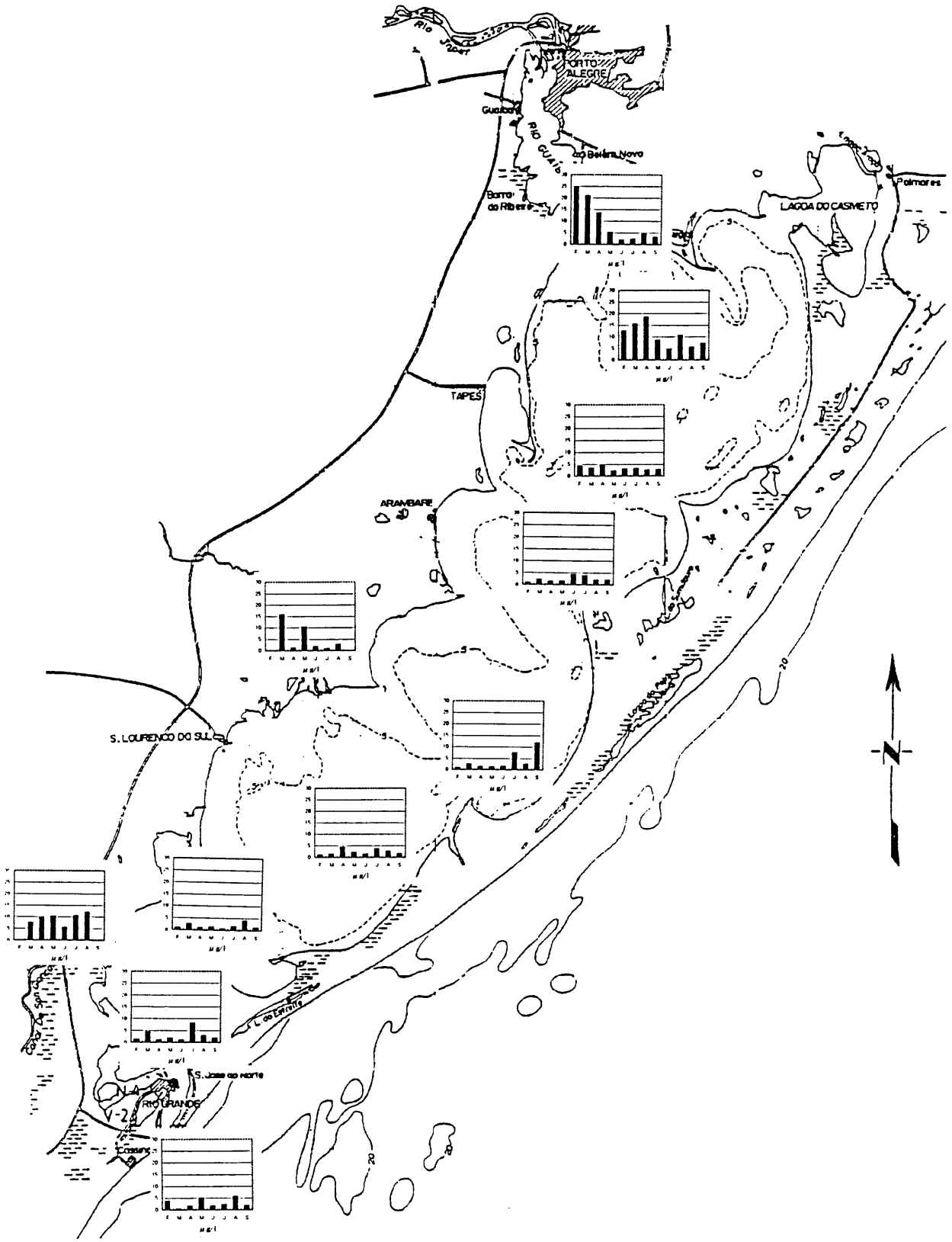


THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig. 2.7-3**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Seasonal and Spatial Distribution of Chl-a in Patos Lake**

(12) The primary production test results indicate higher values in the southern area than in the northern area where eutrophication is high. This indicates the crucial impact of transparency on production levels.

(13) The bottom mud elution test results show the following elution velocity: 58 to 874mg/m^2/d for nitrogen and 0.43 to 28.2mg/m^2/day for phosphorus. Even in comparison with other highly eutrophic lakes, these values are considerably high.

(14) The settling test results show Patos Lake with a settling rate extremely higher than other lakes, although low organic levels indicate the significant influence of re-suspension caused by wind.

2.8 Flow and Pollution Mechanisms in Patos Lake

(1) The hydrodynamic and water quality simulation model was developed in this study as a tool to predict the effect of the water quality improvement measures under the following conditions:

① Hydrological and water quality conditions over the entire Patos Lake area are predictable.

② Water quality fluctuation all year round is calculable by month.

③ The circulation of salinity and organic matter flowing into the lake, and biomass production (internal production) by nutrient proliferation are predictable.

Using this model, the flow and water quality distribution patterns in the whole Patos Lake area were reproduced and the hydraulic and pollution mechanisms were examined.

(2) The calculation field covers the entire Patos Lake (including Guaíba Lake, Casamento Lake) and a lattice interval was set at 2km to express the form of Rio Grande channel and Itapua channel (**Fig. 2.8-1**). However, when the assessment of the impacts of sewage treatment and solid waste management is necessary, the

lattice interval will be set anywhere from 0.5km to 1km. The water depth in each lattice was determined from the chart.

(3) From an overall view of Patos Lake, vertical changes in water quality are less observed than horizontal changes as mentioned in section 2.6 (6). Given these conditions, the study basically intends to adopt the single layer model. However, as vertical changes in water quality are noticeable in the larger section of the southern lake area, the model was divided in order to also allow multi-layer calculations when studying the impact of saltwater backwash.

(4) The hydraulic model to simulate flow conditions in Patos Lake basically adopts the Navior-Stokes motion equation and continuity equation. Factors such as river flow, wind, tidal level, which are known to restrict flow conditions were incorporated in the equations.

(5) The conservative materials diffusion model, which considers only advection and diffusion, will be adopted for water quality simulation in order to forecast substances like salt, which are not decomposed or produced in the lake. The material circulation model which considers not only advection and diffusion but also photosynthesis, respiration, decomposition, settling, elution, etc., will be adopted for water quality simulation to determine organic substances and nutrient salts, substances that are produced and decompose in the lake. The schematic figure for the material circulation model is shown in **Fig. 2.8-2**.

(6) As mentioned in 2.6 (5), tidal fluctuation only slightly impacts lake flow conditions, and 7 cases representing different wind conditions and inflow river water volume were made to simulate flow conditions using the aforementioned hydraulic simulation model. The results confirmed the following correlation between flow conditions, wind conditions, and river runoff.

① No Wind Influences (0 wind velocity)
In case of a small river runoff amount, flow within the lake (exclusive of the Rio Grande channel vicinity) is very slow at less than 1cm/s. In contrast, flow velocity is 5 to 10cm/s, moving from the north to the south overall, when river runoff is large.

② Northeasterly Winds (5m/s)

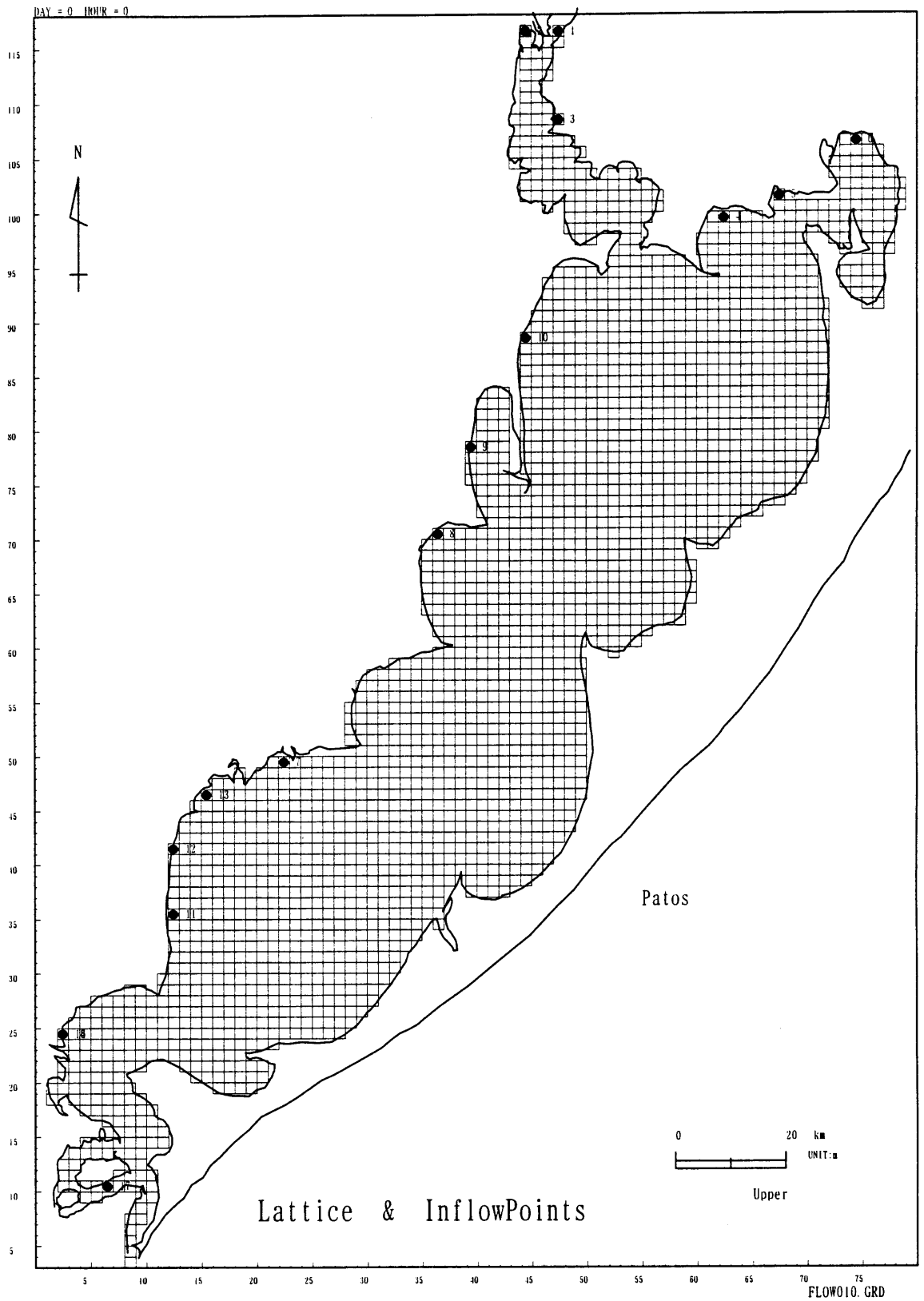
Overall, the flow velocity exceeds 10cm/s from north to south. The longer the wind blows, the stronger the flow toward the western bank becomes. Saltwater intrusion was hardly observed.

③ Southwesterly Winds (5 m/s)

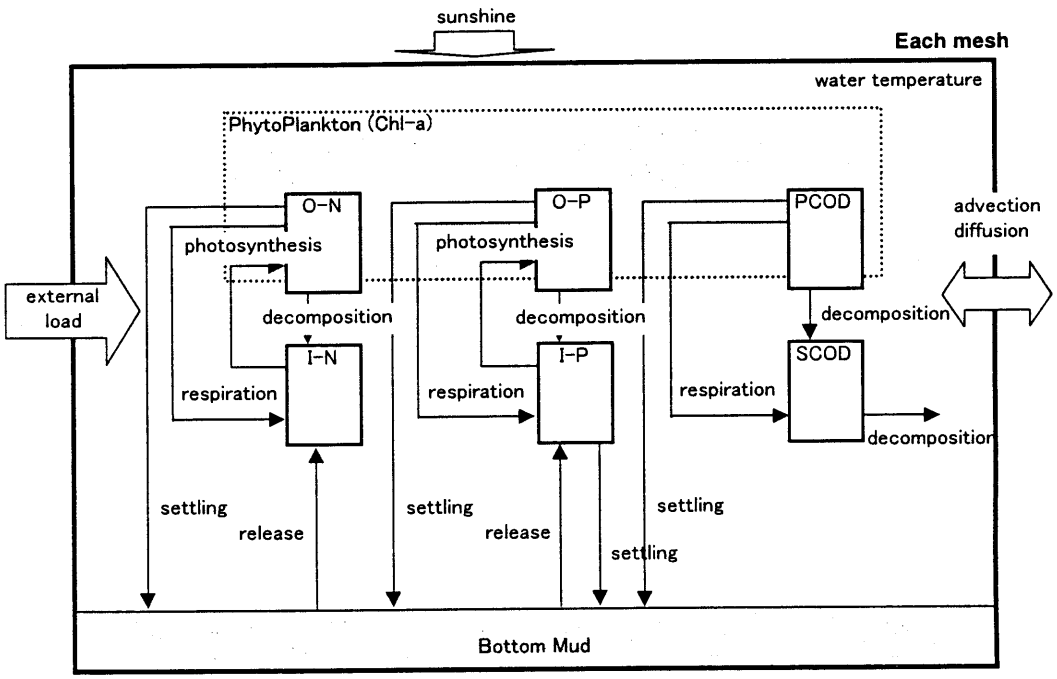
Although water predominantly flows from south to north, the flow is reversed the longer the wind blows due to the circulating current. In the Rio Grande channel, salt water intrusion is progressive, even reaching the central lake area. Backflow was observed at the Itapua channel when runoff from Guaíba river is small.

(7) Based on recent wind observation data (1 year period), water quality distribution (TN, TP, COD) was reproduced with 5m/s winds blowing alternately in southwesterly and northwesterly directions in 4-day intervals, and adopting the mean 1996 and 1997 values for river runoff and load. Water temperature, solar radiation, diatom rate, and mud elution rate were given values for summer and winter. The results show that water quality distribution extends like a belt in the NE-SW direction, with overall concentrations being clearly higher in the western bank and lower in the eastern bank (**Fig. 2.8-3**).

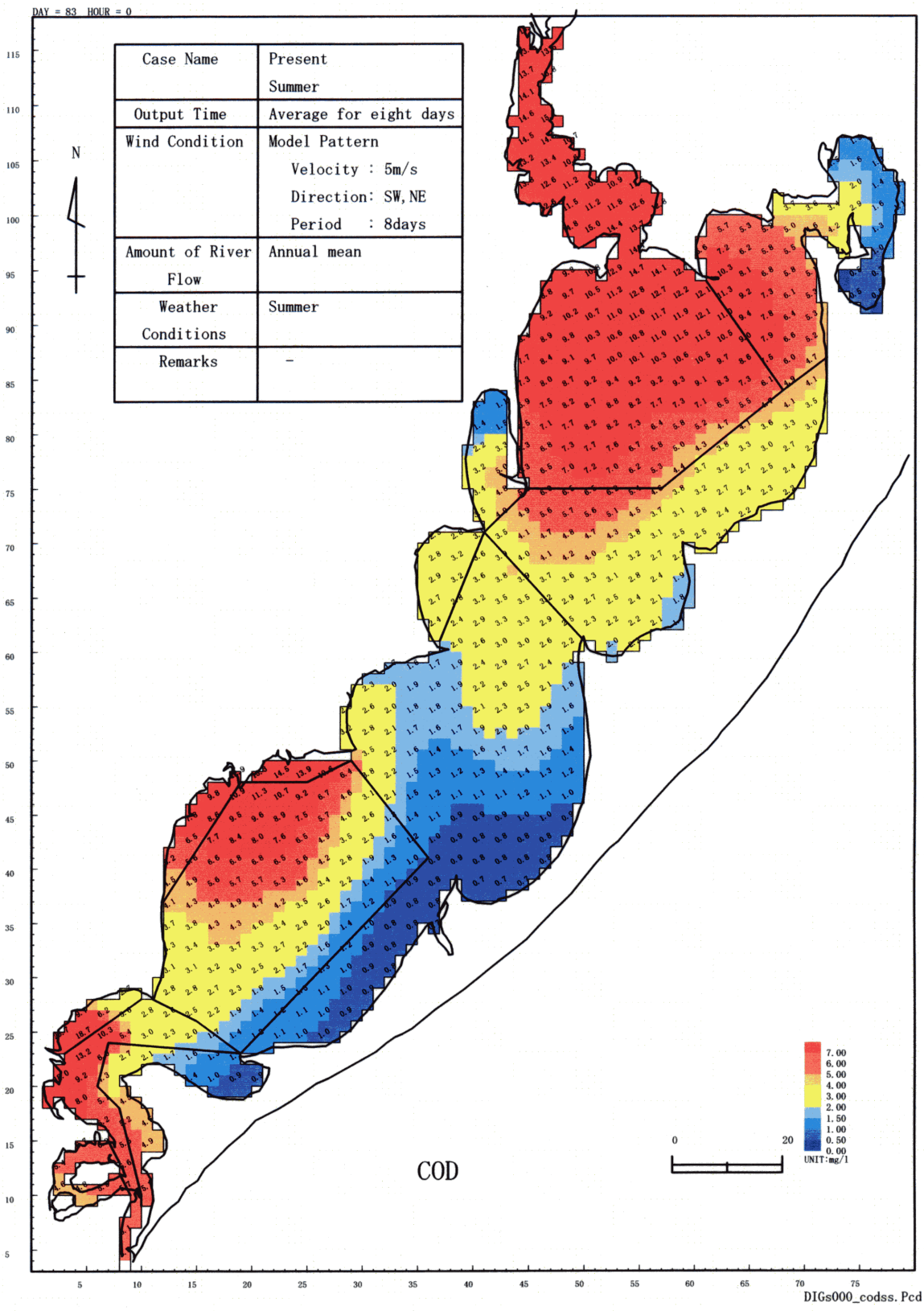
(8) To grasp the impact of the runoff load from major rivers on each area of the lake, lake water quality was determined assuming a 0 runoff load for rivers other than those targeted in this study. The results show that, except for the load resulting from internal production, elution and re-suspension, runoff load from Guaiba River determines more than 90% of the water quality in the northern half of the Patos Lake. On the other hand, more than 90% of the water quality of the southern half of the lake is decided by the runoff loads from Camaquã River and São Gonçalo channel – runoff load from these two sources are roughly of the same proportion.



THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig. 2.8-1**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Lattice and Inflow Points Map of Patos Lake**



THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	Fig. 2.8-2
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	Eutrophication Model



THE STUDY ON THE ENVIRONMENTAL MANAGEMENT
OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES
IN THE FEDERATIVE REPUBLIC OF BRAZIL

JAPAN INTERNATIONAL COOPERATION AGENCY
KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL

Fig.2.8-3

Calculated COD Distribution (Present:Summer Season)

2.9 Sewage Treatment in Urban Areas

(1) Sewage-related works in the municipality of Pelotas is under the supervision of SANEP, a public company administratively and financially independent of the municipality. SANEP has a staff of 450 and is also responsible for the supply of drinking water and the management of solid waste in the municipality.
CORSAN, a water supply and sewerage company, has a total staff of 4,000 and branches in Rio Grande, São Lourenço do Sul, Camaquã and Tapes. While Rio Grande and Tapes contract out sewerage services to CORSAN, São Lourenço do Sul and Camaquã carry out the services independently with the technical assistance of CORSAN whenever necessary.

(2) Based on the production amount of clean water, the daily water supply amount per capita was calculated to range widely: 165 l/day/person in São Lourenço do Sul, 280 l/day/person in Pelotas, and 470 l/day/person in Rio Grande. 80% (130 l/d/p) of the calculated amount for São Lourenço do Sul is considered as the discharge per unit generation for domestic wastewater.

(3) Separate-type sewage systems were constructed about 70 to 100 years ago in Pelotas and Rio Grande. At present, 75% and 36% of the houses in Pelotas and Rio Grande, respectively, are connected to these sewage systems (**Figs. 2.9-1** and **2.9-2**). These sewage systems do not receive industrial wastewater. There are no separate sewage systems in São Lourenço do Sul, Camaquã and Tapes; domestic wastewater is drained into open storm sewage systems without treatment.

(4) At present, out of 5 municipalities, only Rio Grande has a wastewater treatment facility (operating as of March 2000). This wastewater treatment facility, Parque Marinha, was constructed in 1983. It treats wastewater (about 8%) from 4,000 households by the activated sludge method. This method removes about 95% of the BOD (15mg/l) in treated wastewater. The monthly operation and maintenance cost of the facility is R$ 13,000: 1/2 for personnel expenditure and 1/3 for electricity expenses.

(5) About 1,000 households in Pelotas are equipped with septic tanks, 2,100 to 2,500 in São Lourenço do Sul, and 1,800 in Tapes. The new septic tank model consists of 2 tanks – one for night soil and the other for domestic wastewater—and has a capacity of 1,250 l. However, the septic tank only has settling functions. BOD in the treated wastewater discharged from the septic tank is around 60 mg/l and the

removal ratio is about 80%. The installation cost of the septic tank is R$ 280, which is to be paid by the house owner independently.

(6) As aforementioned, almost all urban domestic wastewater is drained into Patos Lake through the rivers and channels without treatment. State laws stipulate that factories are financially responsible for the handling of wastewater resulting from their productive activities. However, it seems that very few factories observe these laws.

(7) Slow progress in the development of sewage treatment is mainly attributed to budget shortage. In Pelotas, the sewage system is relatively old and the budget allocated to the sewage sector is mostly spent on repairs and maintenance. Under this circumstance, there are no progress in plans to expand the sewage network in Pelotas. For operation and maintenance of the sewage systems, São Lourenço do Sul, Camaquã and Tapes receive budgetary assistance from SURSUL (Superintendent of Rio Grande do Sul State), which is an organization under CORSAN. Due to decreasing tax revenues, however, CORSAN uses the revenues from the drinking water charge as well as bank loans to supplement its budget.

(8) Pelotas has no comprehensive plan to expand its sewage system and develop a sewage treatment method for the whole urban area. However, at present, two anaerobic wastewater treatment facilities are under construction at the cost of US$ 700,000. The completion of these facilities is expected to connect 24,000 houses in Pelotas (1/3 of the total number of households) to the sewage system with final treatment facility.

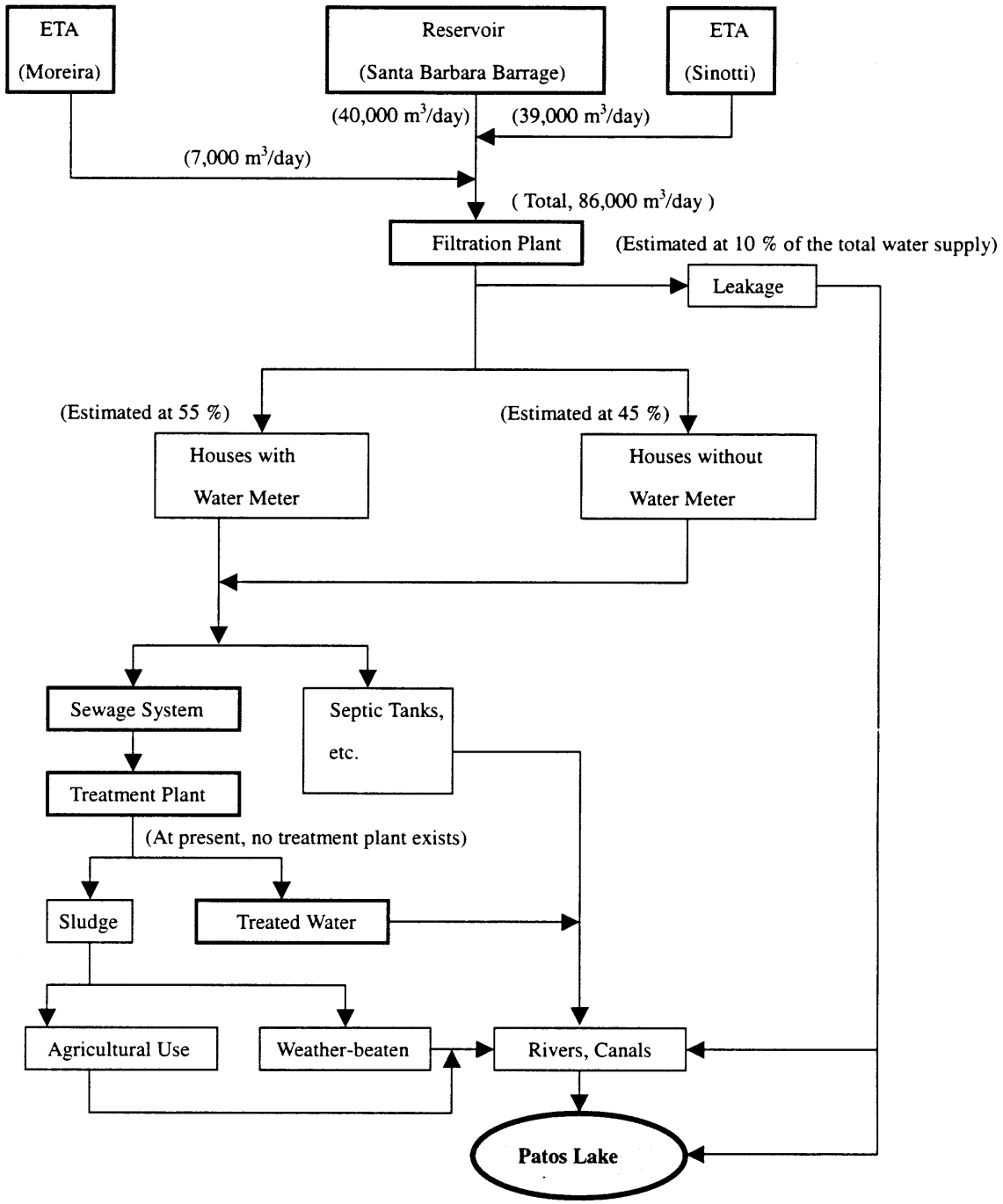
(9) On the other hand, Rio Grande has a relatively comprehensive plan to expand and develop its sewage treatment system covering almost the entire urban area. The plan entails the construction of a large-scale wastewater treatment facility which would use the activated sludge method. The completion of this facility would result in the treatment of wastewater from about 50% of all households by 2001, and about 80% by 2030. Wastewater from the remaining 20% of the households will be treated by another wastewater treatment facility, which utilizes the filtration method, to be completed by 2030. These facilities are estimated to cost a total of R$50,000,000.

(10) A large-scale septic tank, with a capacity of 64,000m^3 and retention time of 3 days, is being constructed in São Lourenço do Sul under a municipal budget of

R$150,000. The completion of the facility enable the primary treatment of wastewater from 465 households (about 2,300 family members). On the other hand, São Lourenço do Sul has a plan to construct a wastewater treatment facility. The plan is scheduled to be contracted out to CORSAN. The facility will use aerobic/anaerobic methods and have a treatment capacity of 32 l/sec by 2010, and 64 l/sec by 2026.

(11) A sewage system and a wastewater treatment facility with a primary treatment capacity of 15m^3/day are currently being constructed in Tapes. The construction cost is estimated at R$800,000 and the facility is expected to be in operation by 2000. Camaquã, on the other hand, has no present or future plans to develop its wastewater treatment system.

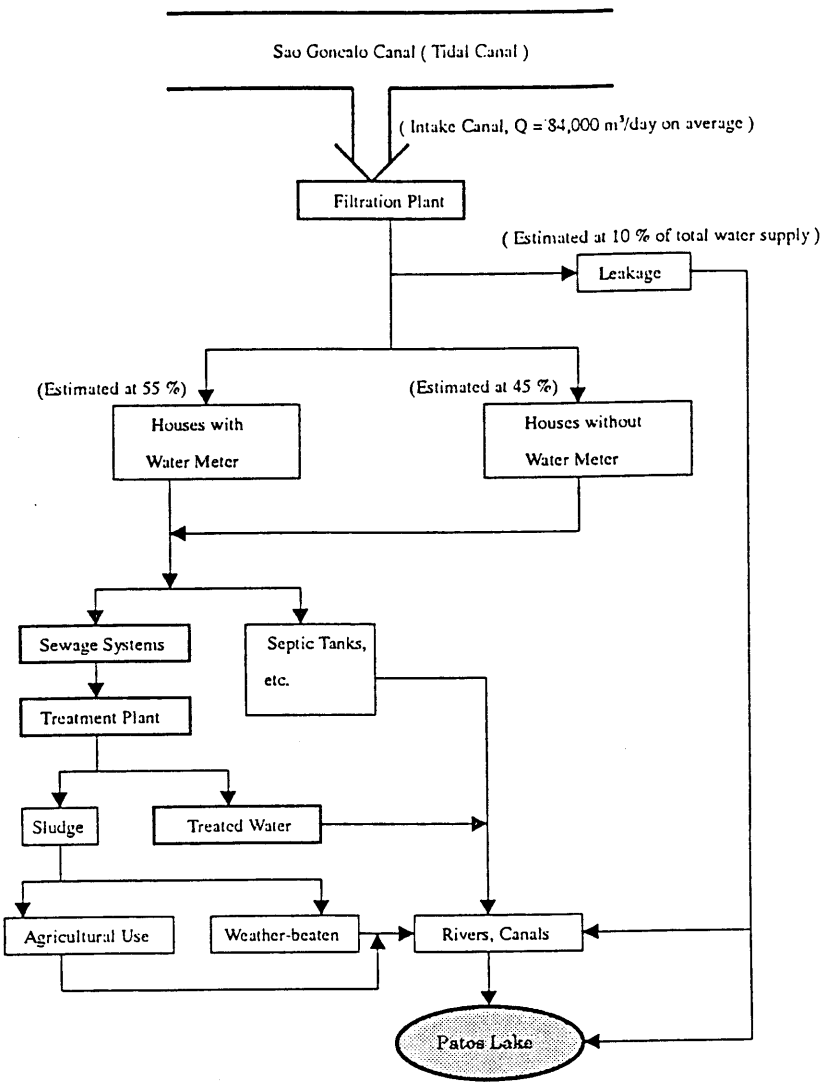
(12) The actual situation and the future plans for domestic wastewater treatment in the aforementioned five municipalities are summarized in **Tables 2.9-1** and **2.9-2**.



Note: From the above chart, average water supply rate in Pelotas City is roughly estimated at Q = 280 l/day/person based on the following calculation without considering the water losses.

Q = 86,000 m³/day divided by 300,000 persons (population of the city) = 280 l/day/person.

THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig. 2.9-1**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Schematic Flow of Present Movement of Wastewater /Drinking Water in Pelotas**



Note: From the above chart, average water supply rate in Rio Grande City is roughly estimated at Q = 470 l/day/person based on the following calculation without considering the water losses.

Q = 84,000 m³/day divided by 180,000 persons (population of the city) = 470 l/day/person.

This value seems to be too big. It needs further clarification.

THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig. 2.9-2**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Schematic Flow of Present Movement of Wastewater /Drinking Water in Rio Grande**

Table 2.9-1 Present Condition of the Sewage and Wastewater Treatment in the Five Municipalities

	Planning Items	Name of Municipality				
		Pelotas	**Rio Grande**	**S.Lourenco do Sul**	**Camapaqua**	**Tapes**
1	Urban Population	291,700	175,200	23,600	42,800	12,000
	Number of House hold	About 89,000	About 48,000	About 7,700	About 14,000	About 5,500
2	Design Discharge of Drinking Water	200 L/person/day	470 L/person/day (To be confirmed)	165 L/person/day	190 L/person/day	165-190 L/person/day (Estimated)
3	Discharge of Wastewater	160 L/person/day	380 L/person/day	130 L/person/day	150 L/person/day	130-150 L/person/day
	Water quality of Wastewater	BOD:300 mg/L	BOD:300 mg/L	BOD:295 mg/L(Estimated)	BOD:300 mg/L(Estimated)	BOD:300 mg/L
	Outlet of Wastewater	Canal Sao Goncalo	Canal do Norte and Saco da Mangueira	Arroio Caraha	Sanga do Passinho Arroio Duro	Sanga das Charqueadas Sanga do Meio
4	Responsible Agency for Wastewater Treatment	SANEP	CORSAN	S.Lourenco do Sul	Camaqua	CORSAN
5	Number of Household Connected to Sewage System	About 66,750 (75 %)	About 18,000 (37.5 %)	Not known	Not known	Not known
6	Number of Household with Septic Tank	About 1,000 (Primary treatment of night soil only and)	To be confirmed through the third stage study in Brazil	2,100 – 2,500 (Primary treatment of nigh soil and wastewater)	Not known, however the number is limited.	About 1,800
	Water Quality of Wastewater after Treatment by Septic Tank	Not known, due to lack of data.	Not known, due to lack of data.	Not known, due to lack of data.	Not known, due to lack of data	Not known, due to lack of data
7	Wastewater Treatment Method	Combined Method	Separation Method	Combined Method	Combined Method	Separation Method
8	Existing Wastewater Treatment Plant	No	Parque Marinha, constructed in 1983.	No	No	No
	Number of Household under Treatment	-	4,000 (About 8 %)	-	-	-
	Treatment Capacity	-	80 L/sec	-	-	-
	Acceptance of Wastewater from Factory	No	No	No	No	No
	Wastewater Quality before Treatment	-	BOD: 300 mg/L	-	-	-
	Treatment Method	-^	Activated Sludge Method	-	-	-
	Wastewater Quality after Treatment	-	BOD:30 mg/L	-	-	-
	Outlet	-	Saco da Mangueira	-	-	-
	Treatment of Sludge	-	Dumping on the Ground	-	-	-
9	Treatment of Wastewater from Factory					
	Kinds of Factories	Leather, Soya Been Oil, Caning, Oil Refinery	Soya Been Oil, Caning, Oil Refinery, Fish Processing	Rice Processing, Leather	Rice Processing, Fish Processing	Rice Processing, Leather
	Treatment Condition	Oil refinery factory has chemical waste treatment. However, others are not known.	Oil refinery factory has chemical waste treatment. However, others are not known.	Not known	Not known	Not known
	Supervising Agency	SANEP, FEPAM	FEPAM	FEPAM	FEPAM and Municipality	FEPAM

Table 2.9-2 Plans for Sewage Improvement and Construction of Wastewater Treatment Plant

	Planning Items	Name of Municipality				
		Pelotas	Rio Grande	S.Lourenco do Sul	Camapaqua	Tapes
1	Summary of Sewage System Improvement Plan	No master plans exist. Due to necessity of maintaining the aged sewage systems, progress of expansion of new sewage systems is very slow.	No master plans exist. First Phase Sewage Expansion Project targeting 25,000 household is in progress. The project will be completed by the year of 2001	No master plans exist. However, the municipality has a future plan to implement the sewage systems improvement project, dividing the municipality into 7 areas.	No master plans exist. Also no on-going sewage systems expansion projects exist.	No master plans exist However, the municipality is going to provide main sewage pipes by the year of 2000 and provide the sewage systems covering the all areas of the municipality by the year of 2003.
2	Wastewater Treatment Plant under Construction	Two (Names not known)	One (Name not known)	One Large-scale Septic Tank ($V = 6,400\ m^3$)	-	One Oxygenation Pond (Name not known)
	Number of Target Household	24,000	25,000 by the Year of 2001 80 % of the Total Households by the Year of 2030	At present 465 households only. However tank capacity can meet future demand.	-	1,800 in Area I by the Year of 2000
	Amount of Wastewater to be Treated	-	-	-	-	15 m^3/day
	Commencement Year of Sewage Service	Year 2000	Module I: Year 2001 Module II: Year 2015 Module III: Year 2030	Year 2000	-	Year 2000 (Area I only)
	Treatment Method	Anaerobic Method (Two Tanks)	Filtration Method Remaining N and P are to be absorbed by plants.	Anaerobic Method	-	Aerobic Method
	Water Quality after Treatment	BOD: 30 mg/L	-	Removing 90 % of Coliform	-	BOD: 30 mg L/sec
	Outlet	-	-	-	-	Sanga das Charaqueadas
	Project Cost	R$ 5,000,000 By the State: R$ 3,000,000 By Municipality: R$ 2,000,000	-	R$ 150,000 By the State: R$ 105,000 By Municipality R$ 45,000	-	R$ 800,000 By Municipality : - By CORSAN: 800,000
3	Construction Plan of Wastewater Treatment Plant	-	-	Exists	No	-
	Number of Target Population	-	-	(7 Basins) 4,000 at Year 2010 14,000 at Year 2026	-	-
	Amount of Wastewater to be Treated	-	-	32 L/sec x 2 = 64 L/sec	-	-
	Commencement Year of Service	-	-	Basin 2, 5:Not known. Basin 1,3,4,6,7: Not known	-	-
	Treatment Method	Filtration by Sand Layer	-	Unaerobic /aerobic Method	-	-
	Water Quality after Treatment					
	Outlet	-	-	Caraha River	-	-
	Project Cost	-	-	-	-	-
	Proposed Funding Agencies	-	-	-	-	-

2.10 Solid Waste Management System in Urban Areas

(1) The household waste collection rate in the municipalities of Pelotas, Rio Grande, Sao Lourenco do Sul, Camaqua and Tapes is extremely high at over 95 %. The municipalities of Pelotas, Rio Grande and Camaqua contract out waste collection (except for some areas) to private companies. The remaining two municipalities are also considering contracting out their waste collection service.

(2) Separate collection is being carried out both in Pelotas and Rio Grande, but not in the other 3 municipalities as the residents are not fully cognizant of the importance of such a collection method. The recycling rate, even in Pelotas where recycling is relatively popular, is only 1.5%. None of the municipalities are efficiently carrying out their soil and bulky waste collection services.

(3) Controlled sanitary landfilling is practiced at the solid waste disposal sites in Pelotas and Rio Grande. On the other hand, the 3 other remaining municipalities only practice open dumping. The present solid waste management conditions in the five major municipalities are summarized in **Table 2.10-1**.

(4) State Law No. 9921, which came into force in 1993, stipulates that all municipalities should adopt sanitary landfilling practices for urban solid waste management. It also stipulates that all municipalities should prepare solid waste management plans within 180 days after the enactment of the Law and implement the plans within one year. However, the Public Attorney Offices accuse the municipalities, with the exception of Pelotas, of non-abidance by the Law.

(5) At present, all municipalities in the State do not collect special taxes on solid waste collection, treatment and disposal. Except for Pelotas and São Lourenco do Sul, the municipalities have no solid waste management laws, a condition that impedes the establishment of safe and effective solid waste management systems.

(6) The municipalities of Pelotas and Rio Grande have designated candidate new waste disposal sites since the existing landfill site has reached its full capacity. These candidate sites, however, have yet to be approved by FEPAM who only has 3 technical staff in its solid waste management section – the section analyzes environmental impact assessment results, evaluates projects and inspects sites (three steps) for approval.

(7) Control of scavengers is an important issue in the solid waste management system

of every municipality. In Pelotas, scavengers collect waste bags and recyclable materials prior to municipal collection, and throw other non-recoverable solid waste materials in vacant lots or canals that result in clogging and unsanitary environmental conditions. In Rio Grande, the licensed cooperative for scavengers (ASCALIXO) pays a minimum wage for the collection and sale of recyclable waste materials. The payment entices many of the unemployed to work for ASCALIXO.

(8) Organic matter makes up about 50% of the household waste of Pelotas and Porto Alegre. Knoch (1978) estimates that 24 to 44% of the rainfall amount that seeps into the ground is leachate from the waste disposal site. With this, it is postulated that an average of 42 to 78 tons/day of leachate from the existing disposal site in Pelotas percolate into the ground or become surface runoff.

(9) The Municipality of Porto Alegre reports that leachate from its disposal site contains 31,200mg/ℓ of COD, 16,500mg/ℓ of BOD, 27.3mg/ℓ of TP, and 1,834mg/ℓ of TN, with the BOD level being about 55 times the BOD in sewage. These levels are bound to increase in the new disposal site.

(10) The existing disposal site of Pelotas has four ponds for leachate treatment. The results of the survey carried out by SANEP indicate that the COD level in the pond for the 4^{th} leachate treatment stage fell to 1/10 of the level in the pond for the 1^{st} leachate treatment stage, verifying how significantly efficient such pond is for leachate treatment.

(11) Despite the fact that the existing waste disposal site (23ha) on the northern shore of Rio Grande is connected to Patos Lake, the site has no leachate treatment facility. Leachate inflow affects water quality and the ecosystem.
Since leachate flows directly into Patos Lake, countermeasures should be adopted as soon as possible.

Table 2.10-1 Conditions of the Solid Waste Disposal Sites in the 5 Municipalities of the Study

	Items	Municipality				
		Pelotas	**Rio Grande**	**S. Lourenço do Sul**	**Tapes**	**Camaquã**
1	**Type of disposal site**	**Controlled landfill** • Daily coverage with earth • Drainage for leachate • Drainage for gases • Compacted turf as bottom liner (40 cm)	**Controlled landfill** • Daily coverage with earth only. No drainage for leachate nor gases. No bottom liner	Open dumping (“ Lixão”) • No protection measures against contamination	Open dumping (“ Lixão”) • No protection measures against contamination	Open dumping (“ Lixão”) • No protection measures against contamination
2	**Present Status**	Closure process A temporary sanitary landfill is planned to be installed at a nearby site on an emergency basis until the definite site of the sanitary landfill is approved by FEPAM. The area belongs to the local government and the operation shall be carried out by a contracted company (now in bidding process). This landfill shall not be licensed by FEPAM because of its location. The same contract shall foresee the reclamation of the “Controlled Landfill” (4.5 ha) now in closure process.	In use The local government is being sued in order to carry out measures for the environmental reclamation of the area.	In use The local government is being sued in order to carry out measures for the environmental reclamation of the area.	In use The local government is being sued in order to carry out measures for the environmental reclamation of the area.	In use The local government is being sued in order to carry out measures for the environmental reclamation of the area.
3	**Time of utilization**	More than 17 years	More than 20 years	More than 20 years	Approximately 7 years	More than 10 years
4	**Area**	3 ha (already closed) 1.5 ha (closure process) 11 ha (temporary sanitary landfill)	14 ha (already closed) 9 ha (in utilization)	approx. 2 ha (no compaction scattered)	approx. 3 ha (no compaction, scattered)	approx. 3ha (no compaction, scattered)
5	**Height**	4 to 5 m at the closure of the landfill.	6 m (closed area) 4 m (in utilization)	Approx. 3 to 4 meters (not even)	No estimation	Approx. 3 to 4 meters (not even)
6	**Disposal Volume**	150 ton/day	100 ton/day	10 ~ 11 ton/day 14 ton/day (Dec to March)	7 ton/day 10 ton/day (Dec to March)	25 ton/day
7	**Location of the disposal site**	Within the urban zone	Within the urban zone	Approx. 2 km from the urban perimeter	Approx. 6 km from the urban perimeter	Within the urban zone
8	**Distance from Patos Lake in a straight line**	Approx. 11.4 km	Less than 60 cm	Approx. 3 km	Approx. 4 km	Approx. 40 km

Table 2.10-1 Conditions of the Solid Waste Disposal Sites in the 5 Municipalities of the Study (continuation)

	Item	Municipalities				
		Pelotas	**Rio Grande**	**S. Lourenço do Sul**	**Tapes**	**Camaquã**
9	**Distance from nearby water stream**	1.0 km from Santa Bárbara Canal 3.6 km from São Gonçalo Canal Beside the Matadouro Brook	-	Arroio Carahá (Carahá brook) is just beside the dumping site	4.5 km from Teixeira Brook	1.2 km from Sanga do Passinho (Passinho brook)
10	**Drainage and treatment of leachate**	Drainage and treatment in stabilization ponds (4 in a sequence). The Matadouro Brook (Sanga do Matadouro) is the recipient water body after the treatment in the stabilization ponds. The leachate is analyzed in a monthly basis by SANEP.	NO	NO	NO	NO
11	**Co-disposal of Medical Service Solid Waste**	YES The collected medical services solid waste is disposed in ditches lined with plastic sheet and covered with lime.	YES They received the **LP** and **LI** for the installation of an Auto-clave at the dumping site to sterilize waste from medical services. After sterilization, the waste shall be disposed toge-ther with domestic solid waste.	NO The medical services solid waste is collected, transported and incinerated by a private company in another city.	NO The medical services solid waste is incinerated in the local hospital. This waste comes from some pharmacies, and 2 health posts (municipal and state).	NO The medical services solid waste is collected, transported and incinerated by a private company in another city.
12	**Presence of scavengers at the site**	NO	YES (several)	YES (several)	YES (several)	YES (several)
13	**Licensing Procedures at FEPAM (Installation of a Sanitary Landfill)**	The EIA-RIMA (Report on Environmental Impact) was elaborated. However FEPAM requested further information to complement the analysis. The Pelotas officials are organizing the necessary further information.	The EIA-RIMA (Study and Report on Environmental Impact) was elaborated. However FEPAM requested further information to complement the analysis. If the Rio Grande officials do not respond the request in time, the licensing process shall be interrupted.	The **LP** shall be granted to an area owned by a private company who intends to operate the Domestic Solid Waste management system (collection, transportation, and final disposal). At present, in bidding process.	According to the FEPAM responsible official, there is no licensing process for a new sanitary landfill being analyzed by that inst-itution. However, the Tapes local government officials declared they have already started the submission process at FEPAM, presenting three alternative areas for the new sanitary landfill location. Both information are incompatible.	The area for the new sanitary landfill already received a **LP** (Previous License) by FEPAM. The local officials shall submit a detailed design of the sanitary landfill to obtain the **LI** (Installation License). The area is already being purchased by the local government.