

TABLAS

1
2
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Table S-1 (1/2) Resumen de Aspectos Claves

Major Problem

Organic Pollution	Toxicant	Turbidity
<ul style="list-style-type: none"> - Destruction of original function (place of aquatic life) of the river - Problem on water supply <ul style="list-style-type: none"> - Suspension of intake - Use of much chlorine (effect to human health) - High treatment cost for color, odor, etc. 	<ul style="list-style-type: none"> - Potential damage to human health - Problem on water supply <ul style="list-style-type: none"> - Suspension of intake - Effect to human health 	<ul style="list-style-type: none"> - Destruction of esthetic environment of the river - Problem on water supply <ul style="list-style-type: none"> - Suspension of intake - High pre-treatment cost to remove sediment

Indicator

Organic Pollution	Toxicant	Turbidity
- BOD (coliform is represented by BOD)	- Heavy metals (Pb, Cr, Cu, Zn)	- SS

Pollution Source

Organic Pollution	Toxicant	Turbidity
Factory: Alcohol, Food, Textile, Others Piggery Residence	Factory: Metal plating, Tannery, Others	Factory: Sand quarry, organic pollution Basin: Basin erosion

Ongoing Pollution Control Efforts (Technical Measure)

Organic Pollution	Toxicant	Turbidity
<u>Factories and Piggeries</u> <ul style="list-style-type: none"> - Most of the factories have plans to install treatment plants prepared with the assistance of a consultant - There are also studies by GTZ for the installation of treatment plants of several representative factories and for improvement in production process <u>Domestic Wastewater</u> <ul style="list-style-type: none"> - Sewerage networks (could be used in the future) have been established in major urban centers 	<u>Factories</u> <ul style="list-style-type: none"> - Treatment is basically conducted 	<u>Factory (Sand Quarry)</u> <ul style="list-style-type: none"> - Some are installed with sand settling ponds, and in these factories, turbidity of effluent is less <u>Other Factories</u> <ul style="list-style-type: none"> - Same with the items in the column of factories for organic pollution <u>Countermeasure for use</u> <ul style="list-style-type: none"> - Hidrocapital uses pre-treatment for removal of turbidity <u>Basins erosion</u> <ul style="list-style-type: none"> - No countermeasures are conducted

Present Problems (Technical Aspect)

Organic Pollution	Toxicant	Turbidity
<u>Factories and Piggeries</u> <ul style="list-style-type: none"> - Only 50% of the factories have treatment plant and actual installation of treatment plants is not progressing well due to lack of funds - In addition, necessity of (to be continued) 	<u>Factory</u> <ul style="list-style-type: none"> - Due to bad maintenance, toxicant flows from some factories. - Factories lack in technical staff for maintaining treatment plants and O&M is not properly conducted - Necessity of treatment to 	<u>Factory (Sand Quarry)</u> <ul style="list-style-type: none"> - Actual installation of the plants is not in good progress due to lack of funds - Necessity of treatment to meet the water quality standard is not well recognized by owners, thus education is necessary <u>Other Factories</u>

Table S-1 (2/2) Resumen de Aspectos Claves

(continued from the previous page)

<p>treatment to meet the water quality standards is not well recognized by owners, thus education is necessary</p> <ul style="list-style-type: none"> - Factories lack technical staff for maintaining treatment plants and O&M is not properly conducted <p><u>Domestic Wastewater</u></p> <ul style="list-style-type: none"> - Treatment plants are either not installed or inoperable except in some residential complexes and the overall treatment rate is very low 	<p>meet the water quality standard is not well recognized by owners, thus education is necessary</p>	<ul style="list-style-type: none"> - The same with the items in the column of factories and piggeries for organic pollution <p><u>Countermeasure for use</u></p> <ul style="list-style-type: none"> - Cost for pre-treatment is high for the removal of sediment <p><u>Basins erosion</u></p> <ul style="list-style-type: none"> - No countermeasures are being conducted
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Institutional Measures already Undertaken and Present Problems

Organic Pollution	Toxicant	Turbidity
<p style="text-align: center;"><u>Laws and Regulations</u></p> <p style="text-align: center;">Laws and regulations are sufficient to a large extent.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>Current water quality standards Decree No.883 do not include a limit for BOD; it should be included</p> </div> <ul style="list-style-type: none"> - Installation of treatment plants by factories is not progressing well; provision of necessary laws and regulations to enhance the installation is needed 		
<p style="text-align: center;"><u>Enforcement of Laws</u></p> <ul style="list-style-type: none"> - Enforcement of these laws and regulations are not adequately conducted. - Application of punitive action is necessary in combination with a strong support system. - Monitoring is conducted with the assistance of GTZ; strengthening of the monitoring system is necessary for the enforcement of the laws. 		
<p style="text-align: center;"><u>Organization and Operational Management</u></p> <ul style="list-style-type: none"> - Training in environmental aspect is needed for the technical personnel of ACRT - Strengthening of function of ACRT is needed - Budget of ACRT is not sufficient 		
<p style="text-align: center;"><u>Public Awareness of the Environment</u></p> <ul style="list-style-type: none"> - Environmental education is performed by ACRT; it should be strengthened - Seminars focusing on manufacturers have been conducted by the program of GTZ; it should be strengthened - Appropriate countermeasures should be taken for forest fires that cause devastation of the basin and resultant erosion and sediment discharge 		

Table S-2 (1/2) Resumen del Plan Maestro

Stage	Category	Objective	Project	Outcome	Procedure	Timing	Responsible agency *1	Effectiveness *2 (US\$1,000)	Economic priority	Financial cost (US\$1,000)	Method of cost recovery	Report reference
Short Term Program	Technical measure	Water quality improvement	Installation of treatment plant to existing factories and piggeries	Reduction of BOD pollution of 0.49 kg/day Reduction of SS pollution Reduction of toxicant	Installation of treatment plant to factories with support of institutional measures	2000-2003	(1) Factory and piggerly owners (2) ACRIT	\$3,864 /ton/day	4	\$11,998	Factory and piggerly owners pay the cost	6.1.1 (Vol. 2)
			Installation of treatment plant to factories (newly constructed)	Reduction of BOD pollution of 0.67 ton/day, SS and Toxicant	Installation with support of institutional measures	2000-2003	(1) Factory owners (2) ACRIT	\$2,473/ton/day	3	\$10,791	-do-	6.1.1 (Vol. 2)
			Installation of sewage treatment plant and its operation	Reduction of BOD pollution of 2.70 ton/day	Installation of sewage treatment plant in the area of Ocuameque del Tuy	1997-2003	(1) ACRIT (2) State Gov.	\$1,333/ton/day	2	\$28,020	Charge to households and factories	6.1.1 (Vol. 2)
			Reforestation	Reduction of BOD pollution of 4.07 ton/day*5 Reduction of Turbidity of 35 mg/l	Installation in the area of Las Teñorias Reforestation in Matiana basin	2000-2003	(1) ACRIT (2) State Gov.	\$422 /ton/day	1	\$12,700	-do-	
			O-Tuy III pumping and construction of Cuaro dam	Securement of water quantity by newly developed water of 2.0 m ³ /s	Construction of pump and dam	1997-2003	(1) ACRIT (2) State Gov.	\$9.1/mg/l	1	\$2,520	Government pay the cost	6.1.1 (Vol. 2)
			Installation of sand settling pond and operation	Securement of water quantity of 0.023m ³ /s	Installation of sand settling pond at Toms de Agua	1997-2003	(1) Hydrocapital	\$6,290/m ³ /s	1	\$85,980	Charge to households in CMA	6.1.2 (Vol. 2)
			Installation of treatment plant to factories	Securement of water quantity of 0.024 m ³ /s	Installation of treatment plant to factories related to odor and color	1997-2003	(1) Hydrocapital (2) ACRIT	\$15,130/m ³ /s	3	\$2,610	-do-	6.1.1 (Vol. 2)
			Provision of law and regulation and operation	Strengthening of control of factory effluent	Approval from higher authority	1997-2003	(1) MARNR (2) CORDIPLAN	N.A.	N.A.	N.A.	N.A.	6.1.3 (Vol. 2)
			Strengthening of the function of organization and operation	Strengthening of enforcement for necessity action taken by agency concerned	Approval from higher authority	1997-2003	(1) ACRIT (2) MARNR	N.A.	N.A.	N.A.	N.A.	6.1.3 (Vol. 2)
			Establishment/operation monitoring system	Collection of basic information	Confirmation of budgetary allocation	1997-2003	(1) ACRIT (2) MARNR	N.A.	N.A.	1,652	Government pay the cost	6.1.3 (Vol. 2)
			Establishment of environmental fund and operation	Assistance for necessary works for environment improvement	Establishment of new law	1997-2003	(1) ACRIT (2) FONCRESI/CORP-INDUSTRIA	N.A.	N.A.	24,846	Repayment by borrowers	6.1.3 (Vol. 2)
			Establishment/operation pollution charge	Promotion of installation of treatment plant for factories/piggeries	Establishment of new law	1997-2003	(1) ACRIT	N.A.	N.A.	N.A.	N.A.	6.1.3 (Vol. 2)
			Establishment/operation public education system	Awareness by public on significance of environment problem	Approval from higher authority	1997-2003	(1) ACRIT (2) State Gov., private sector	N.A.	N.A.	50	Government pay the cost	6.1.3 (Vol. 2)

*1 (1): Implementing Agency/Body (2): Related Agency/Body

*2 Cost Effectiveness = Annual Cost / Outcome (Annual Cost = Initial Cost x annuity factor (0.11 to 0.13) + O&M Cost)

*3 Priority is confirmed through the pre-feasibility study

*4 The cost shows that establish the Environmental Fund including loan amortizations for factories and piggeries

*5 Outcome at the Boca de Cagua N.A.: not applicable

Table S-2 (2/2) Resumen del Plan Maestro

Stage	Category	Objective	Project	Outcome	Procedure	Timing	Related agency ^{#1}	Effectiveness *2 (US\$1,000)	Economic priority	Financial cost (US\$1,000)	Method of cost recovery	Report reference
Mid Term Program	Technical measure	Water quality improvement and Securement of water Quantity	Installation of treatment plant to factories (newly constructed)	Reduction of BOD pollution of 1.17 ton/day Reduction of SS pollution Reduction of toxicant	Installation of treatment plant to factories with support of institutional measure	2004-2010	(1) Factory (2) ACRT	\$2,441/ton/day	2	\$18,606	Factory owners pay the cost	6.1.1 (Vol.2)
			Installation of sewage treatment plant and its operation	Reduction of BOD pollution of 0.55 ton/day	Installation of sewage system in the area of S.F. de Yare	2004-2010	(1) ACRT (2) State Gov.	\$3,440/ton/day	4	\$14,100	Charge to households and factories	6.1.1 (Vol.2)
			Installation of sewage treatment plant and its operation	Reduction of BOD pollution of 0.27 ton/day	Extension of sewage system in the area of Ocumare del Tuy	2004-2010	(1) ACRT (2) State Gov.	\$2,640/ton/day	3	\$4,914	Charge to households and factories	6.1.1 (Vol.2)
			Installation of sewage treatment plant and its operation	Reduction of BOD pollution of 2.20 ton/day	Installation of sewage system in the EL Consejo	2007-2010	(1) ACRT (2) State Gov.	5757 /ton/day	1	\$13,100	Charge to households and factories	6.1.1 (Vol.2)
			Reforestation	Reduction of turbidity of 79 mg/l	Reforestation in two tributaries (Oda, Guayas and Casum)	2004-2010	(1) ACRT (2) State Gov.	\$8.5/mg/l	1	\$5,130	Government pay the cost	6.1.1 (Vol.2)
			Sand settling pond in tributaries	Reduction of turbidity of 22.5 mg/l	Construction in 4 tributaries	2004-2010	(1) ACRT	\$8.4/mg/l	2	\$11,391	Government pay the cost	6.1.1 (Vol.2)
			Sustainable enforcement of monitoring	Sustainable collection of basic information	Continuous operation	2004-2010	(1) ACRT	N.A.	N.A.	Continuation of Short Term	Government pay the cost	6.1.4 (Vol.2)
			Sustainable enforcement of strengthening of control	Strengthening of enforcement for necessity action taken by agency concerned	Continuous operation	2004-2010	(1) ACRT	N.A.	N.A.	Continuation of Short Term	Government pay the cost	6.1.3 (Vol.2)
			Sustainable enforcement of public education	Education for school, manufacturers and inhabitants	Continuous operation	2004-2010	(1) ACRT	N.A.	N.A.	Continuation of Short Term	Government pay the cost	6.1.3 (Vol.2)
			Sustainable enforcement of application of environmental fund	Assistance for necessary works for environment improvement	Continuous operation	2004-2010	(1) ACRT	N.A.	N.A.	Continuation of Short Term	Government pay the cost	6.1.3 (Vol.2)
Sustainable enforcement of application of pollution charge	Promotion of installation of treatment plant for factories and pigeries	Continuous operation	2004-2010	(1) ACRT	N.A.	N.A.	Continuation of Short Term	Government pay the cost	6.1.3 (Vol.2)			

*1 (1): Responsible Agency/Body (2): Related Agency/Body *2 Cost Effectiveness = Annual Cost / Outcome (Annual Cost = Initial Cost x 0.11 + O&M Cost) N.A.: not applicable

Table S-3

Plan de Gerenciamiento Ambiental (Planta de Tratamiento Cloacal)

Managing Item	Source of Impact	Measuring Standard of Impact	Managing Approach	Management Location	Managing Agency Concerned
(Pre-Construction Stage)					
-Social unrest	-Project location -Land acquisition	-Compensation -Public protest/ demonstration & project disturb	-Negotiation -Public hearing -Presidential decree No 184 (Expropriation Law)	-Project site -All project-affected communities	-MARNR -Tuy Agency -Local Government -Regional Government
(Construction Stage)					
-Noise	Operation of heavy equipment	Noise level : 65 dB (Leq) (Decree No 2217)	-Control of number or speed of vehicles/ equipment -Working hour -Equipment operators	-Residential area -School, clinic	-Tuy Agency -Local Government
-Air pollution and traffic congestion	-Mobilization of equipment -Civil works	-Quality standard (Decree No 638) -Traffic congestion frequency/duration	-Covering materials with sheet -Watering road -Selection of spoil site	-Construction site -Public road & access road	-Tuy Agency -Local Government
-Water quality of the river	All civil works relating to the project	Water quality standard according to Decree No. 883	-Effort to minimize spilt soil into the river -Protective net at downstream direction	-Construction site -Sewage pipe setting location	-Tuy Agency
-Sediment	Earth works (embankment / filling)	Contents of Cr, Ni, Pb Cu and Zn in sediment	-No use of such materials for embankment -Proper method of disposal in dumping site	Construction site	-Tuy Agency
-Aquatic biology	Embankment / filling for flood protection	Presence and density of benthos, plankton and netton	-Effort to minimize degradation of water quality -Preservation of natural ecology	Tuy river at Project site (sampling point as determined in EIA)	-Tuy Agency
-Employment and economic growth	Project implementation	-Willingness to participate in project -Increase in family income	Recruitment of local manpower	Municipalities of Santos Michelena and Tomas Landier	-Tuy Agency -Local Government
(Post-Construction Stage)					
-Illegal land use of project site	-Project location -Land acquisition	-No. of squatters -Illegal land use	-Effort to gain public comprehension -Control of illegal land use	Proposed site for sewage treatment plant	-MARNR -Tuy Agency -Local Government -Regional Government
-Generation of stench and insects	Sewerage treatment plant	Public complaint, protest and reaction	-Treatment method and system -Proper operation and maintenance	Sewerage treatment plant	-Tuy Agency
-Disposal of sludge	Sewerage treatment plant	Sludge composition (contents of toxic substances)	-Sludge disposal system -Proper operation and maintenance	-Final disposal site -Sewerage treatment system	-Tuy Agency -Mancooso -Local Government
-Sewage canals/pipes	Domestic/Industrial wastewater	Function of sewerage system	-Proper maintenance of sewerage network -Educating people	Each community concerned	-Tuy Agency -Local Government

Table S-4

Plan de Gerenciamiento Ambiental (Tanque Sedimentador de Arena)

Managing Item	Source of Impact	Measuring Standard of Impact	Managing Approach	Management Location	Managing Agency Concerned
(Pre-Construction Stage)					
-Social unrest	-Project location	-Compensation -Public protest/ demonstration & project disturb	-Negotiation -Public hearing	-Construction site -All project-affected land	-Hidrocapital -MARNR -Tuy Agency -Local Government
(Construction Stage)					
-Noise	Operation of heavy equipment	Noise level : 65 dB (Leq) (Decree No 7217)	-Control of number or speed of vehicles/ equipment -Working hour -Equipment operators	Village(s) close to project site	-Hidrocapital -Tuy Agency -Local Government
-Air pollution and traffic congestion	-Mobilization of equipment -Civil works	-Quality standard (Decree No.638) -Traffic congestion frequency/duration	-Covering materials with sheet -Watering road -Selection of spoil site	-Construction site -Public road & access road	-Hidrocapital -Tuy Agency -Local Government
-Water quality of the river	All civil works relating to the project	Water quality standard according to Decree No.883	-Effort to minimize spilt soil into the river -Protective net at downstream direction	-Construction site -Water intake facility	-Hidrocapital -Tuy Agency
-Sediment	Earth works (embankment / filling)	Contents of Cr, Ni, Pb Cu and Zn in sediment	-No use of such materials for embankment -Proper method of disposal in dumping site	Construction site	-Hidrocapital -Tuy Agency
-Aquatic biology	All civil works relating to the project	Presence and density of benthos, plankton and neeton	-Effort to minimize degradation of water quality -Preservation of natural ecology	Tuy river at Project site (sampling point as determined in EIA)	-Tuy Agency
-Employment and economic growth	Project implementation	-Willingness to participate in project -Increase in family income	Employment of local manpower	San Francisco de Yare and other nearby villages	-Hidrocapital -Local Government
(Post-Construction Stage)					
-Illegal land use of project site	-Project location	-No. of squatters -Illegal land use	-Effort to gain public comprehension -Control of illegal land use	Proposed site for sand settling pond and its surrounding area	-Hidrocapital -MARNR -Tuy Agency -Local Government
-Water intake and pre-treatment facility	Sand settling pond	-Turbidity -Pumping operation	-Introduction of mechanical sand settling system -Proper operation and maintenance	-Sand settling pond -Intake facility	-Hidrocapital -Tuy Agency
-Flushed sediment	Sand settling pond	Volume of flushed sediment	-Flushing operation -Proper maintenance of facility	-Flushing gate -Downstream of intake weir	-Hidrocapital -Tuy Agency
-Sewage canals/pipes	Domestic/industrial wastewater	Function of sewerage system	-Proper maintenance of sewerage network -Educating people	Each community concerned	-Tuy Agency -Local Government

**Table S-5 Plan de Monitoreo Ambiental
(Planta de Tratamiento Cloacal)**

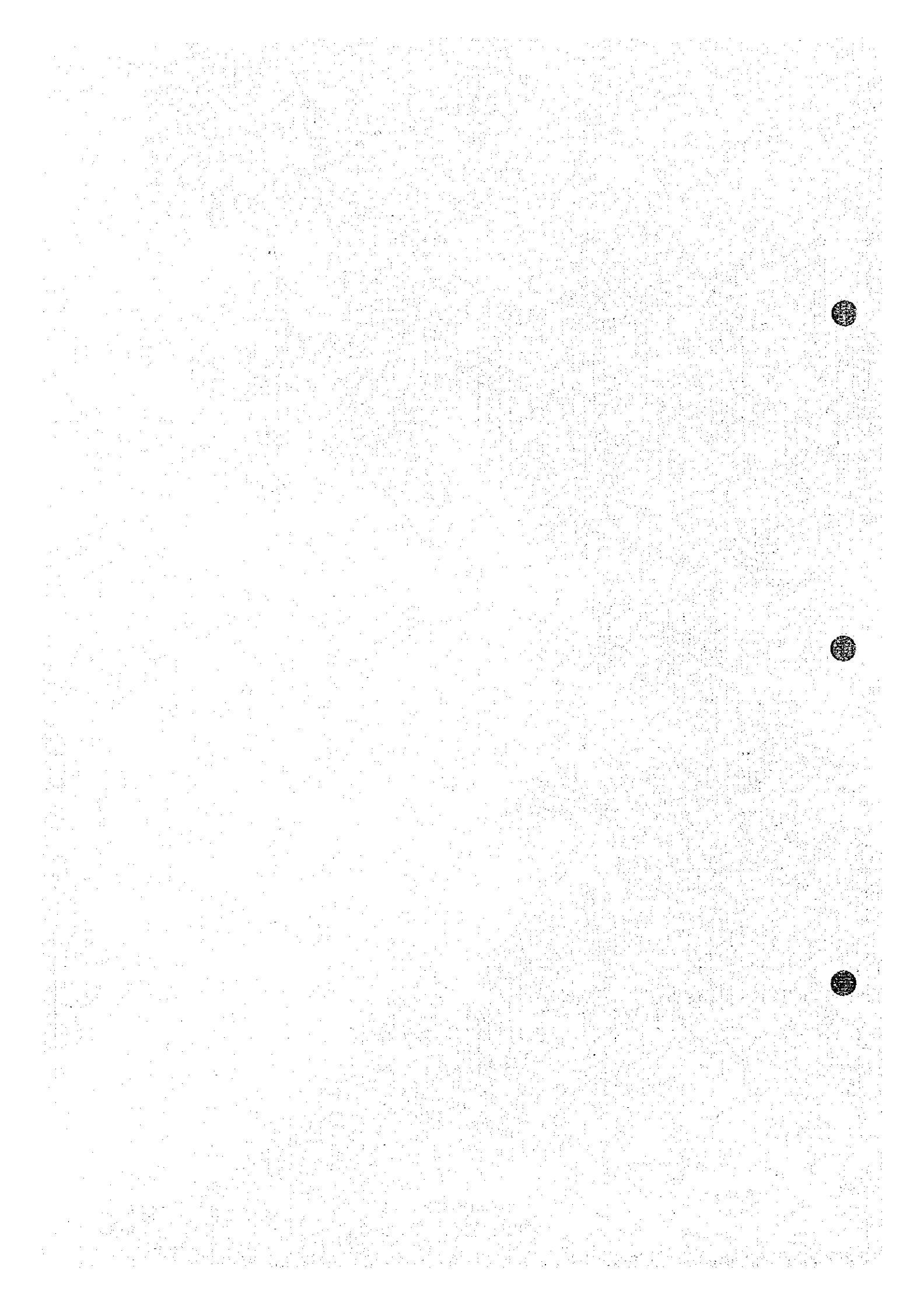
Monitoring Item	Monitoring Method	Location	Monitoring Frequency	Duration	Monitoring Agency
Illegal land use of project site	Field visit and confirmation	Proposed site for sewerage treatment plant	Every 6 months	No limit defined	-MARNR -Tuy Agency -Local Government
Noise	Measured by noise level meter	Residential area close to project site	Once a month	Construction period	Tuy Agency
Dust and traffic congestion	Field inspection and measurement	-Construction site -Urban area	Once a month	Construction period	Tuy Agency
Sediment	Field inspection and measurement	Sampling points as selected in EIA	Every 6 months	Till year 2010	Tuy Agency
Aquatic biology	-Field inspection -Sample analysis	Sampling points as selected in EIA	Every 6 months	Till year 2010	Tuy Agency
Water quality of the Tuy River	Test and analysis of sample waters in laboratory	Sampling points as selected in EIA	Every 6 months	Till year 2010	Tuy Agency
Groundwater quality	Test and analysis of sample waters in laboratory	Sampling points (deep well) as selected in EIA	Every 6 months	Till year 2010	Tuy Agency
Inflow of wastewater	Sample analysis in laboratory	Inlet of sewerage treatment plant	Once a week	No limit defined	Tuy Agency
Outflow of wastewater	Sample analysis in laboratory	Outlet of sewerage treatment plant	Once a week	No limit defined	Tuy Agency
Disposal of sludge	-Field inspection -Sample analysis	-Sewerage treatment plant -Disposal site	Once a month	No limit defined	-Tuy Agency -MARNR
Water supply operation	-Pump operation hours -Volume of pre-treated water	Pre-treatment plant	Every 3 months	Till year 2010	Hidrocapital
Public health	Collection of inform. on waterborn diseases	Districto Sanitario No.2	Every 3 months	Till year 2010	Tuy Agency
Generation of stench and insects	Public opinion and field inspection	-Sewerage treatment plant -Residential area	Every 3 months	Till year 2010	Tuy Agency
Operation and maintenance of facility	Field inspection	-Sewerage treatment plant -Project-related communities	Every 6 months	No limit defined	Tuy Agency

Table S-6

Plan de Monitoreo Ambiental (Tanque Sedimentador de Arena)

Monitoring Item	Monitoring Method	Location	Monitoring Frequency	Duration	Monitoring Agency
Illegal land use of project site	Field visit and inspection	Construction site and its surrounding areas	Every 6 months	No limit defined	-MARNR -Hidrocapital -Local Government
Noise	Measured by noise level meter	Communities close to project site	Once a month	Construction period	Tuy Agency
Dust and traffic congestion	Field inspection and measurement	-Construction site -Artery road to urban center	Once a month	Construction period	Tuy Agency
Sediment	Field inspection and measurement	Sampling points as selected in EIA	Every 6 months	Till year 2010	Tuy Agency
Aquatic biology	-Field inspection -Sample analysis	Sampling points as selected in EIA	Every 6 months	Till year 2010	Tuy Agency
Water quality of the Tuy River	Test and analysis of sample waters in laboratory	Sampling points as selected in EIA	Every 6 months	Till year 2010	Tuy Agency
Flushed sediment	-Field inspection -Volume of flushed sediment	-Sand settling pond -Downstream of intake weir	Once a month	Till year 2010	-Hidrocapital -Tuy Agency
Turbidity	Sample analysis in laboratory	Pre-treatment plant	Once a week	No limit defined	Hidrocapital
Water supply operation	-Pump operation hours -Volume of flushed sediment	Pre-treatment plant	Every 3 months	Till year 2010	Hidrocapital
Operation and maintenance of facility	Field inspection	Sand settling pond	Every 3 months	No limit defined	Hidrocapital
	-Volume of pre-treated water				
Public health	Collection of inform. on waterborn diseases	Districto Sanitario No 2	Every 3 months	Till year 2010	Tuy Agency
Generation of stench and insects	Public opinion and field inspection	-Sewerage treatment plant -Residential area	Every 3 months	Till year 2010	Tuy Agency
Operation and maintenance of facility	Field inspection	-Sewerage treatment plant -Project-related communities	Every 6 months	No limit defined	Tuy Agency

FIGURAS



Study Schedule

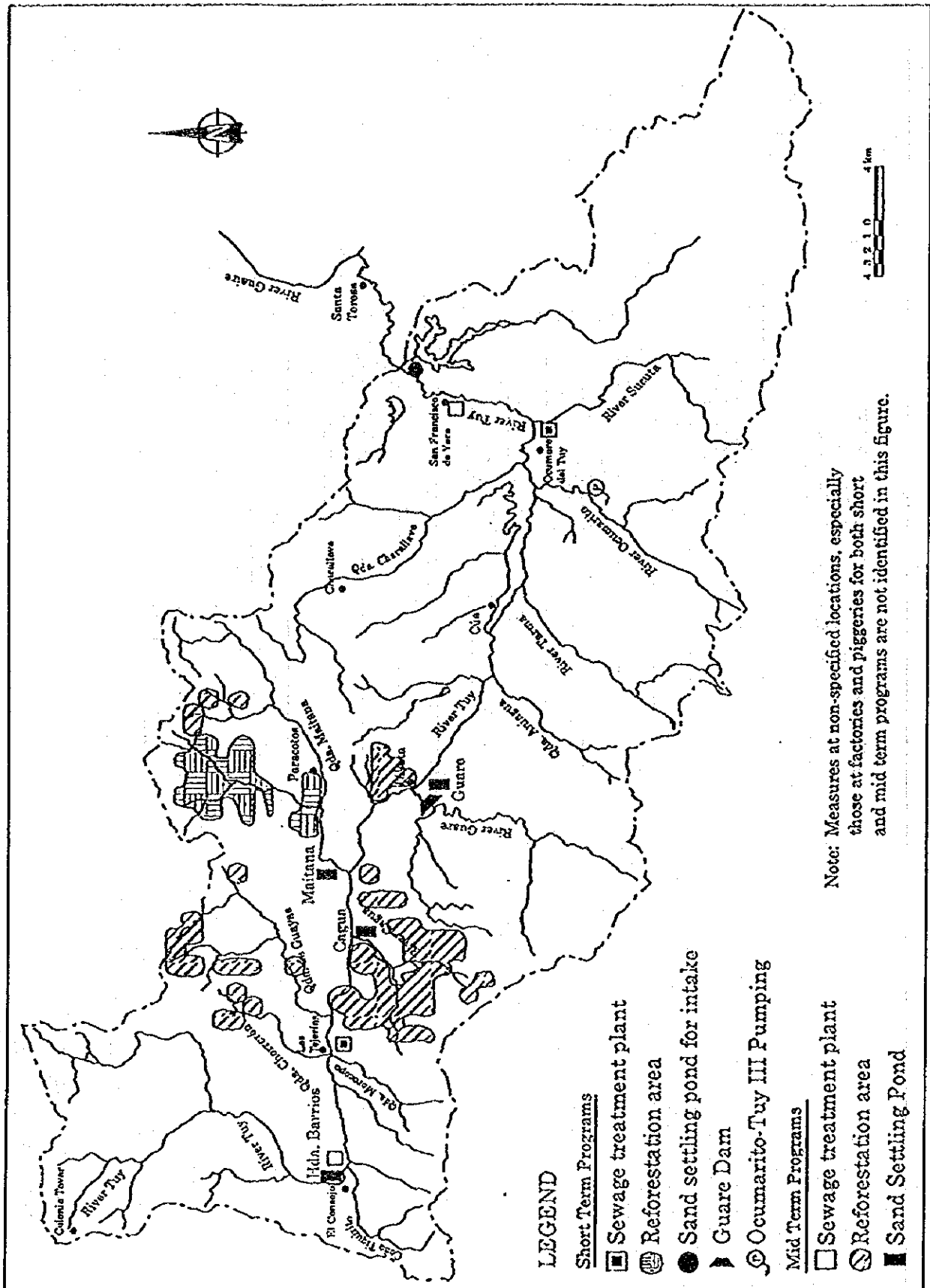
	1996												1997							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Field Study		First						Second				Third					Fourth			
Home Office Study	Preparatory					First								Second					Third	
Study Phase	← Phase I				→				← Phase II				→							
Report	▲ C/R					▲ PR/R(1)		▲ IT/R						▲ PR/R(2)			▲ DF/R			▲ F/R
Workshop/Seminar								▲ Workshop								▲ Workshop	▲ Seminar			
Steering Committee					▲			▲			▲			▲			▲			

Note: IC/R: Inception Report
 PR/R: Progress Report
 IT/R: Interim Report
 DF/R: Draft Final Report
 F/R: Final Report

THE STUDY ON
 THE ENVIRONMENTAL IMPROVEMENT PROGRAM OF THE UPPER AND MIDDLE
 STREAM OF THE TUY RIVER BASIN
 IN THE REPUBLIC OF VENEZUELA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. S-1 Programa del Estudio



THE STUDY ON
 THE ENVIRONMENTAL IMPROVEMENT PROGRAM OF THE UPPER AND MIDDLE
 STREAM OF THE TUY RIVER BASIN
 IN THE REPUBLIC OF VENEZUELA
 JAPAN INTERNATIONAL COOPERATION AGENCY

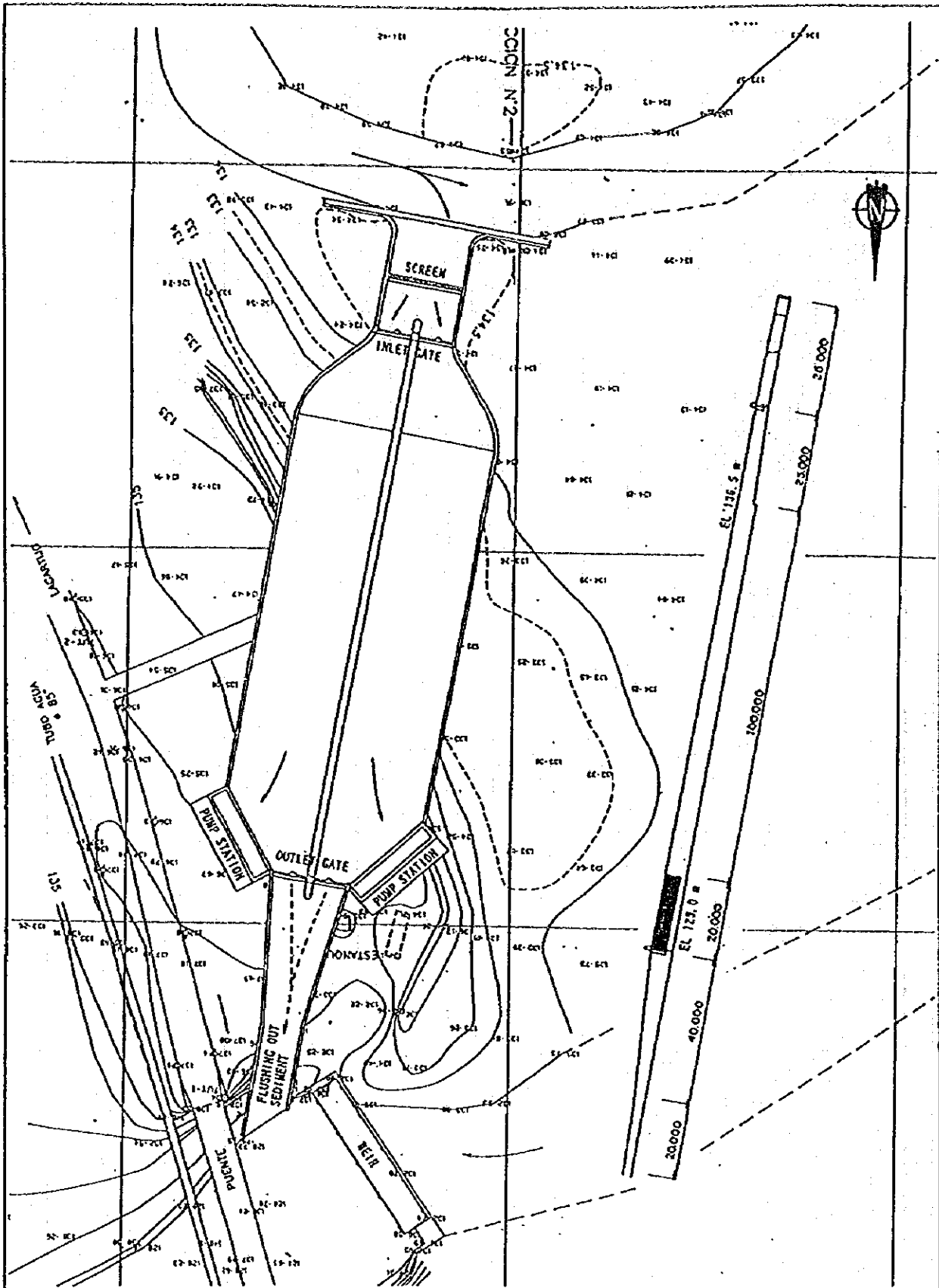
Fig. S-2
 Ubicacion de Medidas Estructurales

Item	Year												
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Short Term Program													
<i>Structure Measure</i>													
Water quality													
Factory (Food/non-food)													
Existing													
Newly developed													
Domestic wastewater													
Ocumare del Tuy													
Las Tejerias													
Turbidity													
Reforestation													
Water quantity													
Securement of water													
Ocumarito-Tuy III Pumping													
Guare Dam													
Factory													
For color/odor													
Turbidity													
Sand settling pond for intake													
<i>Institutional Measure</i>													
Laws and Regulations													
Organization													
Monitoring													
Public education													
Environmental Fund													
Pollution Charge													
Mid Term Program													
<i>Structure Measure</i>													
Water quality													
Factory (Food/non-food)													
Newly developed													
Domestic wastewater													
Ocumare del Tuy													
San Francisco de Yare													
El Consejo													
Turbidity													
Reforestation													
Sand settling pond for tributary													
<i>Institutional Measure</i>													
Sustainable enforcement													
Monitoring													
Strengthening of Control													
Public education													
Environmental Fund													
Pollution Charge													

THE STUDY ON
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JAPAN INTERNATIONAL COOPERATION AGENCY

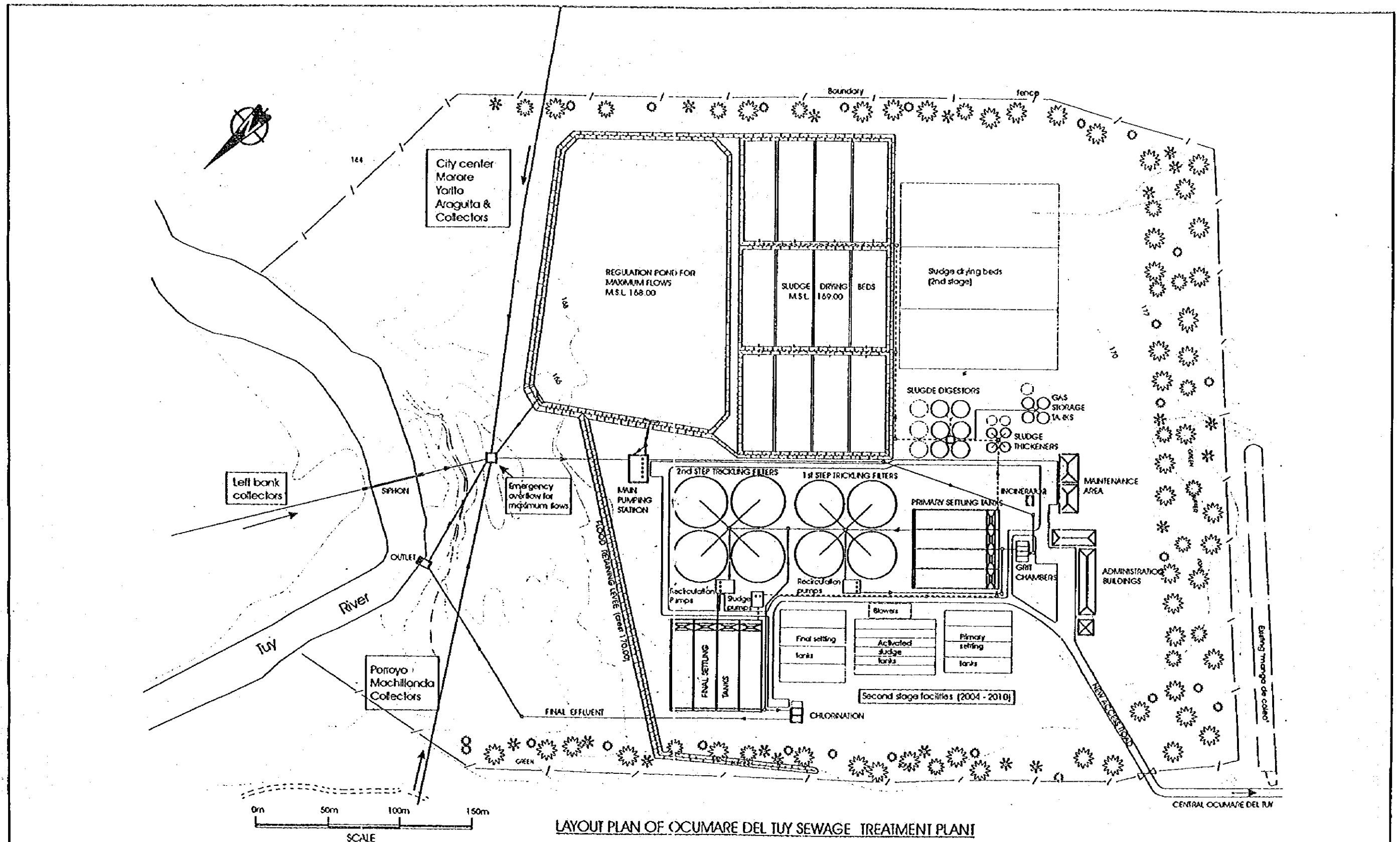
Fig. S-3 Programa de Implementacion del Plan Maestro



THE STUDY ON
 THE ENVIRONMENTAL IMPROVEMENT PROGRAM OF THE UPPER AND MIDDLE
 STREAM OF THE TUY RIVER BASIN
 IN THE REPUBLIC OF VENEZUELA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. S-4 Perfil del Tanque Sedimentador
 de Arena

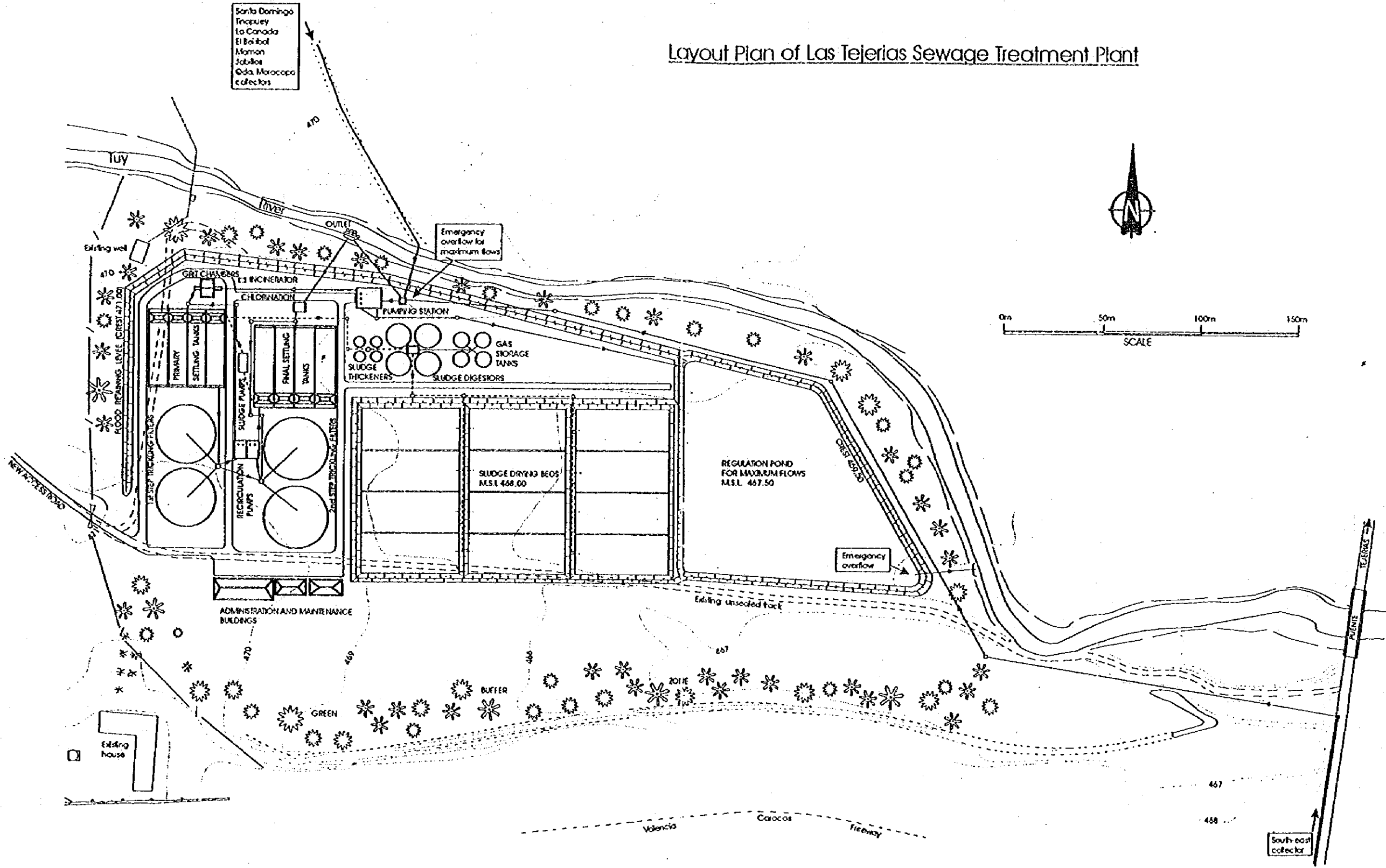


LAYOUT PLAN OF OCUMARE DEL TUY SEWAGE TREATMENT PLANT

THE STUDY ON
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 STREAM OF THE TUY RIVER BASIN
 IN THE REPUBLIC OF VENEZUELA
 JAPAN INTERNATIONAL COOPERATION AGENCY

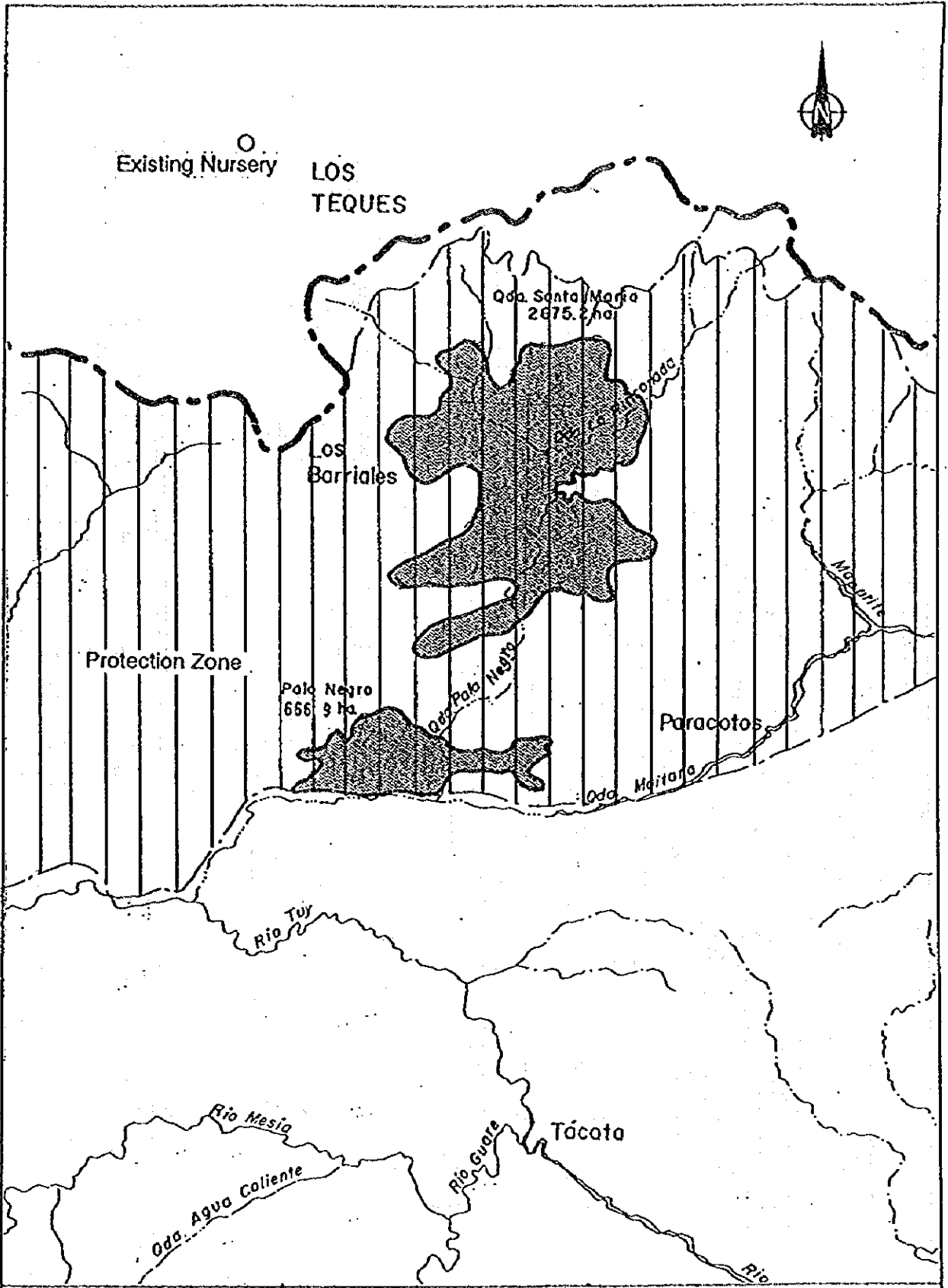
Fig. S-5 Perfil de la Plana de Tratamiento Cloacal (Ocumare del Tuy)

Layout Plan of Las Tejerías Sewage Treatment Plant



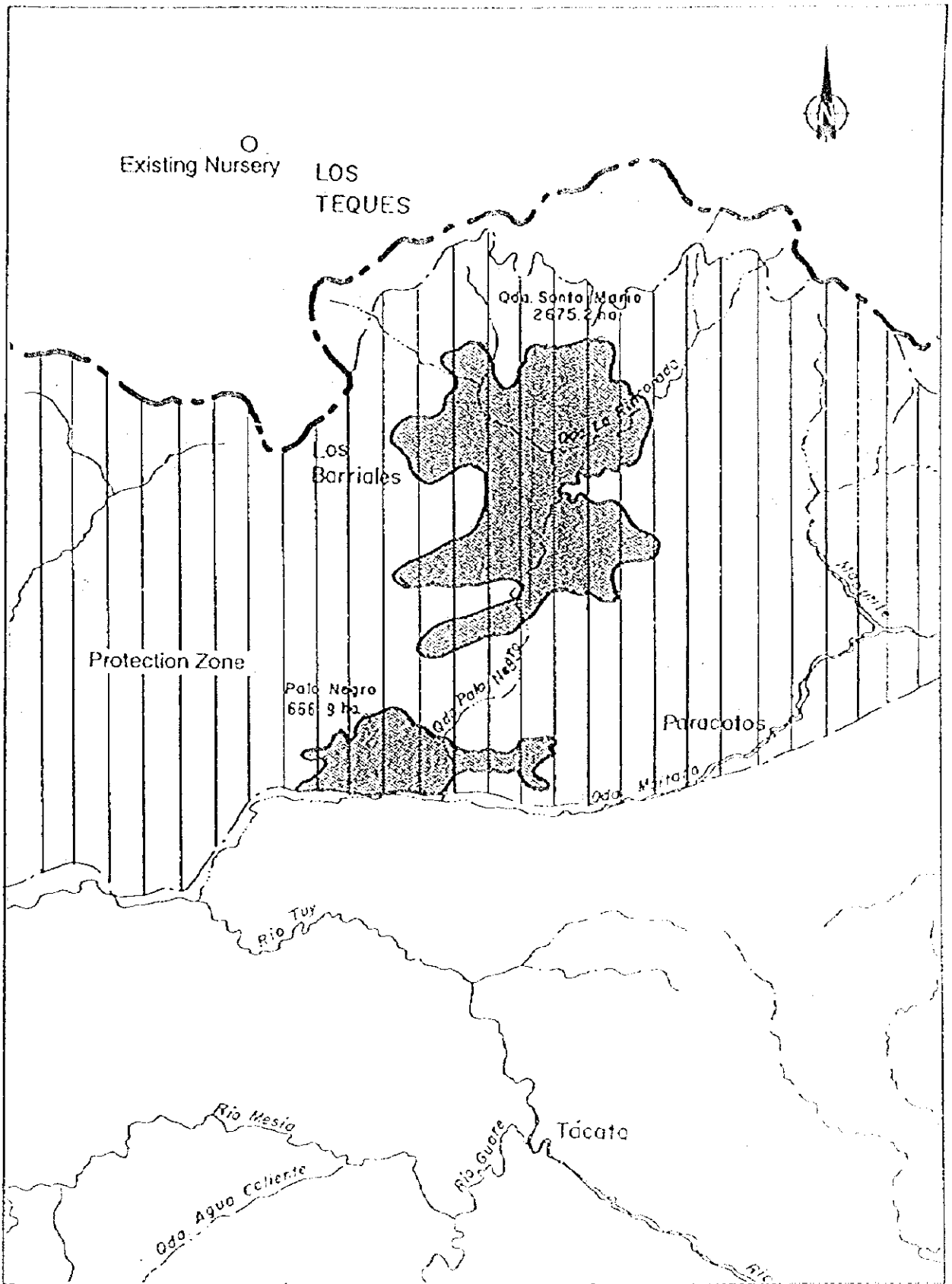
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Fig. S-6 Perfil de la Planta de Tratamiento Cloacal (Las Tejerías)



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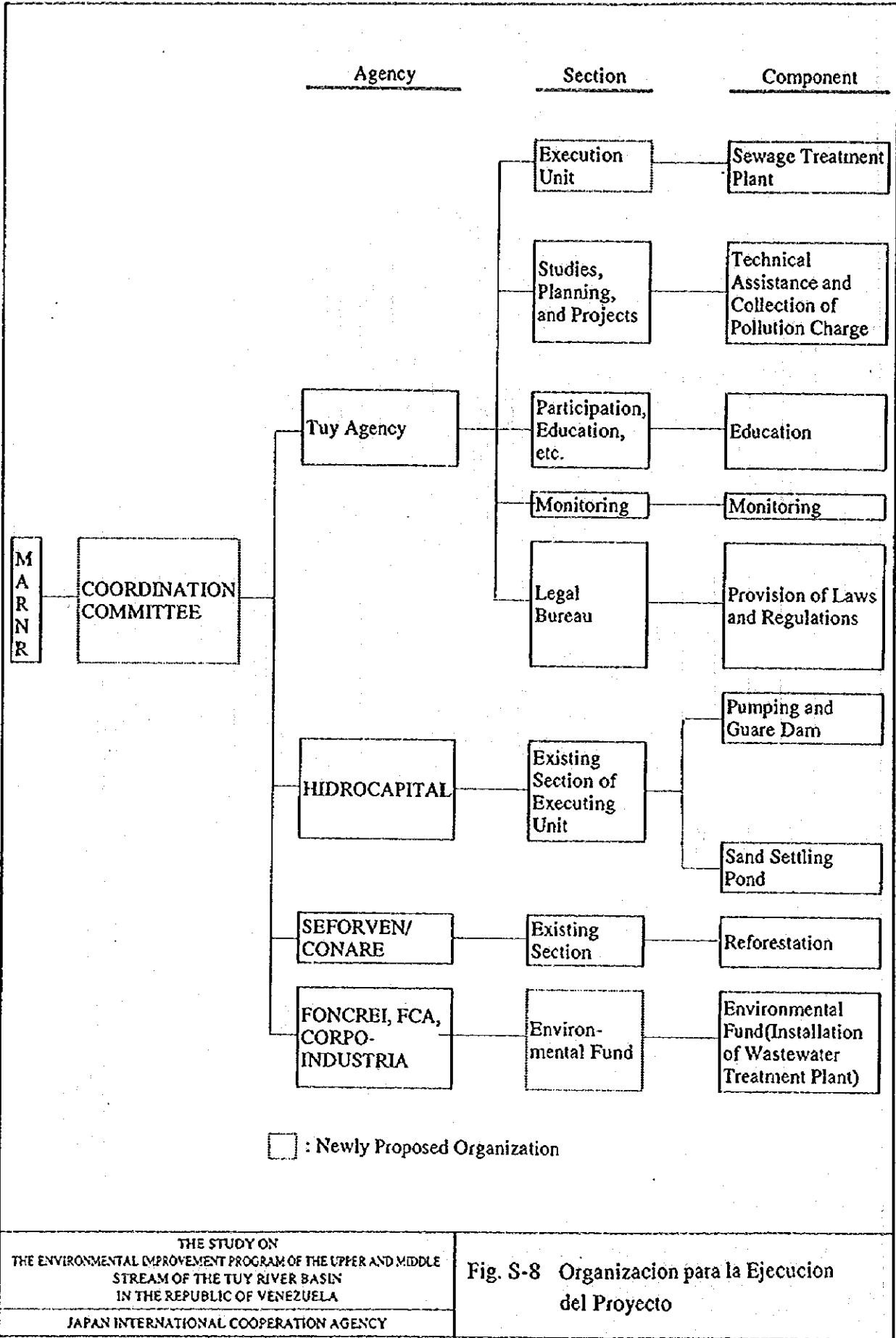
Fig. S-7 Sitio Objetivo de Reforestacion

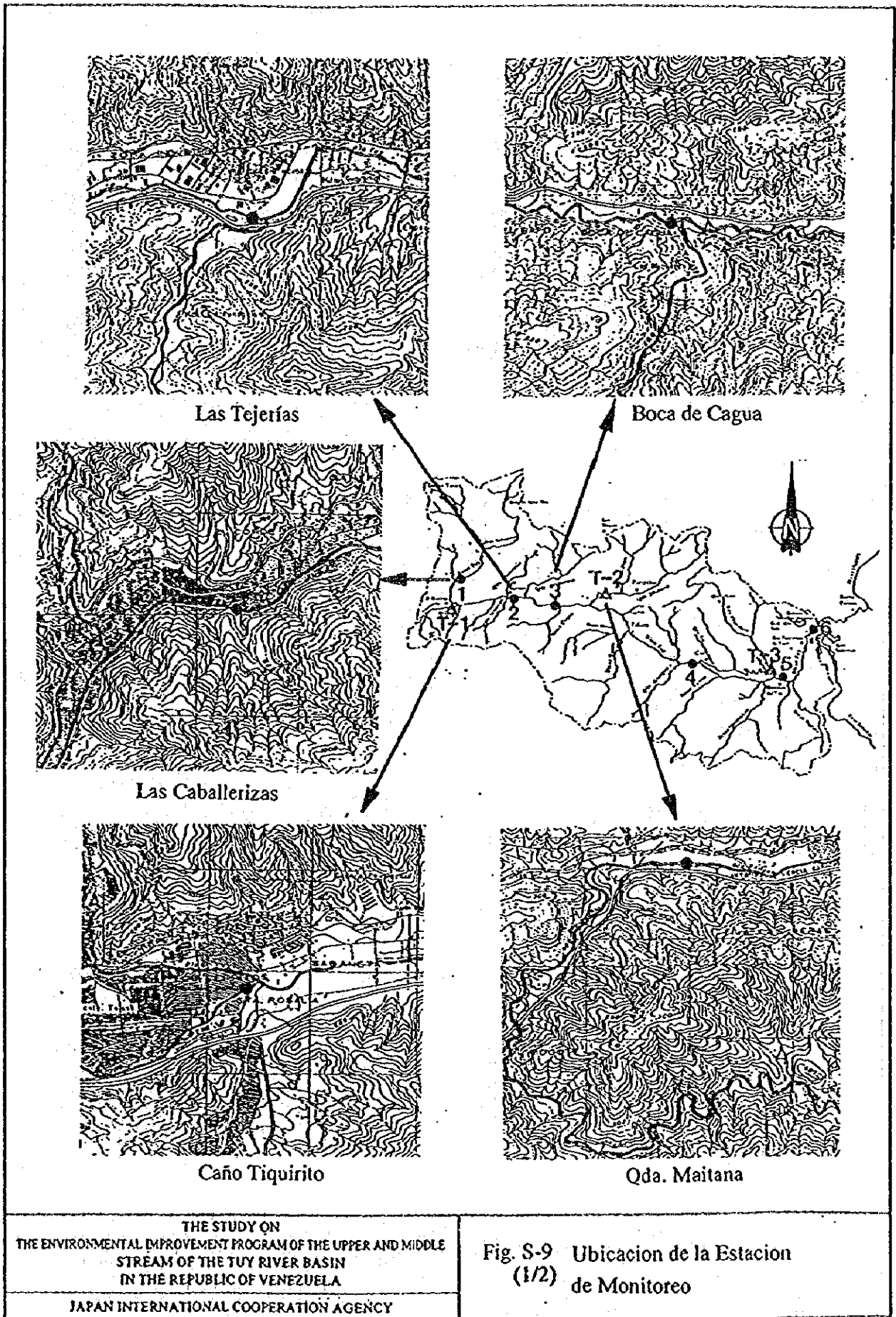


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Fig. S-7 Sitio Objetivo de Reforestacion





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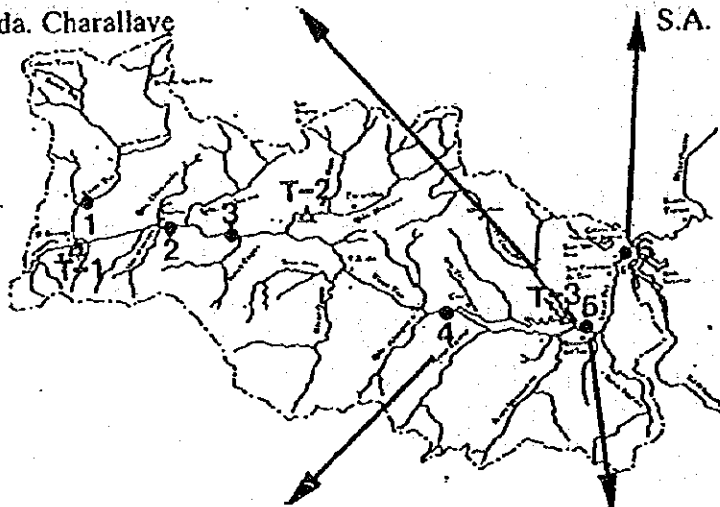
Fig. S-9 Ubicacion de la Estacion
 (1/2) de Monitoreo



Qda. Charallave



S.A. de Yare



Cua Bridge



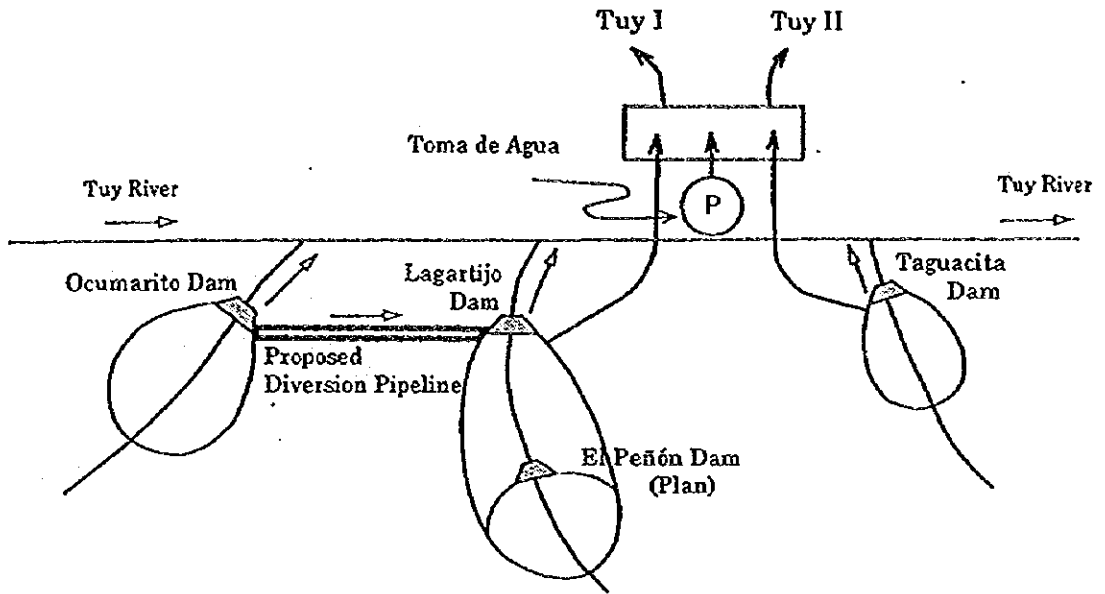
Ocumare Bridge

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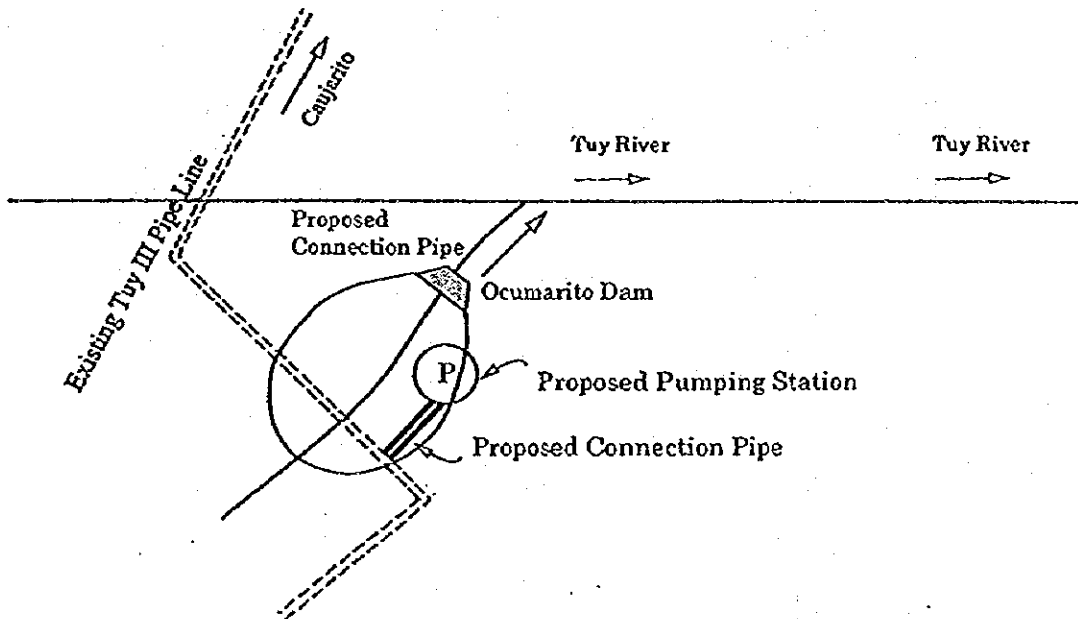
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Fig. S-9 Ubicacion de la Estacion
 (2/2) de Monitoreo

Ocumarito - Lagartijo Diversion Plan



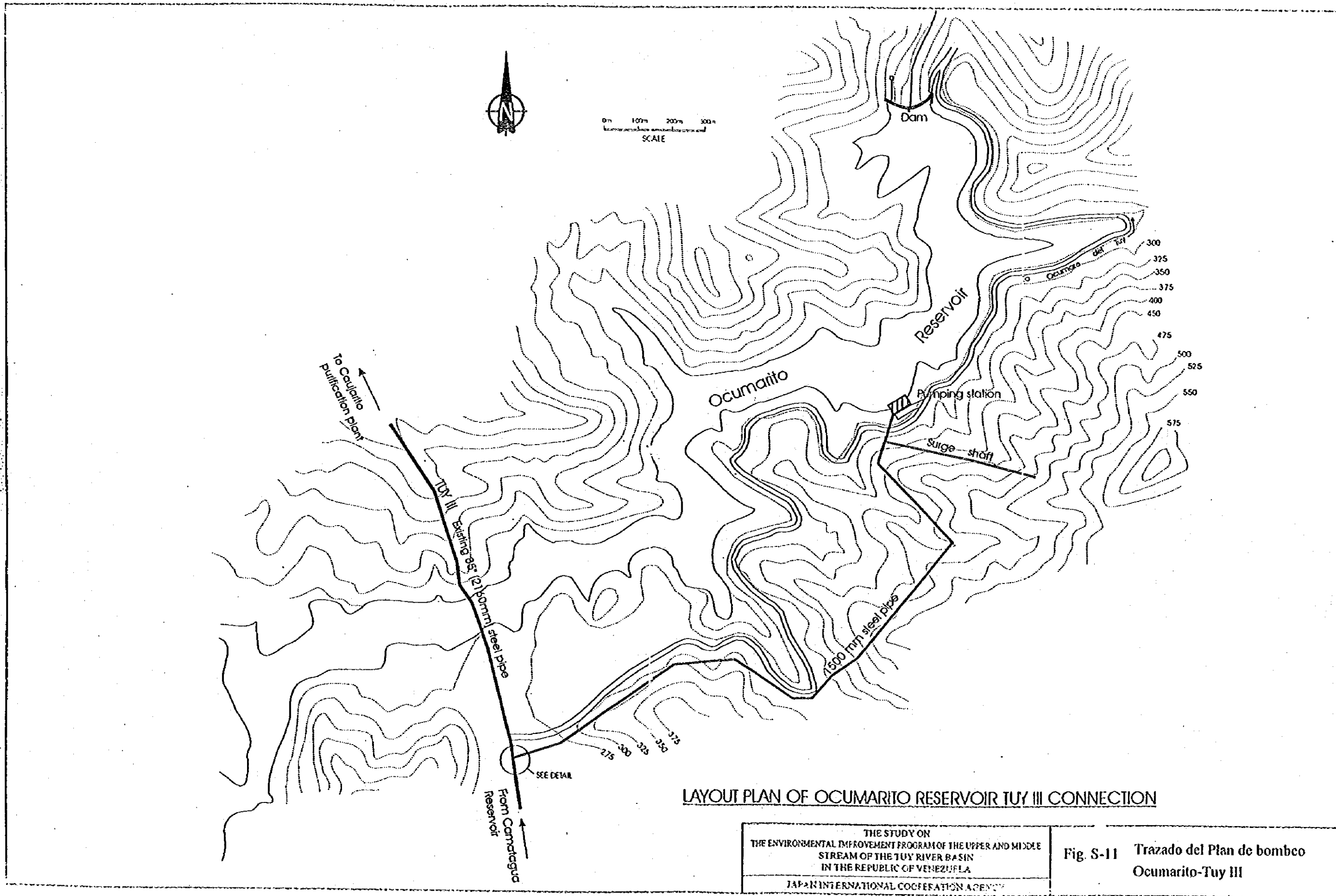
Pumping Plan to Tuy III Pipeline

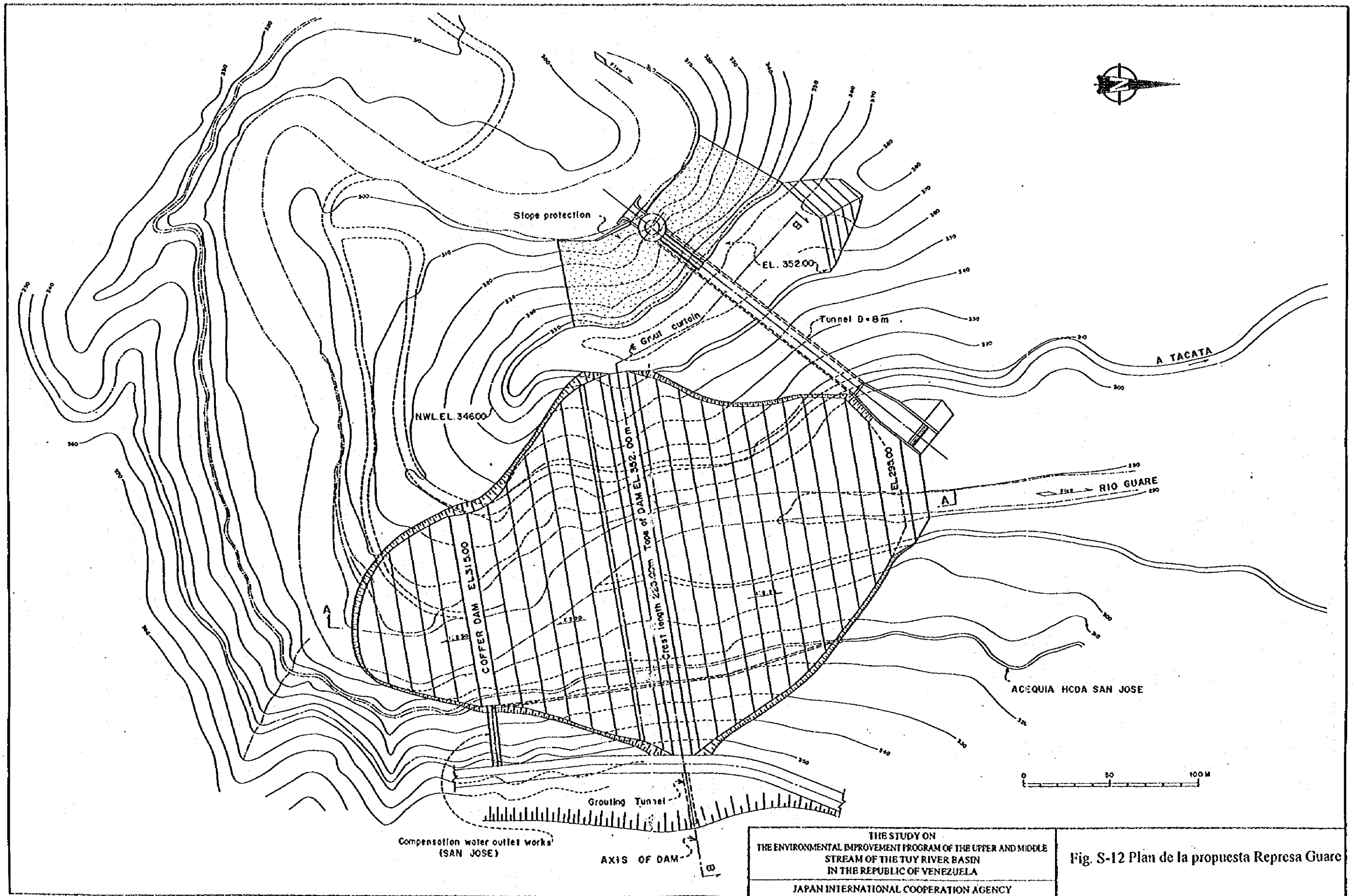


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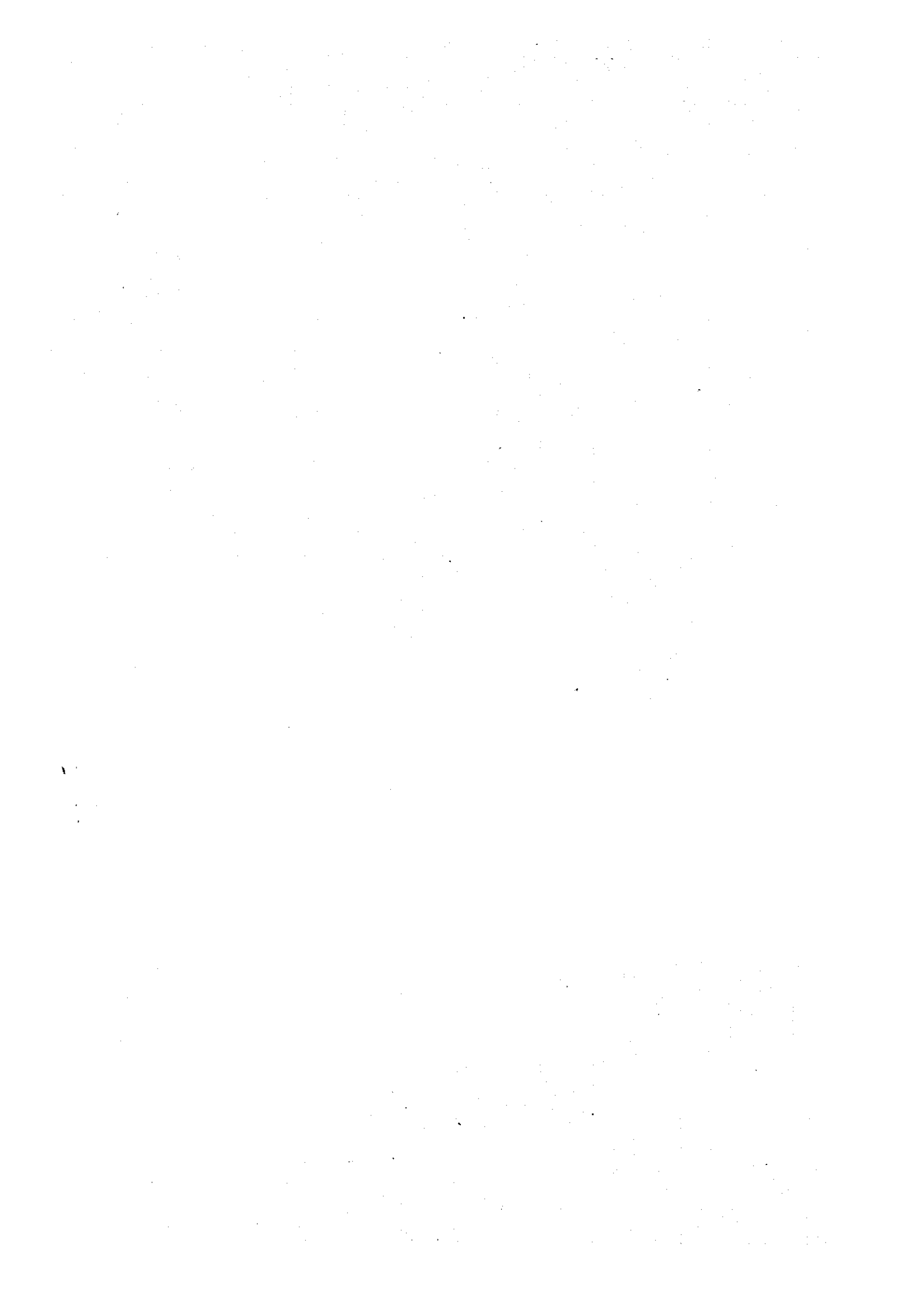
Fig. S-10 . Concepto General para la Utilizacion del Rio Ocumarito

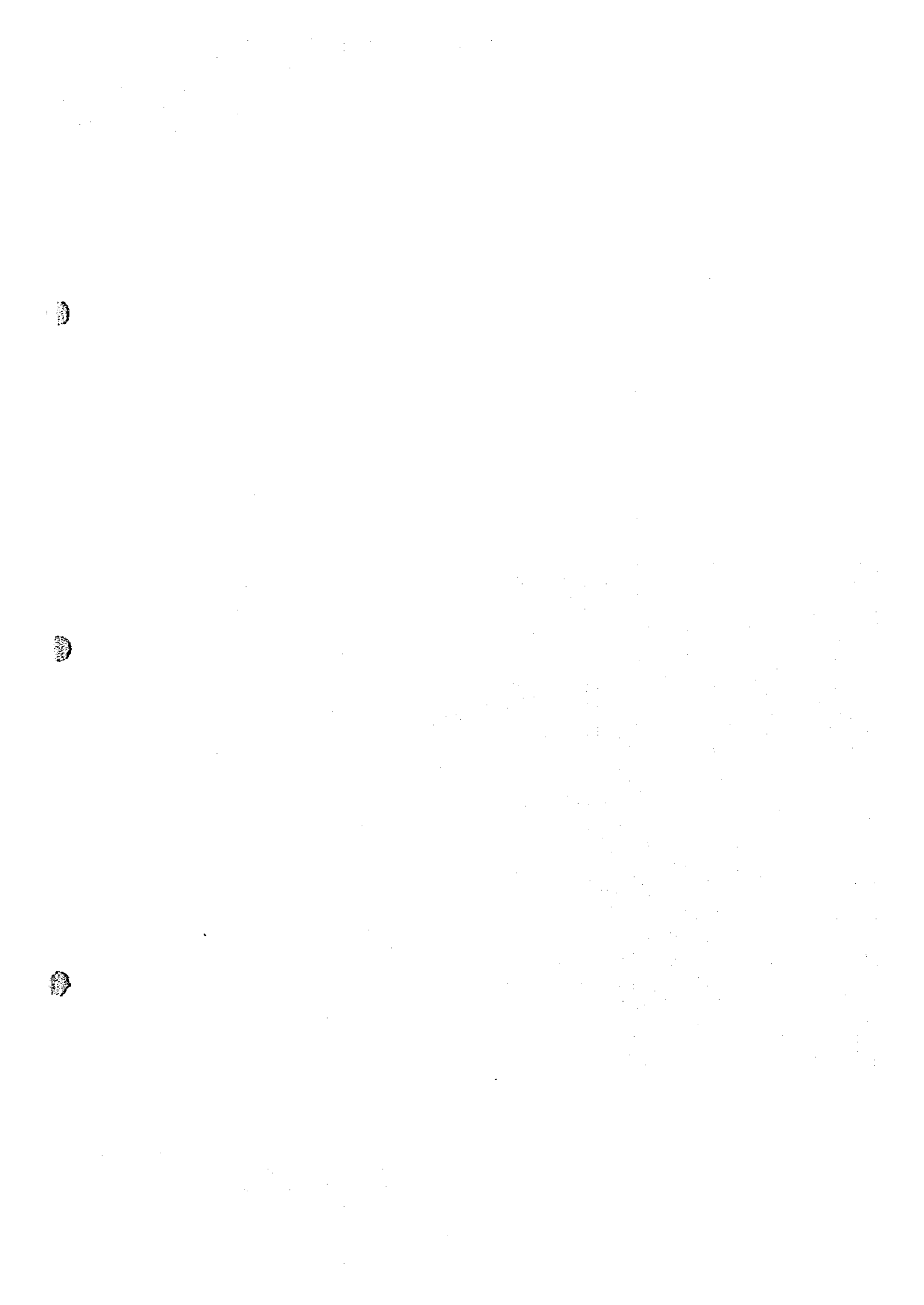


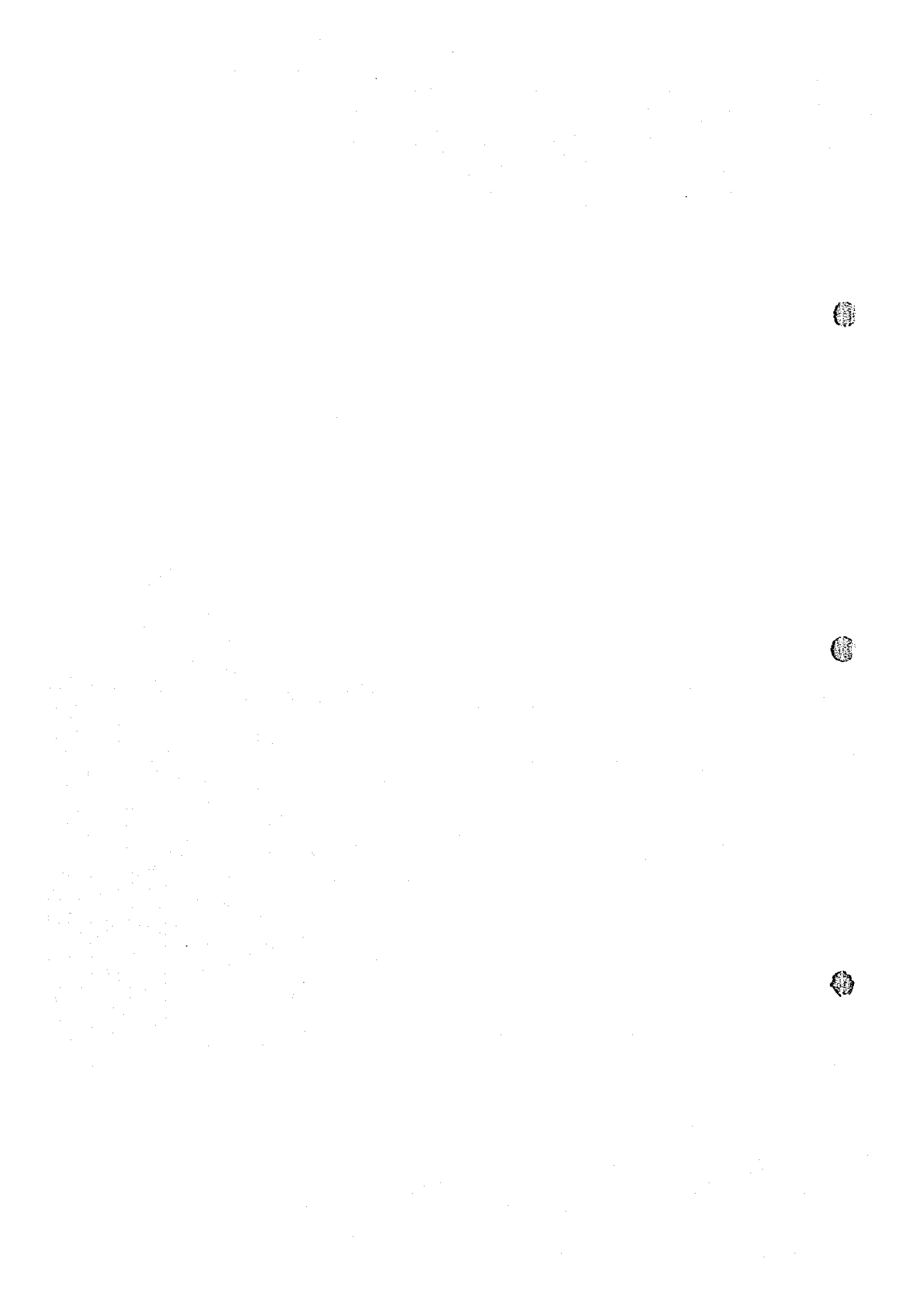


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Fig. S-12 Plan de la propuesta Represa Guare







JICA