 Income Levels

Information on average incomes in the home is illustrated in the following tables. These data have been obtained from EPH for October 1995, 1996, and 1997 for the whole of MABA and Capital Federal. Households are ordered into ten classes according to income, each class containing 10% of households. These have been further grouped into three Strata in which level I accounts for the lowest 40% of households, level II accounts for the middle classes 5-8, and Level III accounts for the highest 20% of households.

In Greater Buenos Aires in 1997 (Table 1), household income for Level I varied \$172-572 accounting for 18.3% of the total household income. For Level II, household incomes varied between \$717 and 1399 and accounted for 42.2% of total household income. Finally for Level III average household incomes were \$1895-3623 accounting for 39.5% of total household income.

**Table 2 Percentage of total household income in three classes for Greater Buenos Aires**

Greater Buenos Aires			
Year	Strata		
	I	II	III
1995	17.7	41.9	40.5
1996	19.4	42.9	37.7
1997	18.3	42.2	39.5

In the City, the values for Level I are similar. Incomes for households in Level II range from \$725-1412 accounting for 27.8% of household income. While for Level III average incomes were \$1959-3968 accounting for 65.7% of total household income. This indicates the concentration of high income earning households in the City.

**Table 3 Percentage of total household income by class in Capital Federal**

Capital Federal			
Year	Strata		
	I	II	III
1995	6.9	26.8	66.3
1996	6.1	26.4	67.6
1997	6.5	27.8	65.7

A study by the *Centro de Estudios Bonaerensis* (CEB) referred to in the PSI, estimated income per capita at the level of the partidos. They identified the following zones for average income per capita:

- \$672 - Capital Federal
- \$535 - San Isidro and Vicente López
- \$322 - Avellaneda, La Matanza (area around Capital Federal), Morón, Gral. San Martín and Tres de Febrero
- \$276 - Alte. Brown, Berazategui, Lanús, Lomas de Zamora and Quilmes
- \$224 - Florencio Varela, E. Echeverría, Merlo, Moreno, La Matanza (remainder), San Fernando and Tigre

AASA commissioned a socio-economic study of the population at the census level using an Index of Social Stratification which combined three levels - % population less than 14 years old, % deficient dwellings, and % household heads without or lacking basic education. The index was verified by field surveys. The study pointed to the highest socio-economic level in the central areas and along the main transport arteries. The lowest socio-economic level was mainly found in the periphery of the Concession Area in the basins of the Matanza-Riachuelo and Reconquista and along the southern coast of the Río de la Plata.