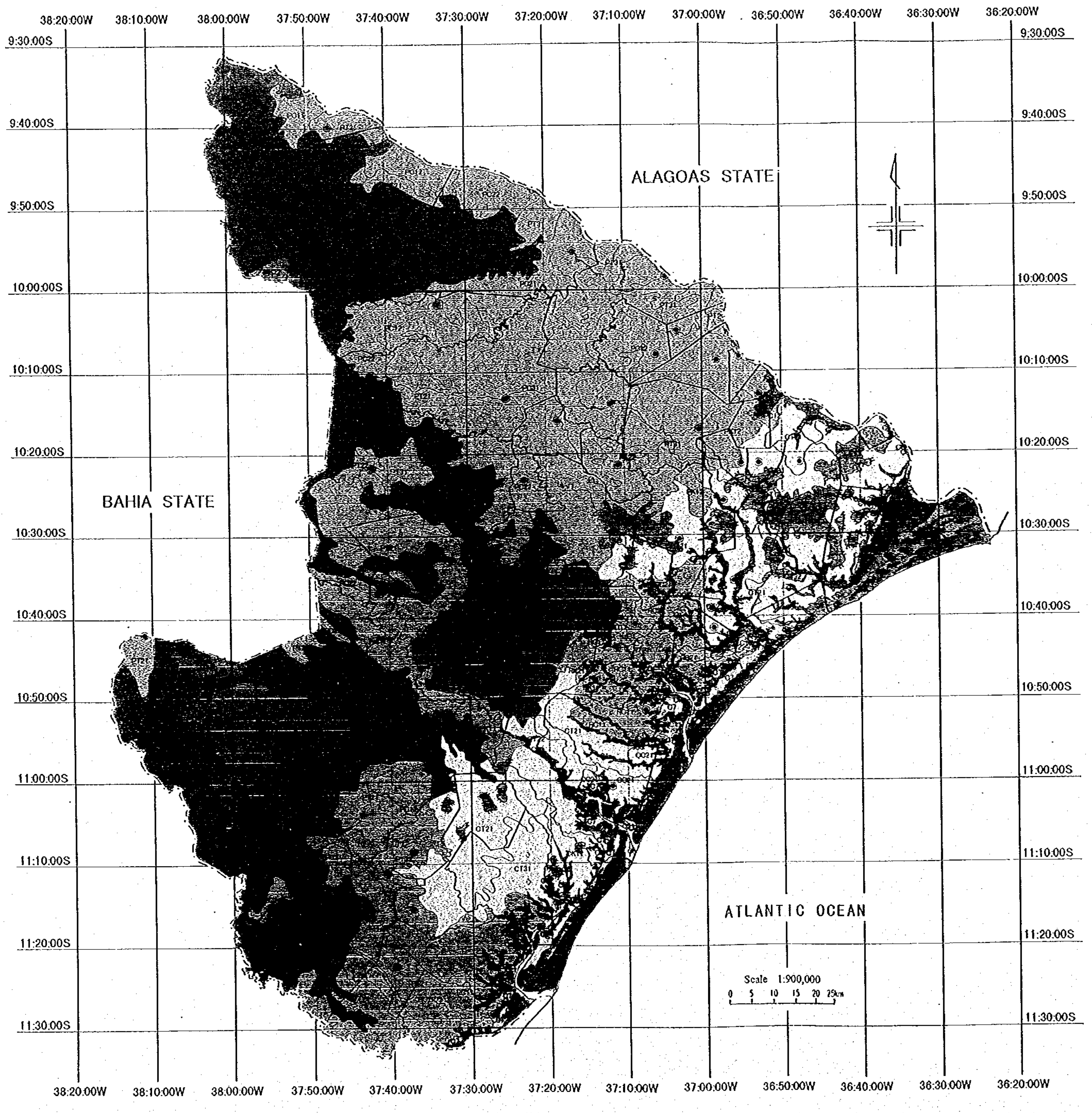


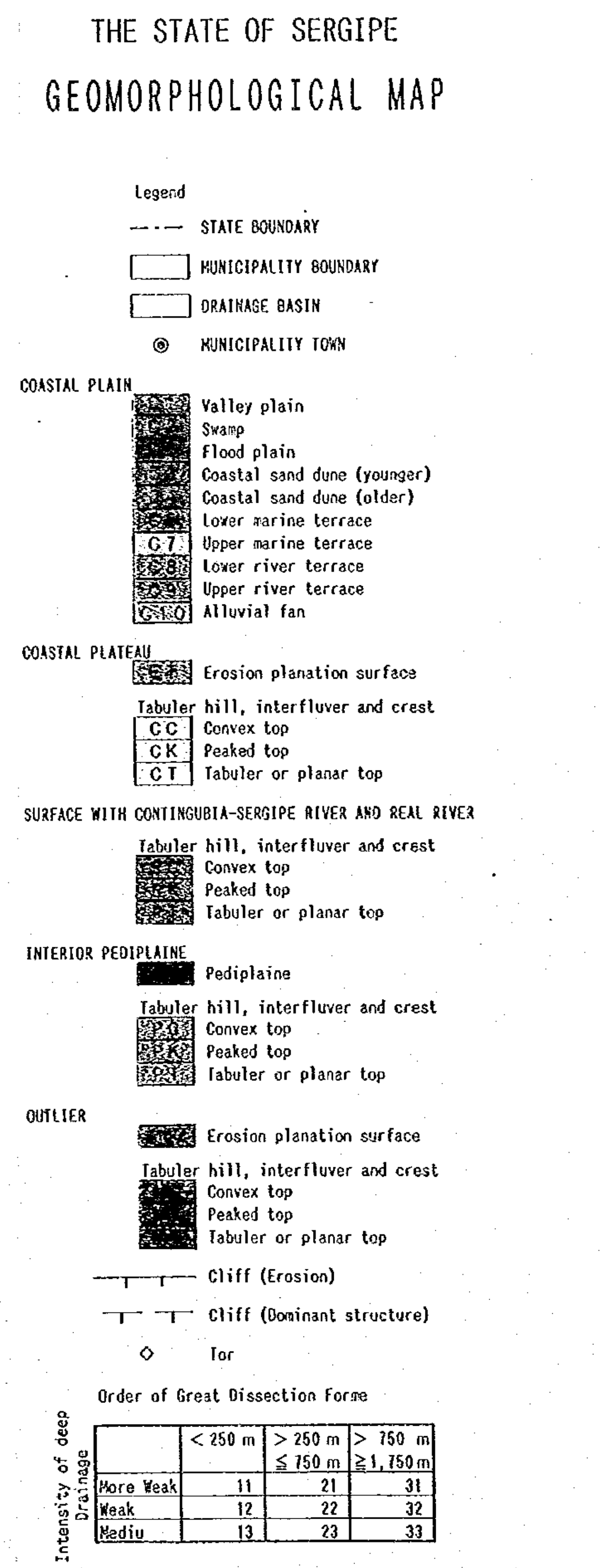
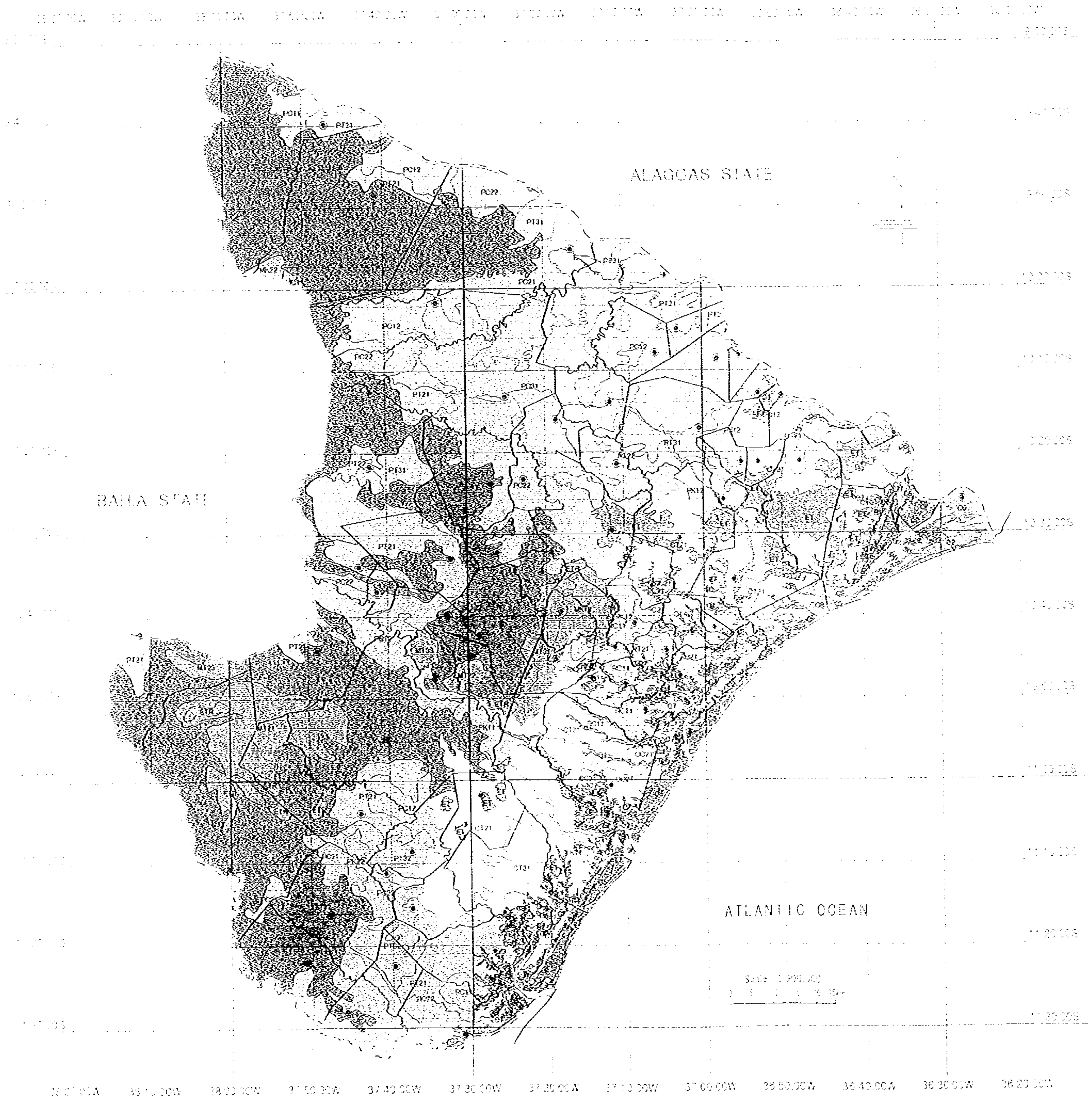


Figure-2.1 Geomorphological Map in Sergipe State by Satellite Image Analysis



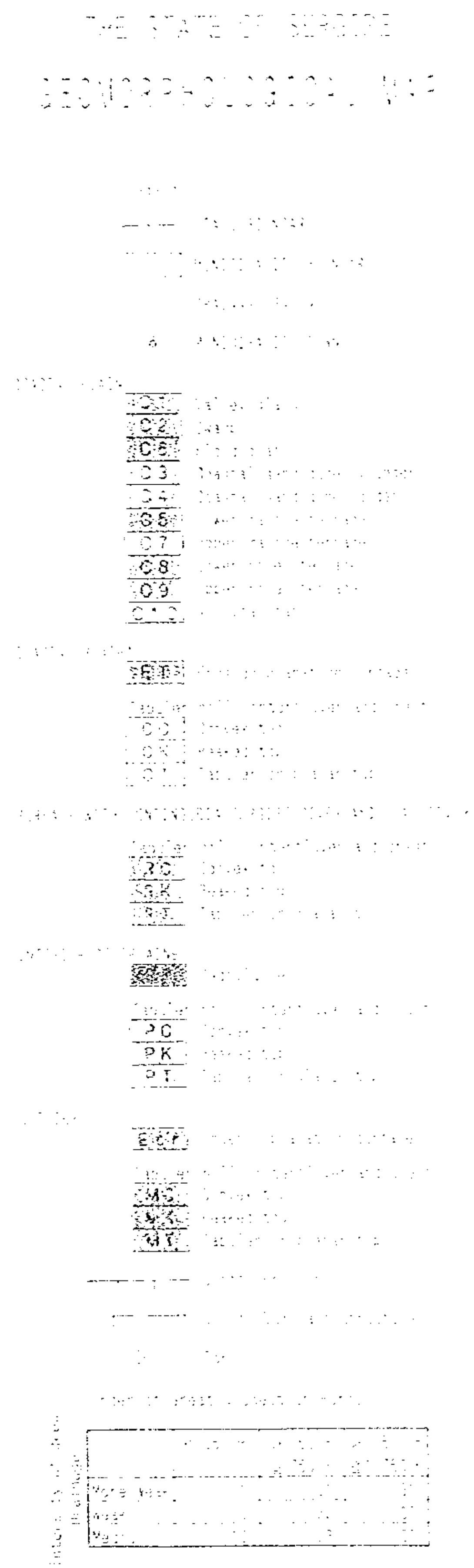


Figure-2.1 Geomorphological Map in Sergipe State by Satellite Image Analysis

THE STATE OF SERGIPE
GEOLOGICAL MAP

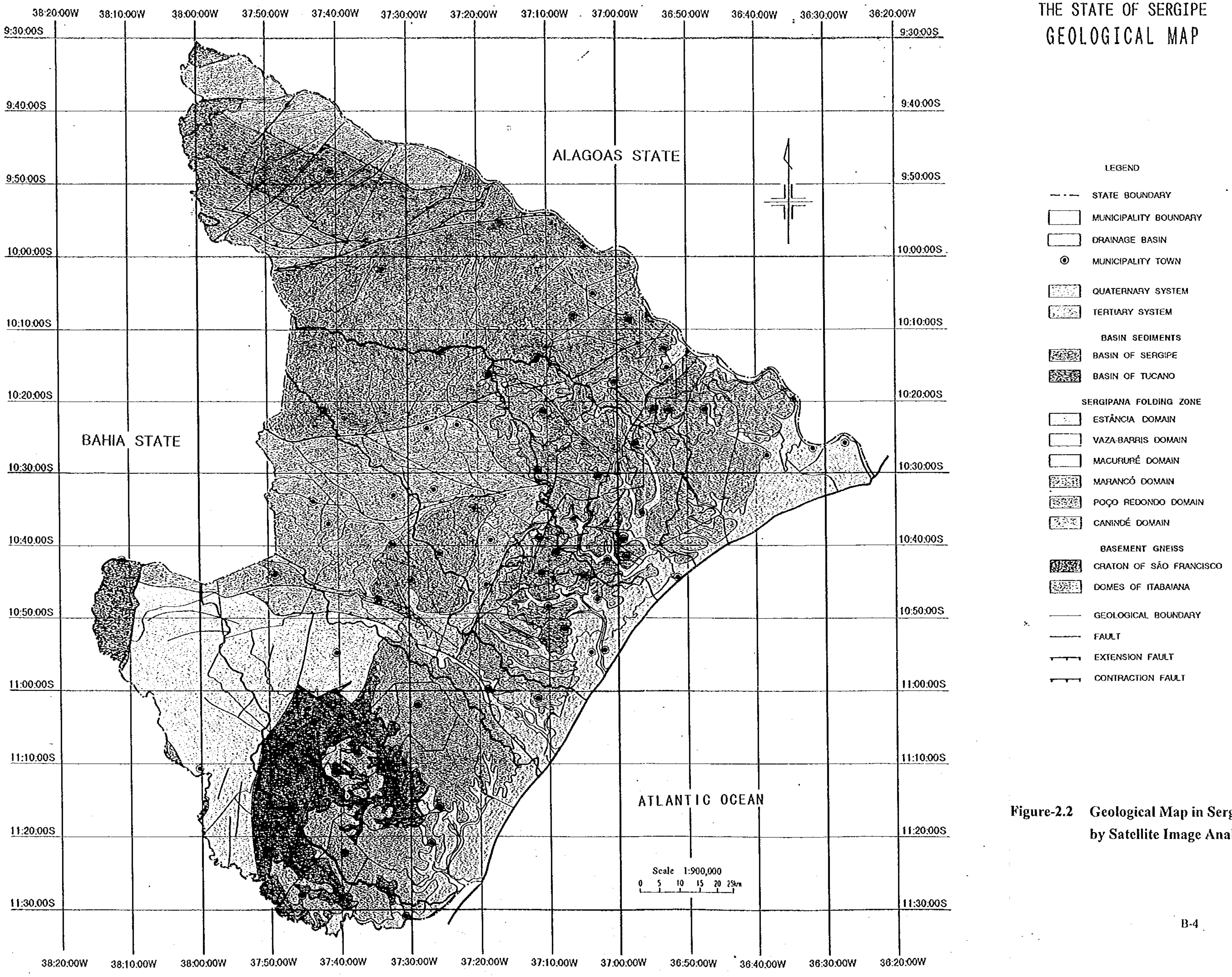


Figure-2.2 Geological Map in Sergipe State by Satellite Image Analysis

2.3 Topography and Geology by River Basin

2.3.1 Topography by River Basin

Sergipe State is divided into 6 main river basins. Every basin has the same geomorphological component from upstream to downstream, namely mountain area - flat plateau area - coastal plain. However, each geomorphological unit has different weight by basin. Basins in the northern part of Sergipe State have less mountain area, on the other hand, basins in southern part have more mountain area. This fact is closely related to size of basin. Sao Francisco River Basin, located in the northern-most part of Sergipe State, has less mountain area and more flat plateau. It results in milder slope than the other basins. On the other hand, Piaui River Basin and Real River Basin, located in the southern-most part of Sergipe State, have more mountain area. The other basins, Japaratuba, Sergipe, Vaza-Barris River Basin, located in the middle part of Sergipe State, have intermediate characteristics between the formers. In these Basin, however, Itabaiana Dome is notable with steep mountain dividing Sergipe Basin and Vaza-Barris Basin.

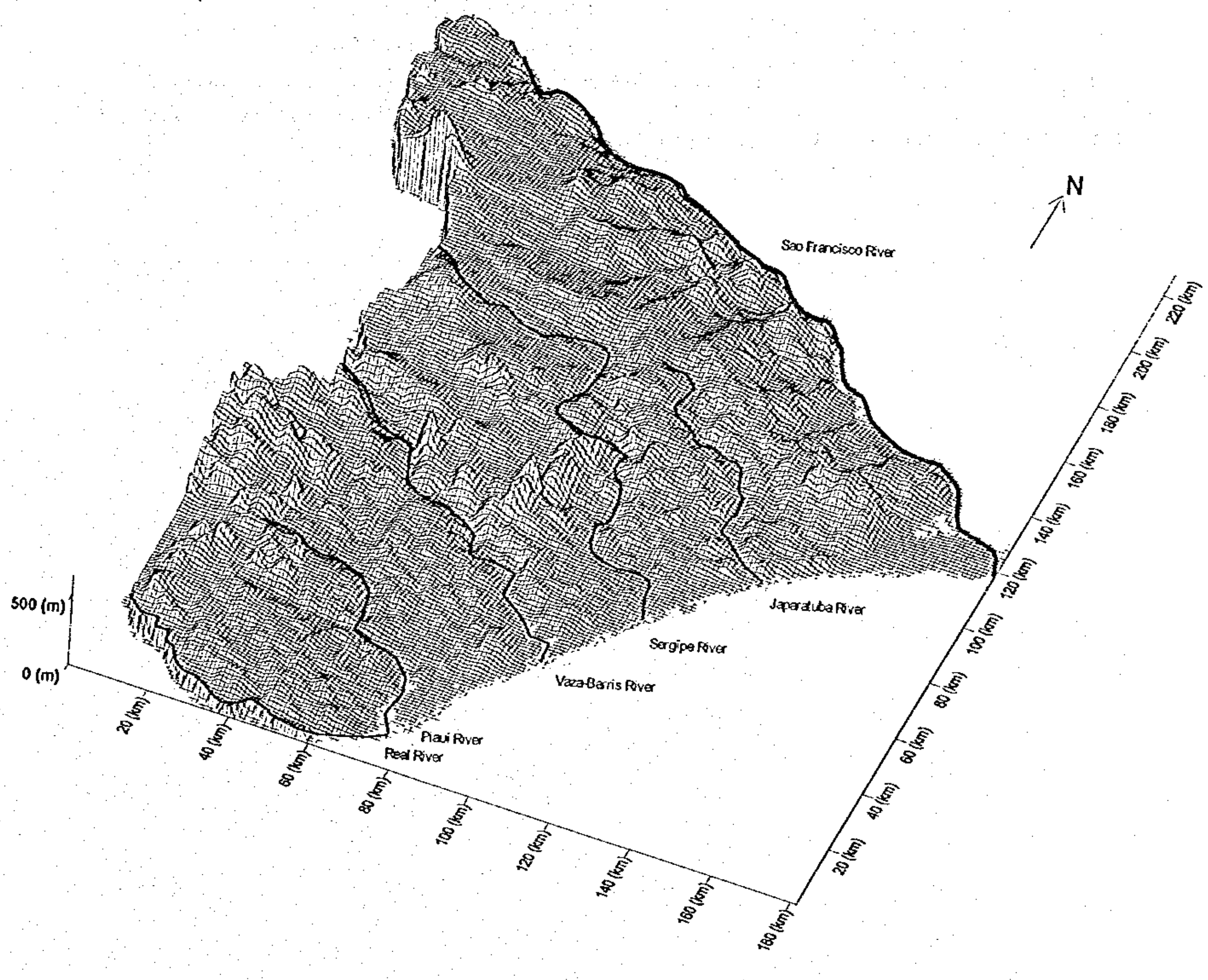


Figure-2.3 Bird's-eyes View of Sergipe State

2.3.2 Geology by River Basin

Each river basin has different geological unit. Representative geological unit by river basin is shown in Table-2.3.

Table-2.3 Geology of Basin

Basin	Upper stream	Middle stream	Lower stream
Sao Francisco	Maranco Domain (3%) Poco Redondo Domain (6%) Caninde Domain (3%)	Macurure Domain (40%)	Quaternary (5%) Barreiras Formation (11%)
Japaratuba	Barreiras Formation (48%)		
	Macurure Domain(28%)	Sergipe Basin (12%)	Quaternary (12%)
Sergipe	Macurure Domain (26%)	Vaza-Barris Domain (24%) Itabaiana Dome (7%)	Quaternary (11%) Barreiras Formation (16%) Sergipe Basin (11%)
Vaza-Barris	Vaza-Barris Domain (51%)	Itabaiana Dome (11%)	Barreiras Formation(17%)
Piaui	Estancia Domain (20%)	Barreiras Formation(39%) Sao Francisco Craton (25%)	
Real	Estancia Domain (59%)		Barreiras Formation (9%) Sao Francisco Craton (18%)

Note: (%) : Area of each geological unit represented by % against total basin area

CHAPTER 3 HYDROGEOLOGY

3.1 Hydrogeological Classification

Hydrogeology of the study area is dominated by geological condition. Hydrogeological classification should follow the geological classification. Table-3.1 shows hydrogeological classification and Figure-3.1 shows its distribution.

Table-3.1 Hydrogeological Unit the Study Area

Age		Stratigraphy	Rock Faces	Hydraulic Characteristics
Cenozoic	Quaternary	Alluvium	Clay, silt, sand, gravel	Unconfined stratum water
	Tertiary	Barreiras Formation	Claystone, siltstone, sandstone, conglomerate	Unconfined / confined stratum water
Mesozoic |	Cretaceous |	Tucano Basin	Limestone, sandstone, shale	Unconfined / confined stratum water
Palaeozoic	Silurian	Sergipe Basin	Limestone, sandstone, shale	Unconfined / confined stratum water
Late Proterozoic		Caninde Domain	Gabbro, amphibolite, metavolcanic rock, ultramafic rock	Unconfined fissure water
		Poco Redondo Domain	Granites, migmatite, gneiss	Unconfined fissure water
		Maranco Domain	Granites, meta conglomerate, phyllite	Unconfined fissure water
		Macurure Domain	Micaschist, quartzite, gabbro	Unconfined fissure water
Middle Proterozoic - late Proterozoic		Vaza-Barris Domain	Carbonate, phyllite, argillaceous rock	Unconfined fissure water
		Estancia Domain	Sandstone, argillaceous rock Conglomerate.	Unconfined fissure water
Archaean - early Proterozoic		Sao Francisco Craton	Gneiss, migmatite, granodiorite.	Unconfined fissure water
		Itabaiana Dome Craton	Migmatite.	Unconfined fissure water

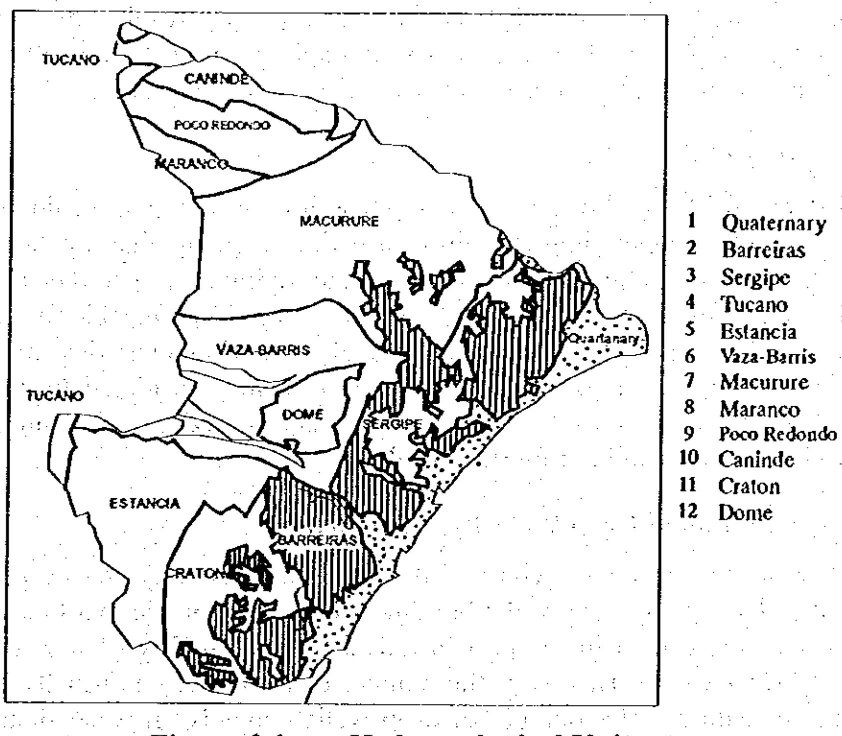


Figure-3.1 Hydrogeological Unit

3.2 Current Groundwater Use and Hydrogeological Information

Groundwater development has been carried out mainly by drilling deep wells in Sergipe State. More than 4,000 deep wells and great number of shallow wells were drilled until now. Other than wells, groundwater is used from springs. Characteristics of deep wells are described below based on the result of existing data analysis.

(1) Deep Well Data-base

SRH has deep well data-base storing more than 4,000 well data. This data base contains items listed below;

Table-3.2 Contents of Deep Well Data-base by SRH

Items	Content
Organization	1) Name of organization which funded drilling
Well location	1) Municipality, 2)Village name
Well dimension	1) Diameter, 2) Length,
Well capacity	1) Yield, 2) Static water level, 3) Dynamic water level 4) Draw down
Water quality	1) pH, 2) Cl, 3) No, 4) No_3, 5) $CaCO_3$
Well construction record	1) Year, month and data of commencement of drilling, 2) Year, month, data of completion of drilling

Groundwater potential of this Study were analyzed using information derived from the Data-base which was expected to provide hydrogeological characteristics such as well capacity, hydraulic parameters and water quality and so on. In order to get hydrogeological characteristics mentioned above, lithology and hydrogeological unit of each deep well must be identified from the data-base. As shown in Table-3.2, however, the data-base does not have such items. In order to resolve this problem, the following method was taken; one representative hydrogeological unit was selected for each municipality in accordance with its hydrogeological location. Then, each deep well in the data-base was given one hydrogeological unit according to the municipality to which this deep well belongs. It means that all the deep wells belonging to the same municipality have the same hydrogeological unit. This method does not lead to precise result, however it seems that this method will be permitted in order to assess rough groundwater potential for the Master Plan under the condition of the current data shortage of the data-base.

(2) Aquifer of Deep Well

Deep wells were drilled in the sites belonging to almost all the hydrogeological units which are listed in Table-3.1, including Barreiras formation. It seems that boreholes having been drilled in Barreiras formation, in fact, aimed at underlying hydrogeological unit as a target because Barreiras formation is generally too thin and too impermeable for boreholes to get sufficient groundwater. Consequently, hydrogeological characteristics indicated by deep wells which are located in Barreiras formation area are considered to indicate those of underlying unit. Barreiras formation should be considered as the aquifer suitable for shallow well (dug well) and not for deep wells.

(3) Distribution of Deep Wells by Municipality

The number of existing deep wells is different by municipality (see Appendix-1). Some municipalities have many deep wells but others not. It is notable that tremendous number of deep wells were drilled in the past in Itabaiana municipality (758 wells) and Lagarto municipality (289 wells). However, the number of deep wells is usually less than 50 in most of municipalities. The number of deep wells depends on water demand and water quality by municipality.

(4) Basic Capacity of Deep Well

Yield, specific capacity, success rate and water quality are most important parameters of deep well (see Appendix-1). Representative values of these parameters are shown in Table-3.3. It is clear that well capacity is different by each geological unit, and also groundwater development potential seems to be different by each geological unit. Especially difference in water quality is dominant. Generally in terms of water quality, deep wells in sedimentary rock area (Cretaceous and Quaternary) is more excellent than deep wells in crystalline rock area in quality and quantity. Barreiras formation which distributes in wide area of the Study area , is out of Table-3.3 because of its poor capacity for deep wells.

Table-3.3 Basic Capacity of Deep Well

Aquifer	Yield (m^3/day)	Specific Capacity (m^3/day/m)	Success rate (%)	Rate of fresh water (%)
Alluvium covering Sergipe Basin Alluvium covering Craton	600	140	95	100
Tucano Basin	100	4	60	60
Sergipe Basin covering Barreiras	140	17	80	85
Sergipe Basin outcropping	140	13	70	60
Caninde Domain	40	2	45	10
Poco Redondo Domain	40	2	45	10
Maranco Domain	40	2	45	10
Macurure Domain	40	2	60	15
Vaza-Barris Domain	80	4	75	40
Estancia Domain	50	3	70	50
Sao Francisco Craton covered by Barreiras	70	4	85	90
Sao Francisco Craton outcropping	40	2	75	30
Itabaiana Dome Craton	70	4	75	35

(5) Groundwater Quality

It is notable that groundwater in Precambrian rock usually contains high salinity in the study area (see Appendix-1). Especially chlorine (Cl) density is high, usually more than 250 ppm. Groundwater in Maranco Domain and Macurure Domain, which belong to Precambrian rock, show especially high Cl with more than 250 ppm in most of deep wells. On the other hand, groundwater in Itabaiana Dome, which also belongs to Precambrian rock, shows less Cl concentration, and some wells show Cl of less than 250 ppm. Compared with Precambrian rock, sedimentary rock (Cretaceous, Tertiary and Quaternary) in the Study area has lower Cl concentration of usually less than 250 ppm.

(6) Depth and Diameter of Deep Wells

Most of wells have depth of 40 m～80 m, and the average is 60m (see Appendix-1). Diameter of deep wells is 6 inch (15 cm).

(7) Groundwater Static Level

Groundwater static level is usually less than 15 m from ground surface, and average is 10 m (see Appendix-1).

(8) Number of Deep Wells by Aquifer Drilled in the Past

The number of deep wells by aquifer is shown in Table-3.4. In the past, many deep wells were drilled in the area covered by Barreiras Formation, and in the area of Itabaiana Dome, Estancia Belt and Vaza-Barris Belt.

Table-3.4 Number of Deep Wells Drilled by Aquifer

Hydrogeological unit	Number	Hydrogeological unit	Number
Quaternary	13	Vaza-Barris Domain	599
Area covered by Barreiras Formation	1,078	Macurure Domain	247
Sergipe Basin	272	Maranco Domain	108
Tucano Basin	97	Sao Francisco Craton	25
Estancia Domain	603	Itabaiana Dome Craton	950

3.3 Groundwater Field Survey

Groundwater level and water quality were observed for all Sergipe State by the Study Team. The observation was carried out twice, the first observation was in September 1998, and the second one was in November 1998. Observed items were below;

- Groundwater level
- Water quality : pH, temperature, electric conductivity, dissolved oxygen

All the results of the groundwater survey are attached to Appendix-2.

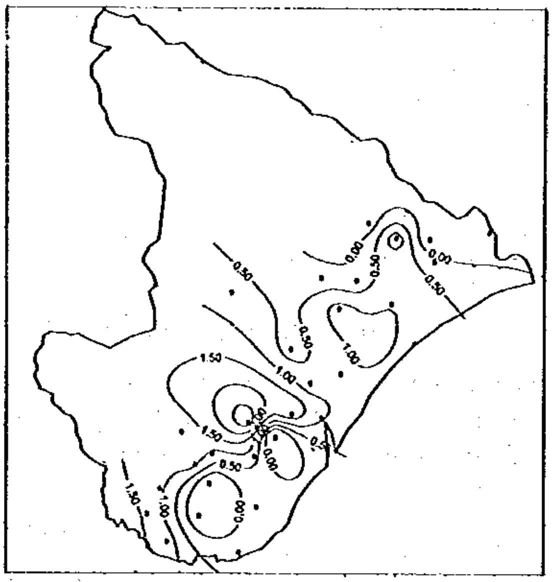
(1) Groundwater Level

The observation was done twice in different season in order to obtain groundwater level fluctuation. Groundwater level was measured for 70 deep wells and 30 shallow wells. The result is shown in Figure-3.2 (a)-(b). As shown in this figure, groundwater level fluctuation is about 1m to 2 m in the whole Sergipe State during the observation period. The observation wells sometimes showed locally unusual large fluctuation which seemed to be caused by pumping. These unusual groundwater fluctuations were easily identified by comparing them with the other normal fluctuations.

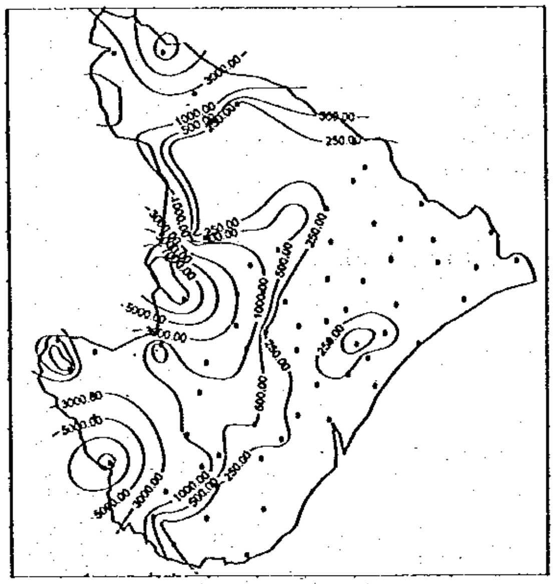
(2) Water Quality

Measured electric conductivity is shown in Figure-3.2 (c)-(d). Electric conductivity has strong relationship with salinity. The relation is approximated as Conductivity (μS/cm) = 0.5 x Cl (ppm). As shown in Figure-3.2 (c)-(d), electric conductivity, namely salinity, becomes gradually higher from the coastal area to the inland area.

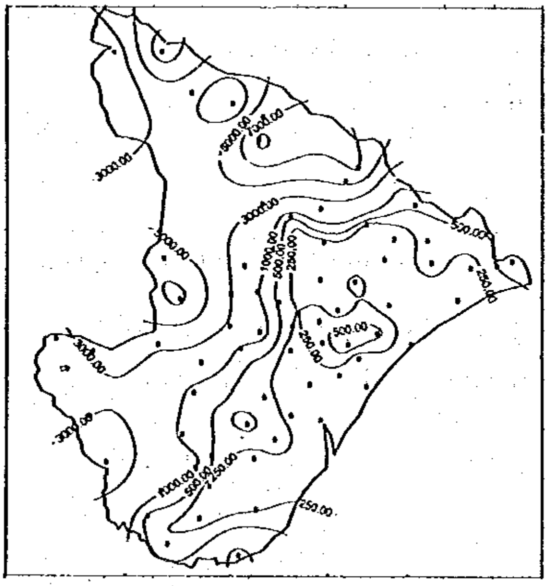
a) Groundwater Level Draw Down of Deep Wells during Sep. and Nov. 1998 (m)



b) Groundwater Level Draw Down of Shallow Wells during Sep. and Nov. 1998 (m)



c) Electric Conductivity of Groundwater in Sep. 1998 (μS/cm)



d) Electric Conductivity of Groundwater in Sep. 1998 (μS/cm)

Figure-3.2 Result of Field Groundwater Survey

CHAPTER 4 GROUNDWATER POTENTIAL

Groundwater exists in whole Sergipe State, though its quantity and quality is different in each site. Groundwater development is possible in any place in Sergipe State depending on groundwater development potential of each place. Groundwater development potential is dominated by three factors shown below;

- Groundwater recharge
- Well capacity
- Groundwater quality

Items above are examined below.

4.1 Modified Aquifer Classification

This Study used deep well data-base established by SRH. Hydrogeological classification for the Master Plan formulation was made as shown in Table-4.1 taking account of effective utilization of the data-base.

Table-4.1 Hydrogeological Classification for the Master Plan

Hydrogeological Unit	
Alluvium covering Sergipe Basin	Maranco Domain
Alluvium covering Sao Francisco Craton	Macurure Domain
Tucano Basin	Vaza-Barris Domain
Sergipe Basin covered by Barreiras	Estancia Domain
Sergipe Basin outcropping	Sao Francisco Craton covered by Barreiras
Caninde Domain	Sao Francisco Craton outcropping
Poco Redondo Domain	Itabaiana Dome Craton

4.2 Groundwater Recharge

Groundwater recharge is analyzed by two methods below.

Method - (I) : Analysis of groundwater level fluctuation
Method - (II) : Numerical Simulation

4.2.1 Method-(I) : Analysis of Groundwater Level Fluctuation

(1) Principle of Method-(I)

Principle of Method-(I) is shown in Figure-4.1.

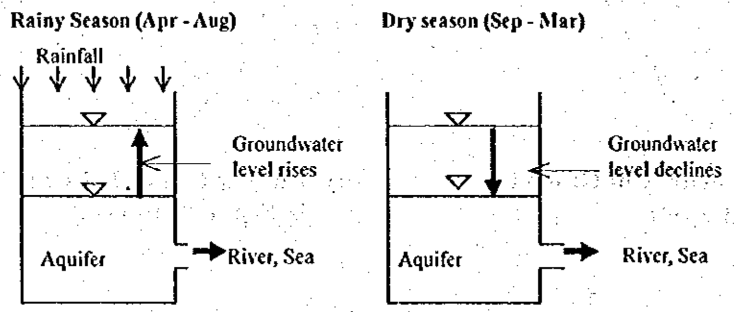


Figure-4.1 Principle of Method-(I)

Annual groundwater level fluctuation suggests the change in annual amount of groundwater stored in aquifers which is provided by rainfalls. Consequently, annual groundwater recharge can be calculated by formula below;

$$R = u \times dh \times F$$

Where,

R :Annual groundwater recharge (m^3/year) u : Specific yield of aquifer
dh :Annual groundwater level fluctuation (m) F : Area of aquifer (m^2)

(2) Specific Yield

There are no existing data showing representative values of specific yield in the Study area. Therefore, the values are assumed using general values with wide range by each geological unit, and the result is shown in Table-4.2.

Table-4.2 Specific Yield of Aquifer

Aquifer	Specific yield	Aquifer	Specific yield
Alluvium covering Sergipe	0.15 - 0.20	Maranco Domain	0.005 - 0.01
Alluvium covering Craton	0.10 - 0.20	Macurure Domain	0.005 - 0.01
Tucano	0.05 - 0.10	Vaza-Barris Domain	0.03 - 0.05
Sergipe covered by Barreiras	0.05 - 0.15	Estancia Domain	0.01 - 0.02
Sergipe outcropping	0.10 - 0.15	Craton covered by Barreiras	0.05 - 0.15
Caninde Domain	0.005 - 0.01	Sao Francisco Craton outcropping	0.03 - 0.05
Poco Redondo Domain	0.005 - 0.01	Itabaiana Dome	0.03 - 0.05

(3) Annual Groundwater Level Fluctuation (dh)

There are no data in the Study area which shows long term groundwater level fluctuation. Therefore annual groundwater level fluctuation (dh) was assumed using the result of groundwater level survey carried out by the Study Team. However, groundwater level fluctuation was observed for only 3 month between Sep. and Nov. 1998 in this survey. Therefore, annual groundwater level fluctuation must be assumed from groundwater level fluctuation observed for 3 month. However, there is no such a theoretical methods as foreseen the annual groundwater fluctuation from short time fluctuation without long term data. Consequently only an empirical method was applicable for this purpose with assumed pattern of annual groundwater fluctuation shown in Figure-4.2 which was assumed from rainfall pattern of the Study area. After careful examination by which abnormal data were excluded, annual groundwater level fluctuation was assumed as shown in Table-4.3.

dh = dh' × (between 2 and 3)
where dh: Annual groundwater level fluctuation,
dh': Groundwater level fluctuation during Sep. and Nov. 1998

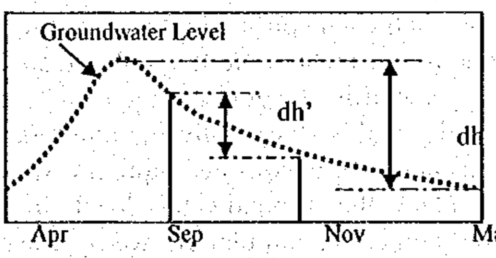


Figure-4.2 Groundwater Fluctuation Pattern Empirically Assumed

Table-4.3 Presumed Annual Groundwater Level Fluctuation

Hydrogeological Unit	Observed groundwater level fluctuation during Sep. to Nov.	Assumed annual groundwater level fluctuation
Sedimentary Rock Area	0.7m	1.4m – 2.1m
Crystalline Rock Area	0.8m	1.6m – 2.4m

(4) Result of Analysis by Method-(I)

Annual groundwater recharge was analyzed, and the result is shown in Table-4.4.

Table-4.4 Annual Groundwater Recharge by Method-(I)

Hydrogeological Unit	Area	Annual rainfall	Annual Recharge			
	Km²	mm/y	mm/y	lit/s/km²	m³/s	% of annual rainfall
Alluvium covering Sergipe	1,061	1,398	210 - 420	6.7 - 13.3	7.1 - 14.1	15.0 - 30.1
Alluvium covering Craton	434	1,672	140 - 420	4.4 - 13.3	1.9 - 5.8	8.4 – 25.1
Tucano Basin	310	613	70 - 210	2.2 - 6.7	0.7 - 2.1	11.4 - 34.3
Sergipe covered by Barreiras	2,688	1,271	70 - 315	2.2 - 9.9	6.0 - 26.8	5.5 – 24.8
Sergipe outcropping	962	1,160	140 - 315	4.4 - 9.9	4.3 - 9.6	12.1 - 27.2
Caninde Domain	854	521	8 - 24	0.25 - 0.76	0.2 - 0.6	1.5 - 4.6
Poco Redondo Domain	1,050	570	8 - 24	0.25 - 0.76	0.3 - 0.8	1.4 - 4.2
Maranco Domain	569	639	8 - 24	0.25 - 0.76	0.1 - 0.4	1.3 - 3.8
Macurure Domain	4,909	785	8 - 24	0.25 - 0.76	1.2 - 3.7	1.0 - 3.1
Vaza-Barris Domain	2,656	972	48 - 120	1.52 - 3.81	4.0 - 10.1	4.9 – 12.3
Estancia Domain	2,391	921	16 - 48	0.51 - 1.52	1.2 - 3.6	1.7 - 5.2
Craton covered by Barreiras	2,092	1,425	70 - 315	2.2 - 9.9	4.6 - 20.9	4.9 – 22.1
Craton outcropping	1,435	1,205	48 - 120	1.52 – 3.81	2.2 - 5.5	4.0 – 10.0
Itabaiana Dome	639	1,082	48 - 120	1.52 - 3.81	1.0 - 2.4	4.4 – 11.1
Total	22,050	1,015			34.8 - 107	9 – 15.0

4.2.2 Method-(II) : Numerical Simulation

(1) Principal of Method-(II)

This method is the same as the method-(II) in principle. The groundwater level near the ground surface fluctuates in accordance with the amount of the recharge from rainfall into the ground. It is reasonable to consider the aquifers of crystalline rock as unconfined aquifers, hence the assumption described above will be allowed. On the other hand, in sedimentary rock area such as Sergipe basin, where many layers with great thickness constitute complicated multiple aquifers with confined condition, it is considered that the groundwater recharge from the rainfall may infiltrate into the ground through long and complicated passes to finally reach each confined aquifer. Even in such multiple aquifers, however, the amount of groundwater recharge to the multiple aquifers can be estimated by groundwater recharge to the unconfined aquifer which are located on the top of the multiple aquifers. Consequently in this study, only the aquifers near the ground surface, which are allowed to be considered as unconfined aquifers, were modeled for numerical simulation which can calculate the groundwater level in accordance with given groundwater recharges. The numerical simulation were repeated until the calculated groundwater level fitted to the actual observed groundwater level with enough accuracy, then the given groundwater recharge at the moment was adopted as the solution of this simulation.

Procedure of the simulation is as follows;

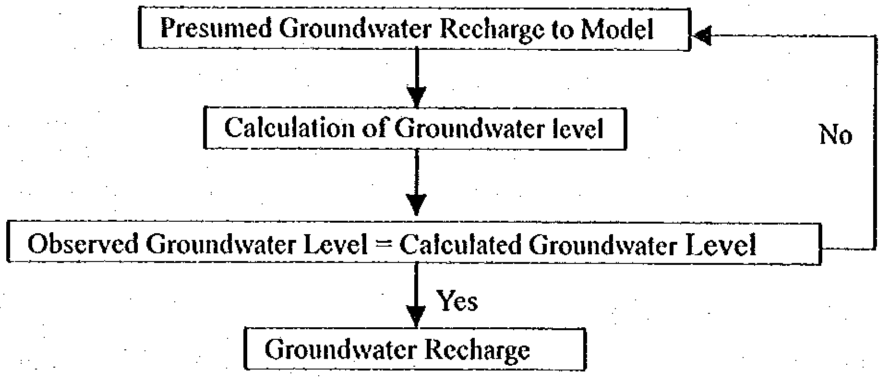


Figure-4.3 Procedure of Simulation

(2) Aquifer Model

(a) Simulation Program

A program for the numerical simulation which was used for this study was MODFLOW, the three dimensional finite difference model which was developed by USGS(United Nation Geological Survey). This program can solve the basic differential equations, constituted by the combination of the Darcy formula low and fundamental continuity equation, under the given boundary and initial conditions, like many conventional simulation models.

(b) Mesh of Modeling

All the Sergipe state was covered by a great number of square meshes. The total number of the meshes was 69 x 73=5,37 1 and the size of the meshes was 3.15 km x 3.15 km. Moreover, the meshes were vertically divided to represent superposition of layers. An element divided by the meshes is called as a 'Cell' which is individually given hydraulic conductivity and layer thickness. All the calculations are performed at the center of each cell and calculated results are also given to the center of the cell.

(c) Layer of Modeling

Simplified simulation model was developed with the hydrogeological unit following the conventional geological classification (Geologia e Recursos Minerars do Estado de Sergipe, 1988). The ground surface with topographical variety was roughly reproduced on the simulation model referring topographical maps. The model consists of four layers in the every parts (thickness; 1^{st}~3^{rd} layer-50m, 4^{th} layer-250m). There is no theoretical background that each layer should has thickness above. However as explained later, hydraulic conductivity of the first layer were obtained from specific capacity of the existing deep well with the average depth of about 50m. Consequently the hydraulic conductivity obtained by method above should be applied for the 1^{st} layer with 50m thickness. On the other hand, almost no data were available for 2^{nd}~4^{th} layer compared with the 1^{st} layer. The 2^{nd}~4th layer with 50m and 250m thickness were applied for necessity requested from hydrogeological judgment and numerical simulation technique. As the result, the model can analyze groundwater flow within the aquifers of 400m thickness from the ground surface. In this simulation, aquifer were modeled as unconfined aquifers, and groundwater flow were analyzed within the aquifers of relatively shallow parts of the ground which is subject to rainfall. On the contrary, Sergipe basin consists of multiple layers which constitute confined aquifers with the total thickness of more than 1,000m. It is clear that the method described above can not cover groundwater flow throughout the Sergipe basin which is of more than 1000m thickness. This study, however, were interested in the groundwater movement which is driven in repose to rainfall, so only the uppermost part of the Sergipe basin, which may be possibly regarded as unconfined aquifers, were analyzed as aquifer which was 400m in total thickness and was divided into four layers of 50m~250m thickness each.

(d) Hydraulic Conductivity

As permeability of the aquifers varies wide in place by place, numerical simulation for large area needs huge number of data with high accuracy. The purpose of the study, however, is to get rough assessment concerning groundwater recharge for all the Sergipe state within the limited existing data. Consequently, the simulation model should be simplified in accordance with accuracy of the existing data. There are few detailed hydraulic parameters obtained by pumping tests (e.g. Avaliacao dos aquiferos da Bacia Sergipe/Alagoas Entre Aracaju e Capela, 1998 etc.), however these data are too limited to reflect the hydrogeological characteristics of large area. On the contrary, specific capacity of deep well is tested for almost all the deep wells all over the Sergipe State. It is generally admitted that specific capacity has strong relationship with transmissivity of wells, that is = specific capacity = transmissivity. Consequently representative transmissivities are assumed for each hydrogeological unit from the representative specific capacities which were obtained statistically from deep well data-base established by SRH. Subsequently hydraulic conductivity was calculated from the transmissivity for each hydrogeological unit. The aquifers in the simulation model were subdivided into 4 aquifers.

1) Sedimentary rock area
In Sedimentary rock area (Sergipe basin), hydraulic conductivities were calculated from specific capacities which were obtained from the well data-base, then hydraulic conductivities were given to each cell of the simulation model which constitutes each hydrogeological unit. The subdivided four layers have the same hydraulic conductivity.

2) Crystalline rock area
Hydraulic conductivities have different values among the 1st layer to 4th layer as explained below;

<u>1st layer (from ground surface to GL-50m)</u>
Representative specific capacities were obtained from the well data-base, then hydraulic conductivity were calculated and given to each cell which constitutes each hydrogeological unit of the model.

<u>2nd layer (GL-50~GL-100m)</u>
The 2nd layers were given the hydraulic conductivities of 1/10 of the 1st layers except the areas covered by Barreiras formation, where the 2nd layers were given the same hydraulic conductivities as the 1st layers.

3rd layer and 4th layer (GL-100m~GL-400m)

The 3rd and 4th layers are regarded as almost impermeable, then hydraulic conductivity of 0.0001m/day were given to all the 3rd and 4th layers.

Discussion above is concerning horizontal hydraulic conductivity. On the other hand, vertical hydraulic conductivity were set as 1/10 of horizontal hydraulic conductivity for sedimentary rock area and 1.0 of horizontal hydraulic conductivity for crystalline rock area in experimental aspect.

(e) Boundary Condition

Boundary condition must be set along all the border of the model and sometimes within the model. Two types of boundary condition are usually applied in accordance with hydrogeological situation, these are 'groundwater head is constant' and 'groundwater flux is constant' along the border. These boundary conditions are indispensable for performance of numerical simulation. Boundary conditions were set as described below;

Border with the Atlantic Ocean

The boundary condition that groundwater head is constant was given along the border with the Atlantic ocean (see Appendix-(III)).

River

Groundwater head is constant. The 6 major rivers and the other main rivers in Sergipe state were set boundary condition in this analysis, of which the Sao Francisco river and the Real river constitute the border with this boundary condition and the others are located inside the model with boundary conditions (see Appendix-(III)).

Water Shed which lies between Sergipe State and Bahia State

Water shed which lies between Sergipe state and Bahia state were given the boundary condition that groundwater flow is zero(0). This boundary with this condition means the groundwater-shed through which groundwater can not flow.

All the border of the model were fixed with one of above three conditions. In addition some rivers which exist inside the model were also given internal boundary condition that groundwater head are constant along the river course.

(f) Groundwater Recharge from Rainfall

The purpose of this simulation is to get assessment of groundwater recharge from rainfall. Many rainfall data sets were assumed for unknown actual groundwater recharge and given to the simulation model, and groundwater recharge with high reality was finally chosen from input data set which gave the highest correspondence between the calculated groundwater level and the actual observed groundwater level.

(g) Criteria for Completion of Numerical Simulation

The groundwater level were calculated at each cell. As mentioned above, after the comparison between the calculated groundwater level and the observed groundwater level, the simulation was completed when both of groundwater levels gave high correspondence. For the criteria of the completion of numerical simulation, it is not proper to compare individually calculated groundwater levels with the actual observed ones which are distributed in wide area and include seasonal fluctuation and artificial fluctuation. It is better to employ statistical method, that is to compare the histograms of groundwater levels which are made of the calculated ones and the actual observed ones. The histogram, which was made of 4,000 drilling results, shows the smooth frequency curve and indicates that the majority of deep wells have groundwater levels of shallower than GL-15m. This histogram may suggest that groundwater near the ground surface may be approached as usual unconfined groundwater, and discontinuities of groundwater levels may not be taking place. Hence the method mentioned above may be applicable.

The aquifer model is outlined as shown in Table-4.5 and Appendix-(III).

Table-4.5 Simplified Aquifer Model

Item	Content
Aquifer model	4 layer model: Permeability of layers gradually reduces from the 1st layer to the 4th layer.
Boundary condition	There are three types of boundary conditions. - Sea : Constant groundwater level boundary - Water shed : No groundwater flow boundary - River : Groundwater discharge boundary
Conductivity	Conductivity is examined for each aquifer from specific capacities of existing boreholes recorded in the data-base which stores 4,000 borehole data

(3) Result of Method-(II)

The simulation was completed when simulated groundwater level fitted with observed one, and groundwater recharge at this time was considered to be the most likely groundwater recharge. The groundwater recharge at this time is shown in Table-4.6. Histogram of observed groundwater levels and simulated ones is shown in Figure-4.4. Both of the histograms look to correspond enough to each other. Histogram of observed groundwater level is obtained from borehole data-base which shows actual groundwater level during drilling.

Table-4.6 Groundwater Recharge by Method-(II)

Hydrogeological Unit	Area	Annual rainfall	Annual groundwater recharge			
	km²	mm/y	mm/y	lit/s/km²	m³/s	% of Annual Rainfall
Alluvium covering Sergipe	1,061	1,398	360	11.42	12.11	25.8
Alluvium covering Craton	434	1,672	170	5.39	2.34	10.2
Tucano Basin	310	613	110	3.49	1.08	18.0
Sergipe covered by Barreiras	2,688	1,271	250	7.93	21.31	19.7
Sergipe outcropping	962	1,160	280	8.88	8.54	24.1
Caninde Domain	854	521	10	0.32	0.27	1.9
Poco Redondo Domain	1,050	570	10	0.32	0.33	1.8
Maranco Domain	569	639	10	0.32	0.18	1.6
Macurure Domain	4,909	785	15	0.48	2.34	1.9
Vaza-Barris Domain	2,656	972	60	1.90	5.05	6.2
Estancia Domain	2,391	921	30	0.95	2.27	3.3
Craton covered by Barreiras	2,092	1,425	90	2.85	5.97	6.3
Craton outcropping	1,435	1,205	60	1.90	2.73	5.0
Itabaiana Dome Craton	639	1,082	80	2.54	1.62	7.4
Total	22,050	1,015	95	3.00	66.15	9.3

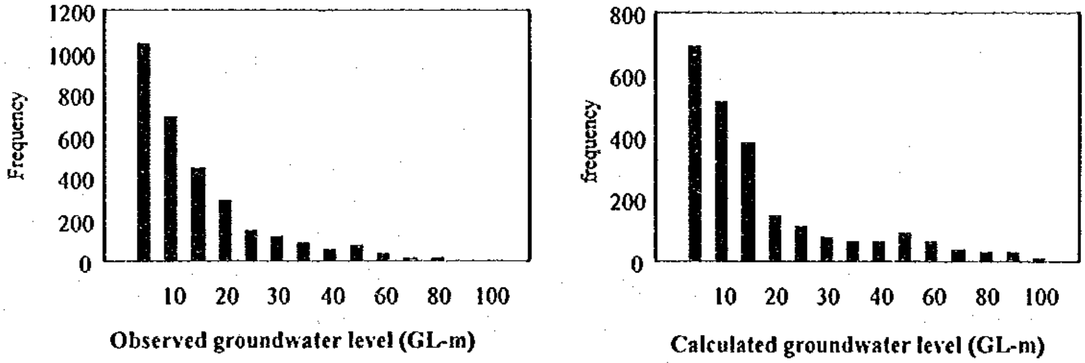


Figure-4.4 Histogram of Groundwater Level

4.2.3 Examination of Groundwater Recharge

Groundwater recharge was estimated by two methods as explained before. The result of the method-(I) shows a wide range of values, the annual groundwater recharge of 34.8m^3/s – 107.0 m^3/s with the average of 70.9m^3/s, as shown in Table-4.4. On the other hand, the result of the method-(II) has a single value, the annual groundwater recharge of 66.15 m^3/s, as shown in Table-4.6. Comparing the two results, result of the method-(I) is, if its average is taken, almost the same as the result of method-(II) with negligible difference between them. Consequently, in this report, the result of the method-(II) is finally applied as value of groundwater recharge, though the actual groundwater recharge is considered to be between 34.8m^3/s – 107.0 m^3/s. The result is shown in Table-4.7. The numerical simulation model employed for this Study is a simplified model to obtain a rough estimation of groundwater recharge for the Master Plan. More detailed simulation model constructed by more detailed data is necessary for farther study of groundwater recharge of individual groundwater development.

Table-4.7 Annual Groundwater Recharge

Hydrogeological Unit	Area	Annual rainfall	Annual ground water recharge			
	Km^2	mm/y	mm/y	lit/s/km^2	m^3/s	% of Annual Rainfall
Alluvium covering Sergipe	1,061	1,398	360	11.42	12.11	25.8
Alluvium covering Craton	434	1,672	170	5.39	2.34	10.2
Tucano Basin	310	613	110	3.49	1.08	18.0
Sergipe covered by Barreiras	2,688	1,271	250	7.93	21.31	19.7
Sergipe outcropping	962	1,160	280	8.88	8.54	24.1
Caninde Domain	854	521	10	0.32	0.27	1.9
Poco Redondo Domain	1,050	570	10	0.32	0.33	1.8
Maranco Domain	569	639	10	0.32	0.18	1.6
Macurure Domain	4,909	785	15	0.48	2.34	1.9
Vaza-Barris Domain	2,656	972	60	1.90	5.05	6.2
Estancia Domain	2,391	921	30	0.95	2.27	3.3
Craton covered by Barreiras	2,092	1,425	90	2.85	5.97	6.3
Craton Outcropping	1,435	1,205	60	1.90	2.73	5.0
Itabaiana Dome Craton	639	1,082	80	2.54	1.62	7.4
Total	22,050	1,015	95	3.00	66.15	9.3

4.3 Well Capacity and Water Quality

Well capacity and water quality were analyzed using the existing data-base. The result is shown in Table-4.8.

Table-4.8 Well Capacity and Water Quality by Aquifer

Hydrogeological Unit	Expected yield (m^3/day)	Specific capacity (m^3/day/m)	Success rate (%)	Rate of fresh water (%)
Alluvium covering Sergipe Basin Alluvium covering Craton Basin	600	140	95	100
Tucano Basin	100	4	60	60
Sergipe Basin covered by Barreiras	140	17	80	85
Sergipe Basin outcropping	140	13	70	60
Caninde Domain	40	2	45	10
Poco Redondo Domain	40	2	45	10
Maranco Domain	40	2	45	10
Macurure Domain	40	2	60	15
Vaza-Barris Domain	80	4	75	40
Estancia Domain	50	3	70	50
Craton covered by Barreiras	70	4	85	90
Sao Francisco Craton outcropping	40	2	75	30
Itabaiana Dome	70	4	75	35

Note: 'Fresh water' means chlorine (Cl) is less than 250 ppm.

4.4 Groundwater Development Potential

Groundwater development potential is shown in brief by basin in Table-4.9, and in detail by municipality in Table-4.10.

Table-4.9 Groundwater Potential by River Basin

Basin	Area (km^2)	Total amount without water quality consideration		Total amount with water quality consideration (Cl < 250 mg/L)	
		mm/year	mil m^3/year	mm/year	mil m^3/year
Sao Francisco	7,276.3	84	611	61	444
Japaratuba	1,722.0	152	262	113	195
Sergipe	3,673.0	131	481	91	334
Vaza Barris	2,559.0	99	253	64	164
Piaui	4,262.0	80	341	56	239
Real	2,558.0	54	138	30	77
Total	22,050.3	95	2,086	66	1,453

Using Table-4.10 for groundwater development plan, items below should be noted.

- Some municipalities locate not only in a single geological unit, but also in several geological units. Such a situation is already took into consideration by weighted mean method in all the parameters shown in Table-4.10.
- Success rate shown in Table-4.10 is the success rate of well with yield of more than 8 m^3/day. This success rate is, according to data-base analysis, almost the same as the success rate of well with yield of more than 0. Therefore, the success rate can be used for rural groundwater development plan, and at same time for urban groundwater development plan with the expected yield in Table-4.10.

Table-4.10 Groundwater Development Potential by Municipality

Code	Municipality	Main aquifer	Area	Annual Groundwater Recharge		Expected Yield	Specific Capacity	Success Rate	Rate of Fresh Water	Rank
			(km²)	(mm/y)	(lit/s)	(m³/day)	(m³/day/m)	(%)	(%)	
01-0120	CANINDE DO SAO FRANCISCO	Caninde	908	27	776	40	3	50	15	D
01-0220	FEIRA NOVA	Macurure	189	15	92	40	2	60	15	D
01-0240	GARARU	Macurure	640	15	313	35	2	60	15	D
01-0260	GRACHO CARDOSO	Macurure	236	15	115	40	2	60	15	D
01-0310	ITABI	Macurure	202	15	99	40	2	60	15	D
01-0420	MONTE ALEGRE	Macurure	418	15	204	40	2	60	15	D
01-0450	NOSSA SENHORA DA GLORIA	Macurure	745	15	364	40	2	60	15	D
01-0540	POCO REDONDO	Poco Redondo	1,220	14	533	40	2	45	10	D
01-0560	PORTO DA FOLHA	Poco Redondo	895	20	555	40	3	50	10	D
02-0140	CARIRA	Macurure	634	32	642	50	4	60	20	D
02-0230	FREI PAULO	Vaza-Barris	406	67	860	75	8	75	35	C
02-0145	NOSSA SENHORA APARECIDA	Macurure	347	39	430	60	5	70	25	D
02-0500	PEDRA MOLE	Vaza-Barris	79	62	154	80	7	75	40	C
02-0520	PINHAO	Vaza-Barris	152	62	298	80	7	75	40	C
02-0600	RIBEIROPOLIS	Vaza-Barris	263	61	507	75	7	75	40	C
03-0020	AQUIDABA	Macurure	370	15	181	40	2	60	15	D
03-0190	CUMBE	Macurure	131	15	64	40	2	60	15	D
03-0380	MALHADA DOS BOIS	Macurure	59	70	132	60	4	65	25	D
03-0430	MURIBECA	Sergipe	82	150	389	90	9	65	40	C
03-0460	NOSSA SENHORA DAS DORES	Macurure	482	32	489	50	4	65	25	D
03-0700	SAO MIGUEL DO ALEIXO	Vaza-Barris	143	45	206	65	5	70	30	D
04-0050	AREIA BRANCA	Vaza-Barris	129	209	857	150	17	75	65	A-B
04-0100	CAMPO DO BRITO	Dome	200	75	476	70	5	75	35	C
04-0290	ITABAIANA	Dome	338	80	854	70	5	75	35	C
04-0370	MACAMBIRA	Vaza-Barris	137	65	285	75	6	75	40	C
04-0390	MALHADOR	Vaza-Barris	102	95	308	85	9	75	45	C
04-0410	MOITA BONITA	Dome	95	74	223	70	5	75	35	C
04-0680	SAO DOMINGOS	Vaza-Barris	102	75	243	75	5	80	50	C
05-0550	POCO VERDE	Tucano	380	81	982	60	8	65	55	C
05-0710	SIMAO DIAS	Vaza-Barris	560	55	978	70	6	75	40	D
05-0740	TOBIAS BARRETO	Estancia	1119	33	1,170	50	3	70	50	D
06-0350	LAGARTO	Estancia	962	57	1,740	60	4	75	55	C
06-0580	RIACHAO DO DANTAS	Estancia	528	46	776	45	3	75	40	D
07-0010	AMPARO DE SAO FRANCISCO	Macurure	39	15	19	40	2	60	15	D
07-0070	BREJO GRANDE	Q/S	149	369	1,747	600	90	95	100	A
07-0110	CANHOBA	Macurure	165	15	81	40	2	60	15	D
07-0160	CEDRO DE SAO JOAO	Macurure	73	89	207	65	6	65	25	D
07-0270	ILHA DAS FLORES	Q/S	57	369	675	600	90	95	100	A
07-0440	NEOPOLIS	Sergipe	249	288	2,281	250	34	80	85	A-B
07-0470	NOSSA SENHORA DE LOURDES	Macurure	80	15	39	40	2	60	15	D
07-0570	PROPRIA	Sergipe	95	262	794	300	42	75	65	A-B
07-0730	TELHA	Macurure	56	37	67	45	4	60	15	D
07-0999	SANTANA DO SAO FRANCISCO	Sergipe	47	273	406	180	23	80	85	A-B
08-0130	CAPELA	Macurure	431	45	615	50	4	60	20	D
08-0200	DIVINA PASTORA	Sergipe	93	273	806	170	19	75	70	A-B
08-0650	SANTA ROSA DE LIMA	Vaza-Barris	66	122	256	95	10	75	50	C
08-0720	SIRIRI	Sergipe	167	238	1,262	175	23	80	80	A-B
09-0330	JAPARATUBA	Sergipe	374	278	3,299	215	29	80	85	A
09-0340	JAPOATA	Sergipe	397	269	3,391	160	19	80	80	A-B
09-0490	PACATUBA	Sergipe	407	323	4,167	405	59	90	90	A
09-0530	PIRAMBU	Sergipe	199	317	2,000	385	56	85	90	A
09-0690	SAO FRANCISCO	Sergipe	86	275	758	140	15	75	70	A-B
10-0150	CARMOPOLIS	Sergipe	40	305	386	295	41	80	85	A
10-0250	GENERAL MAYNARD	Sergipe	18	289	166	180	21	75	70	A
10-0360	LARANJEIRAS	Sergipe	163	302	1,564	235	30	75	70	A
10-0400	MARUIM	Sergipe	95	292	882	195	23	75	70	A-B
10-0590	RIACHUELO	Sergipe	78	293	731	180	20	75	65	A-B
10-0610	ROSARIO DO CATETE	Sergipe	103	302	993	260	34	80	75	A-B
10-0660	SANTO AMARO DAS BROTAS	Sergipe	237	323	2,434	395	57	85	90	A
11-0030	ARACAJU	Sergipe	181	330	1,904	440	65	90	95	A
11-0060	BARRA DOS COQUEIROS	Q/S	87	369	1,030	600	90	95	100	A
11-0480	NOSSA SENHORA DO SOCORRO	Sergipe	157	305	1,518	285	39	80	80	A-B
11-0670	SAO CRISTOVAO	Sergipe	432	276	3,790	215	29	80	85	A
12-0040	ARAUA	Craton	194	72	444	50	3	80	50	C
12-0067	BOQUIM	Craton	213	76	514	50	3	80	60	C
12-0170	CRISTINAPOLIS	Craton	251	71	564	50	3	80	60	C
12-0300	ITABAIANINHA	Craton	480	65	991	45	2	80	40	C
12-0510	PEDRINHAS	Craton	39	82	103	60	3	80	70	B
12-0620	SALGADO	Craton	255	88	716	65	4	80	85	B
12-0750	TOMAR DO GERU	Estancia	337	50	535	45	3	75	45	D
12-0760	UMBAUBA	Craton	124	81	319	55	3	80	70	B
13-0210	ESTANCIA	Craton	649	114	2,347	70	9	80	85	B
13-0280	INDIAROBA	Craton	311	108	1,067	70	8	80	80	B
13-0320	ITAPORANGA D' AJUDA	Craton	757	110	2,638	75	9	80	85	B
13-0630	SANTA LUZIA DO ITANHY	Craton	336	110	1,172	70	8	80	85	B

Note: 1) Main aquifer: Q/S- Quaternary covering Sergipe Basin
2) Rate of fresh water: Fresh water means Cl is less than 250 mg/L.

4.5 Total Evaluation of Groundwater Development Potential

Groundwater development potential was evaluated based on three factors, groundwater recharge, well capacity and water quality. Taking the three factors into the consideration, rank of groundwater potential by aquifer was evaluated, and the results is shown in Table-4.11 and Figure-4.5. The total evaluation gives important criteria on possibility of new groundwater development in the future.

Table-4.11 Evaluation of Groundwater Potential by Aquifer

Hydrogeological Unit	Groundwater Recharge	Well Capacity	Water Quality	Total Evaluation
Alluvium covering Sergipe	A	A - B	A	A - B
Alluvium covering Craton	B	B	A	B
Tucano Basin	B	B	B	B
Sergipe covered by Barreiras	A	A - B	A	A - B
Sergipe outcropping	A	A - B	B	A - B
Caninde Domain	D	D	D	D
Poco Redondo Domain	D	D	D	D
Maranco Domain	D	D	D	D
Macurure Domain	D	D	D	D
Vaza-Barris Domain	C	C	C	C
Estancia Domain	D	D	C	D
Craton covered by Barreiras	C	C	A	B
Sao Francisco Craton outcropping	C	D	C	C
Itabaiana Dome Craton	C	C	C	C

Note: 1) A - High, B - Medium, C – Low, D – Very low
2) Barreiras Formation is excluded from Table above because of its poor capacity for deep wells

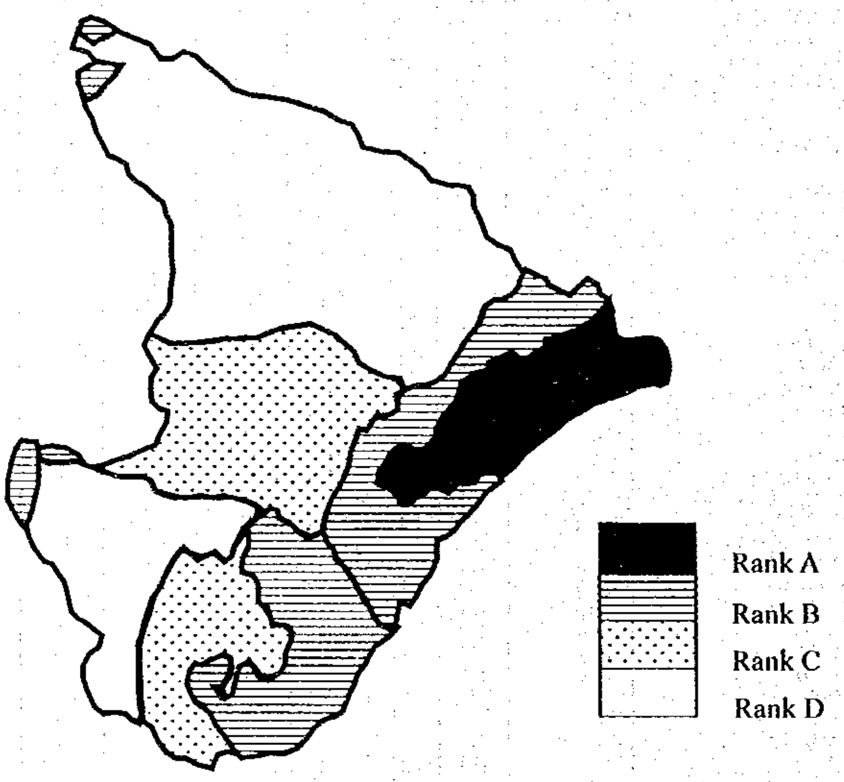


Figure-4.5 Rank of Groundwater Development Potential

CHAPTER 5 RECOMMENDATION

5.1 Promising Groundwater Development Site

Promising groundwater development sites are described below.

5.1.1 Alluvial Basin Aquifer

Alluvial aquifer is located in the coastal area. This aquifer has high permeability, and great deal of groundwater is possible to be pumped up from this aquifer. On the other hand, thickness of the Alluvium is not great, and there is a possibility that groundwater discharge by pumping exceeds groundwater recharge, and sea water intrudes into the aquifer. Therefore, proper well location / yield must be designed.

5.1.2 Sergipe Basin Aquifer

Sergipe Basin aquifer is the most promising aquifer in State. This aquifer expands in large area with high permeability and good water quality. On the other hand, this aquifer has not yet highly developed so far. Therefore, this aquifer is the most promising for new groundwater development. Figure-5.1 shows regional geological section including this aquifer. This aquifer sometimes locates deep in the ground, and drilling length must be 100 to 200m, which is longer than the existing wells. There is a possibility that groundwater discharge by pumping exceeds groundwater recharge, because the aquifer has high permeability. Sergipe Basin aquifer is divided into some formations, and promising ones are described below.

(1) Penedo Formation and Serraia Formation

Sandstone forms good aquifer in Penedo Formation and Serraia Formation. These aquifers locate in the northern part of Sergipe Basin. Muribeca, Malhada dos Bois and Japoata municipalities are located in this area.

(2) Sapucari Formation, Angico Formation, Maruim Formation and Agulhada Formation

Limestone of Sapucari Formation, Angico Formation, Maruim Formation and Agulhada Formation form good aquifers. These aquifers locate in the middle part of Sergipe Basin, in the north - east of Aracaju city, and now provides groundwater to Aracaju city as one of important water resources.

(3) Marituba Formation

Marituba Formation locates eastern-most part of Sergipe Basin along the coast. This Formation forms confined aquifer covered by Alluvium, and is composed of limestone and sandstone with total thickness of 500m (see Figure-5.2). This Formation forms the most excellent aquifer with the highest permeability of all the aquifers in Sergipe State. in this aquifer, wells need 100 to 200m depth for new groundwater development.

(4) Tucano – Jatoba Basin

Sao Sbrastiao Formation and Curituba Formation locate eastern-most part of Sergipe State. Sandstone of these formations forms good aquifer, and is important water resource because this formation is surrounded by Precambrian rock with low yield.

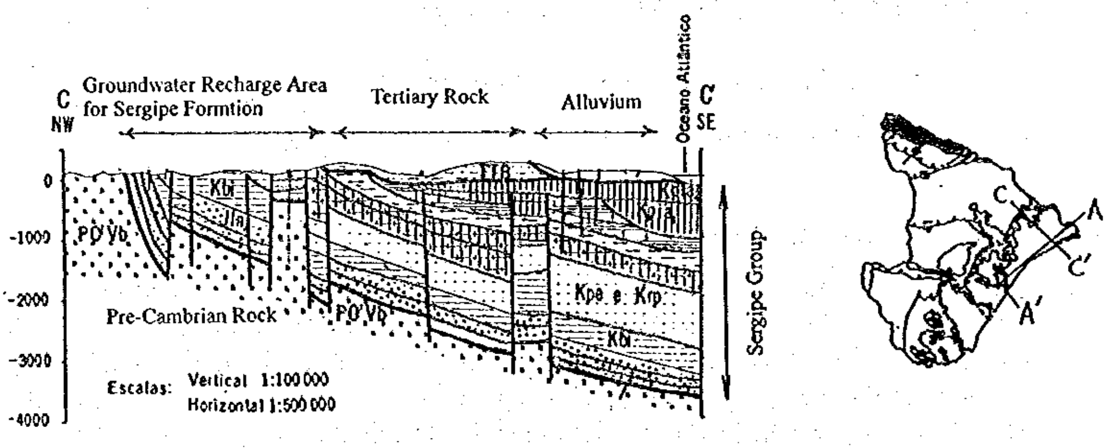


Figure-5.1 Regional Geological Section of Sergipe Basin

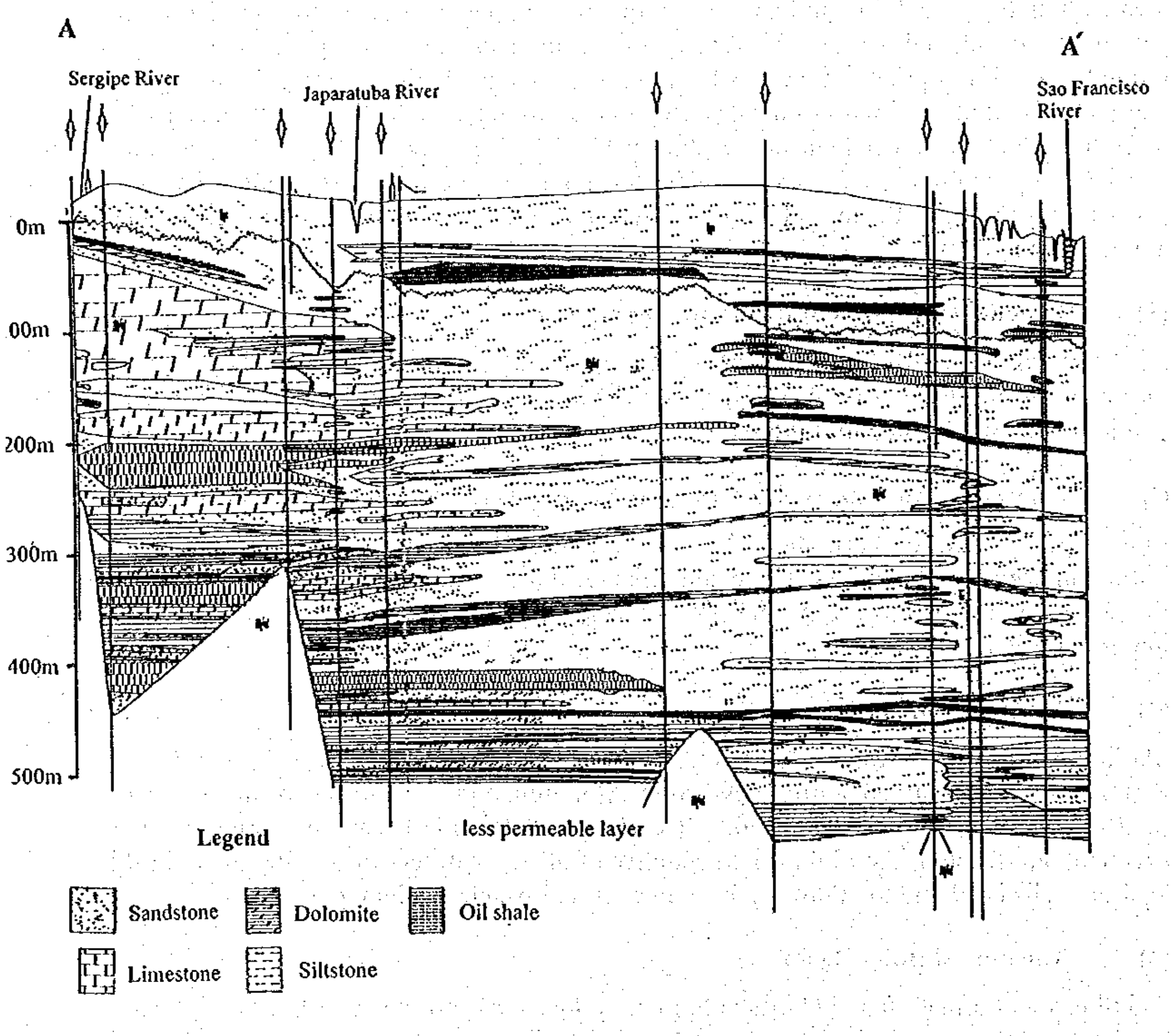


Figure-5.2 Geological Section of Marituba Formation

5.1.3 Crystalline Rock Aquifer

Precambrian aquifer is inferior to the other aquifers in terms of quantity and quality in Sergipe States, and groundwater development in Precambrian aquifer is possible on a small scale only for rural area. On the other hand, areas with higher development potential are locally identified as described below.

(1) Salgado, Lagarto, Estancia Area

Salgado, Lagarto and Estancia areas are located in Estancia Domain and Sao Francisco Craton. Lagarto Formation of Estancia Domain has boundary with gneiss of Sao Francisco Craton, and the boundary with many fissures sometimes forms good aquifer. However, Barreiras Formation covers this area wide, and the boundary is usually difficult to be found.

(2) Itabaiana Dome and Vaza-Barris Area

Gneiss of Itabaiana Dome forms good aquifers, and Frei Paulo Formation and Ribeiropolis Formation of Vaza-Barris Domain also form good aquifers.

5.2 Geophysical Method for Groundwater Survey

In Sergipe state, geophysical methods were not so far applied for groundwater survey to locate promising drilling sites. VLF Method, a kind of electromagnetic method which use special electromagnetic wave prevailing all over the world, is effective to locate new drilling sites for better success rate, especially in Precambrian rock. Fissure zones in rock can be easily and quickly detected by this method with low cost. This method, however, has not yet carried out in Sergipe State so far, therefore, the method may be recommended for new groundwater development. Other than VLF method, electric resistivity method is effective to make clear of geological situation, which lead to proper drilling plan in sedimentary rock area such as Sergipe basin.

5.3 More Detailed Groundwater Potential Assessment for Specified Area

In this study groundwater potential was roughly estimated for whole the Sergipe state in order to formulate the Master plan. However the data and hydrogeological model which were used for this estimation were not detailed ones. In the near future when groundwater development is planned on a large scale in specified area, the more detailed groundwater potential study is necessary including numerical simulations of groundwater movement in response to large scale pumping, which can assess the potential amount of groundwater to be developed without any environmental trouble.

5.4 Proper pumping Test for Aquifer Parameters

Pumping test, of course, is currently performed for every deep wells immediately after they are completed, however, this pumping test is aimed at getting rough estimation for its possible pumping rate without giving hydraulic parameters of its aquifer. It is necessary to obtain aquifer hydraulic parameters precisely for planning large scale groundwater development. For this purpose, execution of proper pumping test is necessary. Pumping test including step draw-down test should be performed with appropriate method.

5.5 Groundwater Level Monitoring

The groundwater monitoring including monitoring of groundwater level and groundwater quality is important in view points of both new groundwater development and environmental conservation. The Study Team performed groundwater field survey in 1998 which is considered a kind of groundwater monitoring. It is desirable that SRH or other adequate organization shall perform and continue groundwater monitoring. Groundwater level monitoring is indispensable for assessment of groundwater development potential and is also indispensable for effective counter-measures such as formulating regulations against environmental problems which are caused by inadequate groundwater use such as over-pimping.

5.6 Groundwater Data-base

Data of more than 4,000 deep wells which were drilled in Sergipe state in the past are stored in a groundwater data-base established by SRH. This data-base was utilized for the Master Plan Study. The data stored in the data-base includes many items such as well owners, well locations, well dimension, well capacities and so on. This data-base can provide many kinds of useful information concerning hydrogeology and groundwater in Sergipe state. However it is considered that this data-base still need additional important items such as exact location and aquifer lithology/geological unit of the wells. These items are essential for hydrogeological study and may give the most important information for multiple purposes. SRH is now trying to add new items to the data-base including items above and in the near future this data-base may play significantly important roles in aspects of groundwater developments and groundwater environmental conservation, though the completion of the data-base needs great elaboration.

APPENDIX-1

Current Groundwater Use
and
Hydrogeological Information

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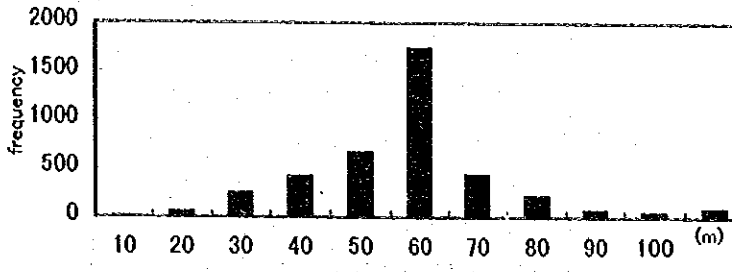
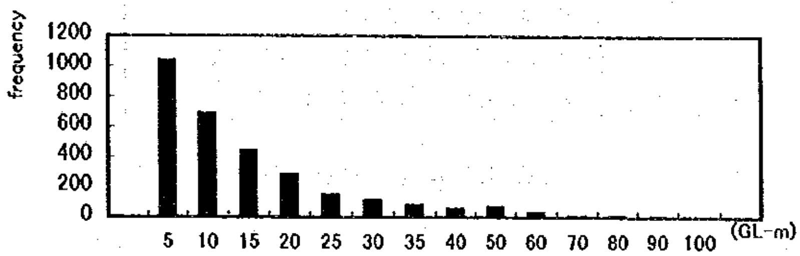
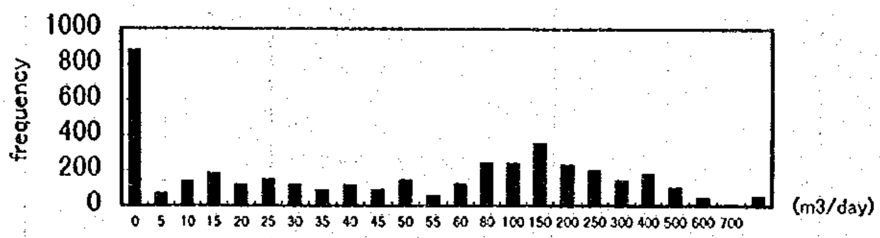


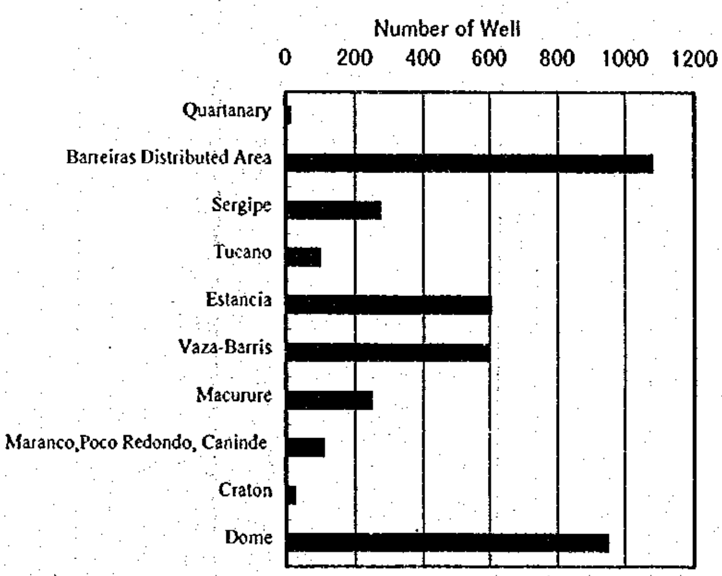
Histogram of Deep Well Depth



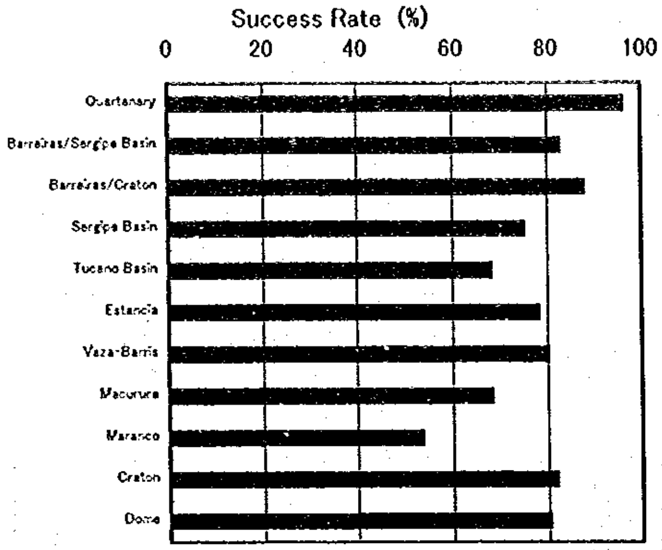
Histogram of Groundwater Level of Deep wells



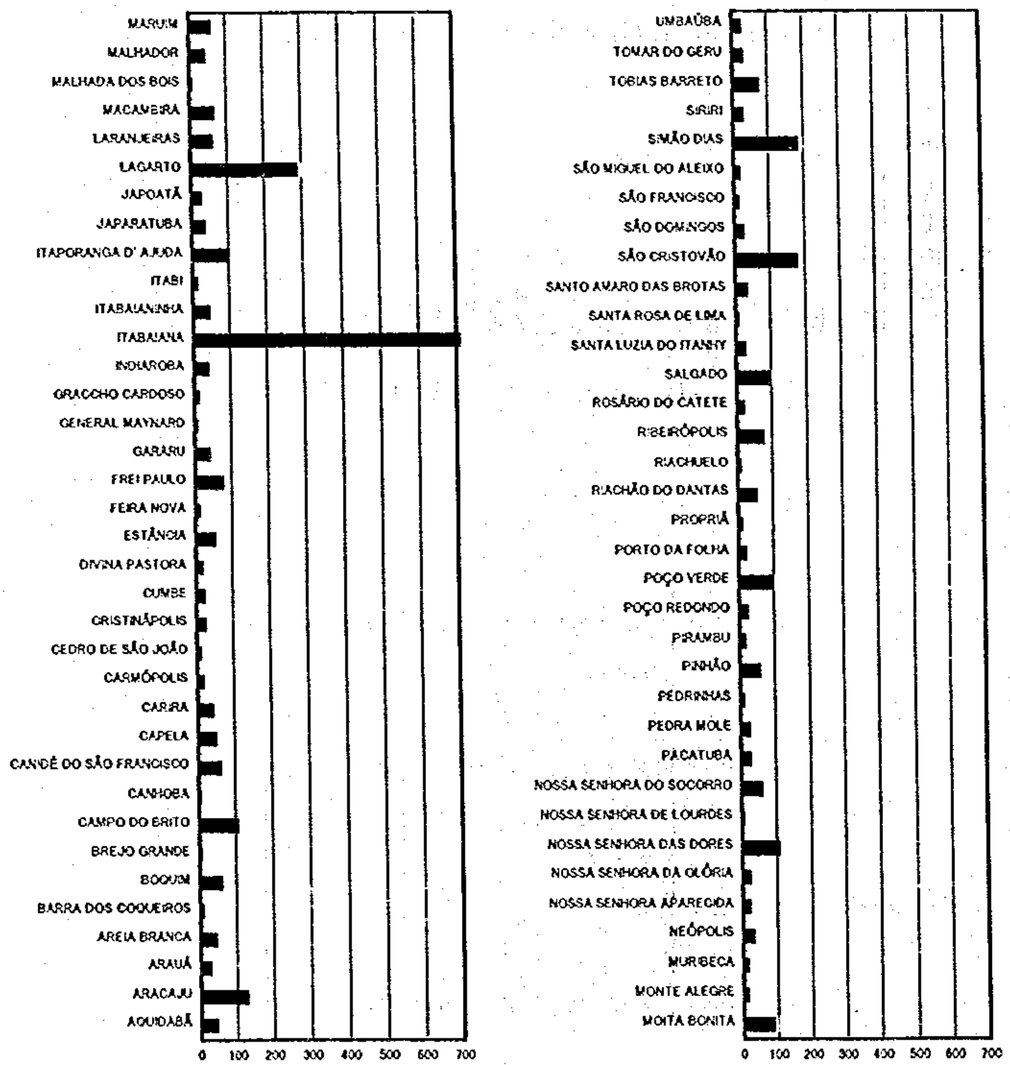
Histogram of Deep Well Yield



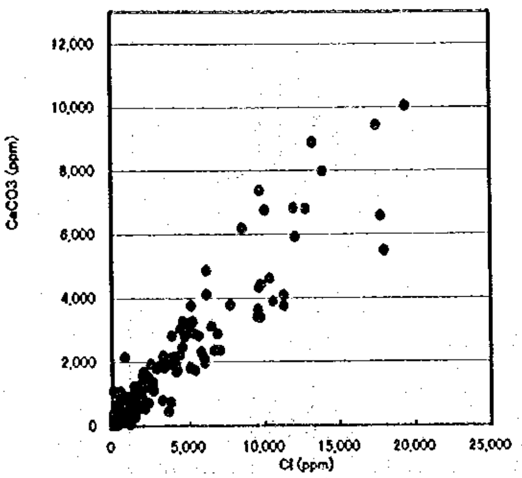
Number of Wells drilled in the Past by Aquifer



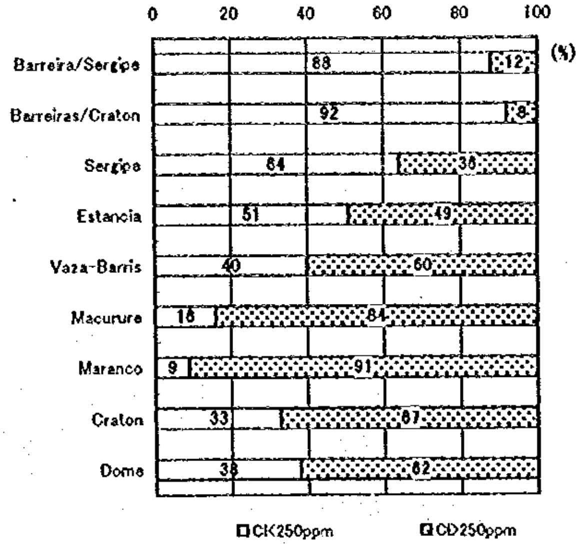
Well Success Rate By Aquifer



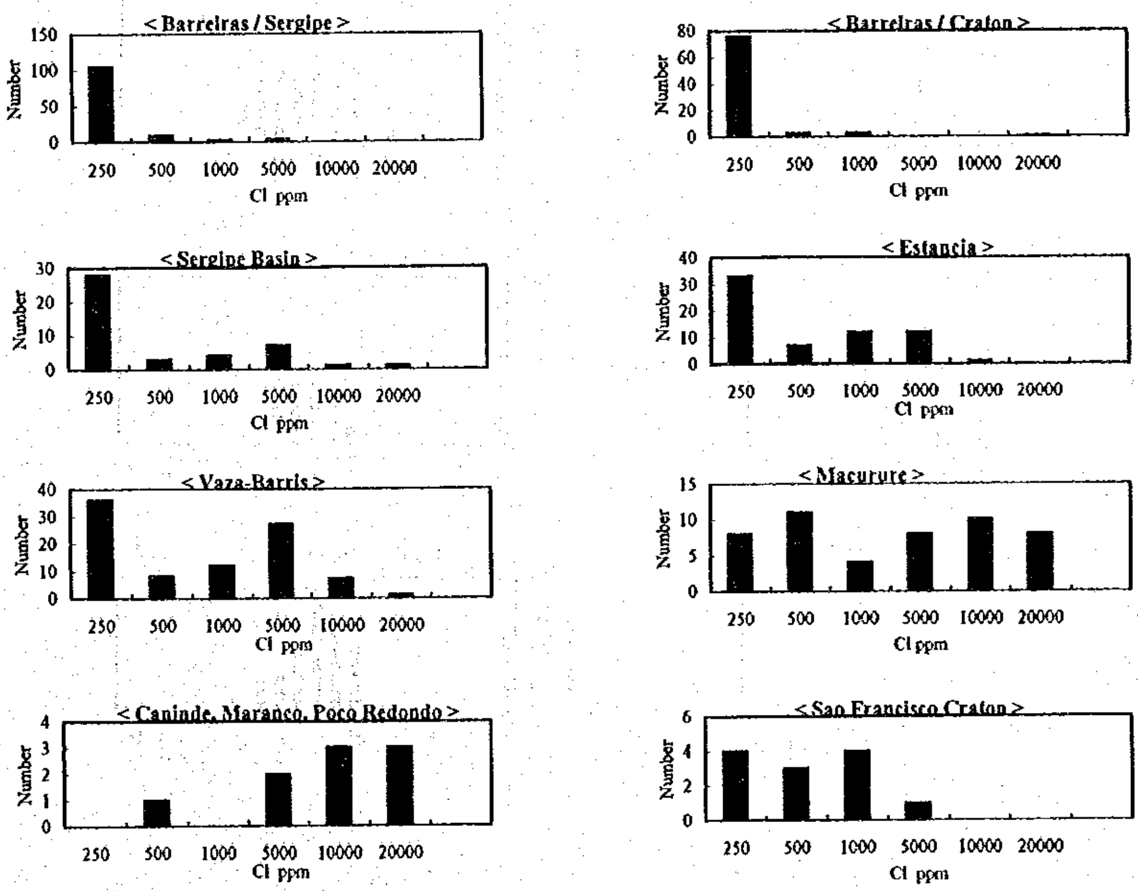
Number of Wells Drilled in the Past by Municipalities

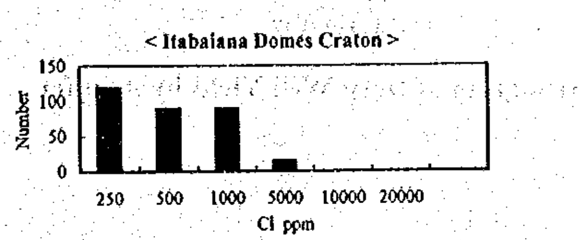


Relationship between Cl and $CaCO_3$

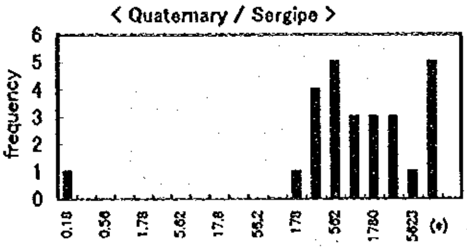


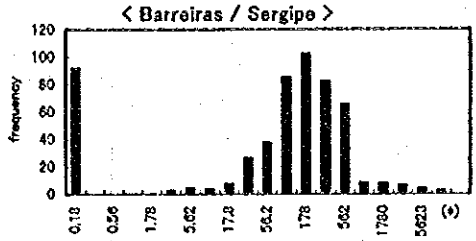
Cl Concentration by Aquifer

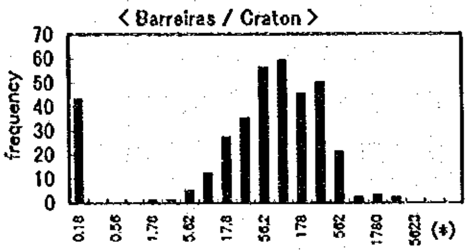


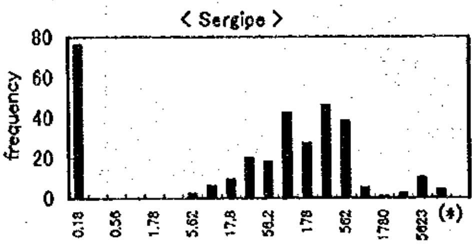


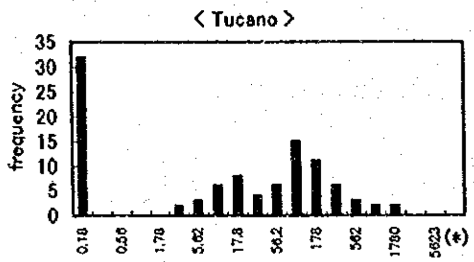
Histogram of Cl Concentration by Aquifer

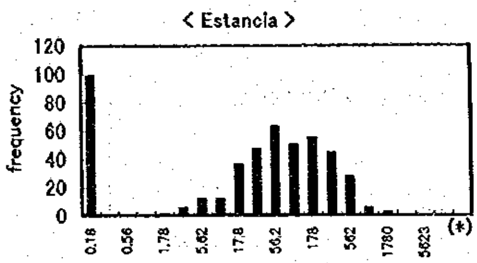


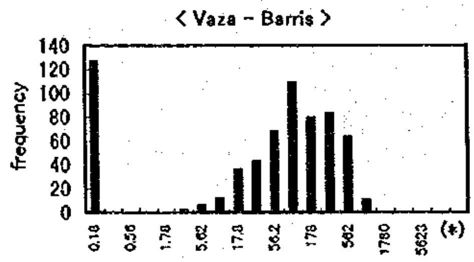


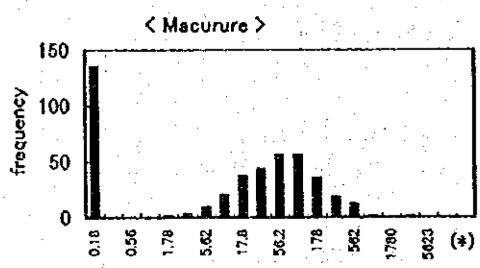


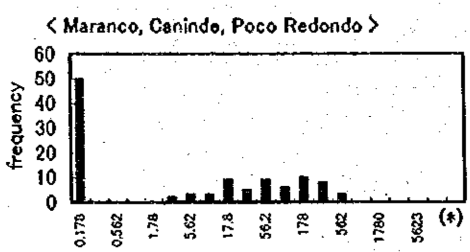


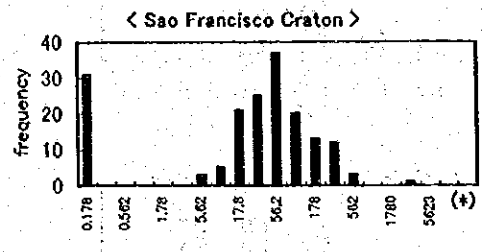


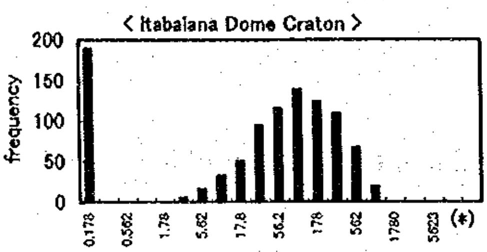






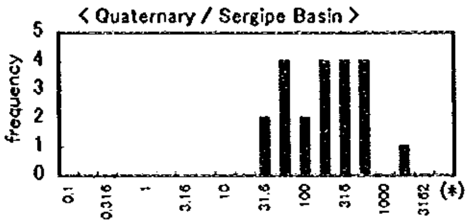


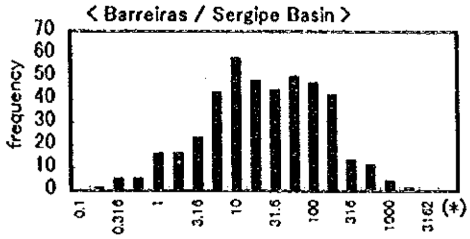


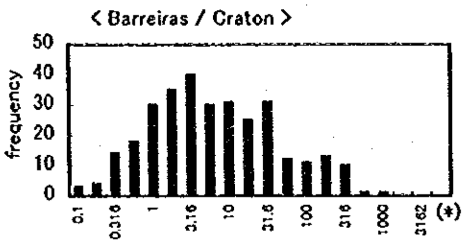


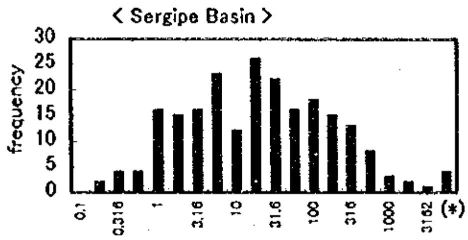
Note : (*) m^3/day

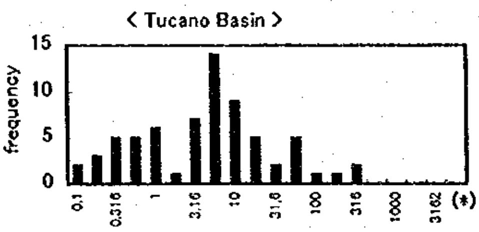
Histogram of Deep Well Yield by Aquifer

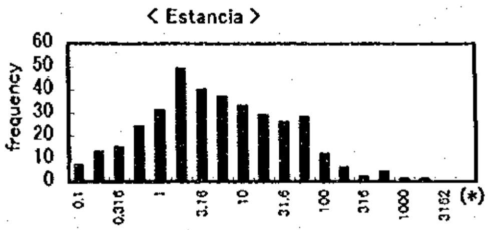


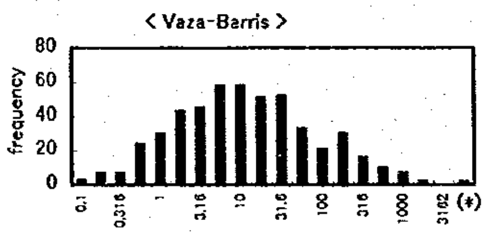


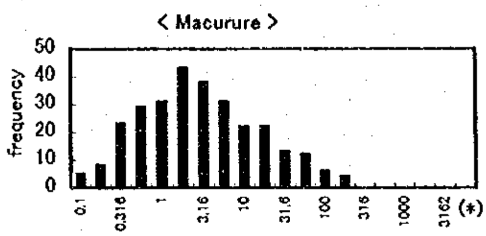


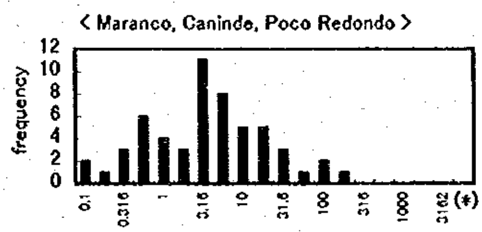


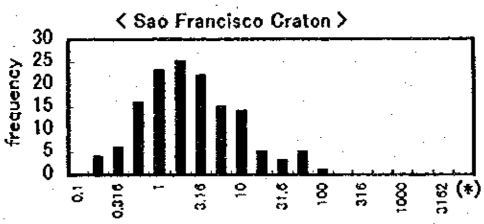


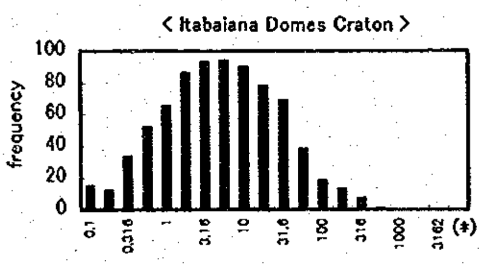










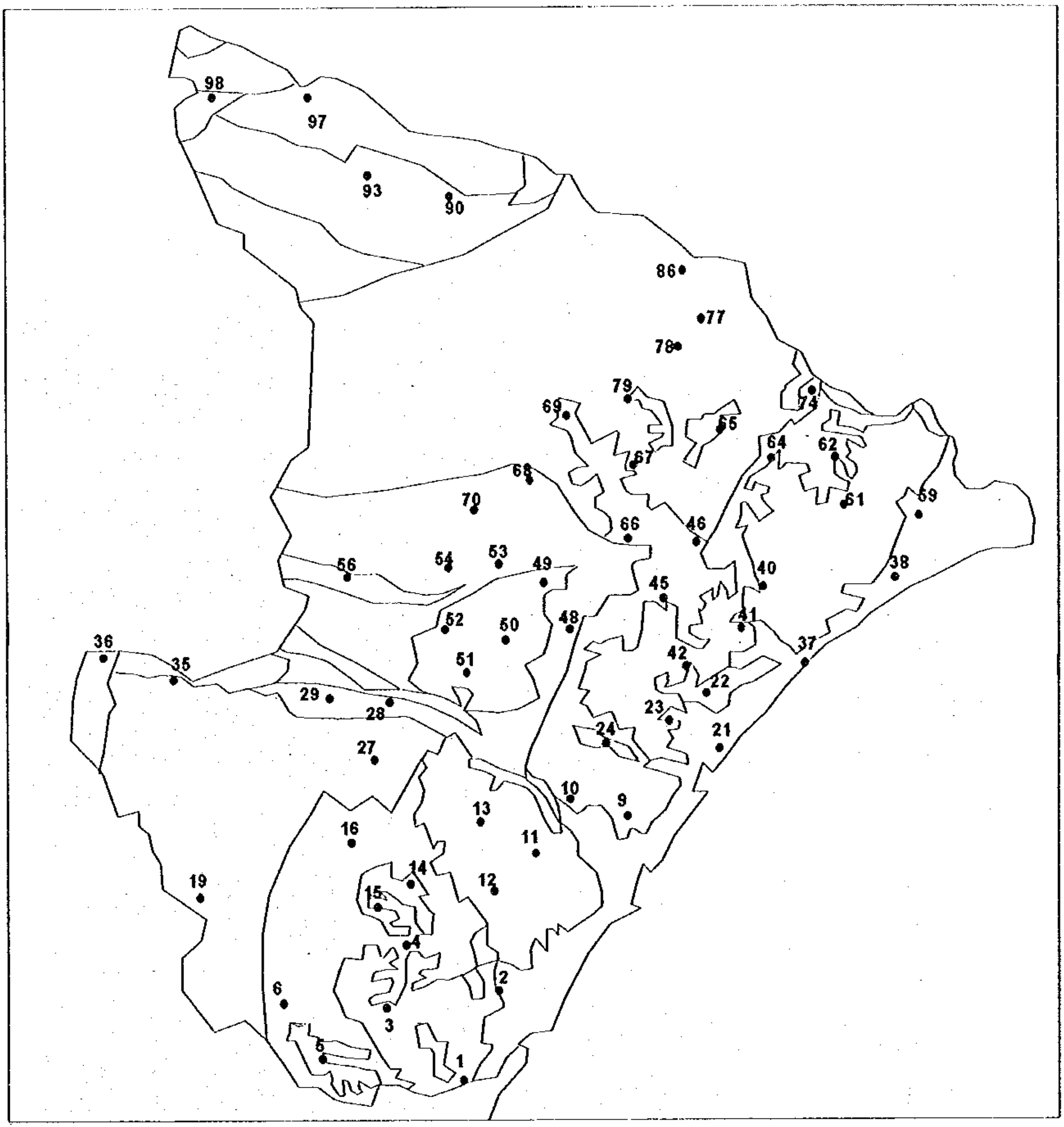


Note : (*) m^3/day/m

Histogram of Deep Well Specific Capacity

APPENDIX-2

Result of Groundwater Field Survey



Water Quality Observation Point

POCOS TU BULARES PROFUNDOS

No	DATA	MUNICIPIO	LOCALIDADE	PROPRIETARIO	DADOS DA PERFURACAO					DADOS OBSERVADOS										
					PROF. (m)	Q (l/h)	N.E. (m)	N.D. (m)	STD (mg/l)	LATITUDE	LONGITUDE	ALT. (m)	PROF. (m)	N.E. (m)	BOCA (m)	TEMP. (°C)	pH	COND. (mS/m)	O.D. (mg/l)	CONDICOES DO POCO
65-F	9-Sep	AQUIDABA	POV. JUREMA	ABILIO MORAIS SANTOS	60.00	2036	9.78	42.35	363.2	10° 17,967'	37°03,819'	345	59.52	4.42	0.48	33.0	7.38	0.06	7.39	Poco sem motor no momento para e guardado em casa possivel roubo
47-F	3-Sep	AREIA BRANCA	POV. MANILHA D'CIMA	P.M. A. BRANCA	58.00	5,013	26.30	30.80		10° 46,120'	37° 17,334'	189	60.00		0.28	27.8	6.45	19.40	4.13	Catavento COHIDRO
47-F	3-Sep	AREIA BRANCA	POV. MANILHA	MANOEL CESARIO SOUZA						10° 40,109'	37° 17,970'	0	55.00	4.20	0.80					Poco com bomba quebrada
21-F	10-Sep	BARRA DOS COQUEIROS	BARRA DOS COQUEIROS	DESO POCO 08						10° 54,947'	37°01,686'	0	59.21	9.74	0.79	29.6	7.38	0.04	2.43	Poco Sistema Barra dos Coqueiros Deso 08 ligado todo dia
57-F	15-Sep	BREJO GRANDE	BREJO GRANDE							10° 25,855'	36° 27,932'	72			1.00	29.9	6.95	0.06	2.38	Poco que abastece a cidade
14-F	25-Aug	BOQUIM	FCA T. BARRETO							11° 08,804'	37° 37,693'	213		15.15	0.89	28.0	5.73	62.90	3.63	Poco da DESO
96-F	29-Aug	C. S. FRANCISCO	ARATICUM	MARIA FERNANDES						9° 43,851'	37° 56,996'		60.00	3.12	0.68					Poco parado, sem reservatorio.
99-F	28-Aug	C. S. FRANCISCO	FAZ. CAICARA	EDILSON						9° 39,412'	37° 39,559'	99	60.00	1.49	0.51	29.5	7.64	167.60	5.18	
51-F	2-Sep	CAMPO DO BRITO	CAMPO DO BRITO	P.M.C.B.						10° 45,015'	37° 30,021'	402		1.20	0.44	27.1	8.35	102.40	6.56	Poco parado
97-F	29-Aug	CANINDE DE SAO FRANCISCO	FAZ. FUTURANA/MONTE PEDRAL	JOSE FRANCA BELEM	61.00	559	3.45	44.10	3,929.2	9° 37,396'	37° 54,608'		60.00	3.36	0.64	28.8	7.33	810.00	3.63	
46-F		CAPELA	ENGENHO FLOR DA INDIA POV. PEDRAS	ARMANDO G. ANDRADE						10°29,240'	37°06,481'	190	19.00	7.00	1.00	24.3	7.07	0.03	99.90	Agua que serve a fazenda e o engenho
73-F	26-Aug	CARIRA	POV. BONFIM							10° 25,692'	37° 47,522'	189		3.19	0.12					Catavento sem utilizacao
73-F	26-Aug	CARIRA	POV. BOA SORTE		66.00	1,003	23.90	41.62	7,019.2	10° 26,180'	37° 49,249'	258				24.5	7.58	>990	5.15	
	8-Sep	CARMOPOLIS	CARMOPOLIS	P.M.C.						10° 39,134'	36° 59,862'	0	60.00	24.21	0.79	27.3	5.74	0.03	5.22	Poco que abastece grande populacao
75-F	14-Sep	CEDRO DE SAO JOAO	POV. POCOS DOS BOIS							10° 17,228'	36° 54,618'	201	59.70		0.50					Nao existe poco nessa cidade o unico cavado ha alguns anos esta entupido
05-F	31-Aug	CRISTINAPOLIS	CRISTINAPOLIS	IBAMA						11° 28,276'	37° 44,821'	0	81.00	59.44	0.56	26.8	5.59	25.10	4.30	Consumo proprio e dos vizinhos
67-F	9-Sep	CUMBE	POV. SUCUPIRA	LUIS GONZAGA FEITOSA	61.00	2200	7.50	41.65	157.6	10° 22,570'	37°13,455'	267	75.47	7.58	0.53	28.7	7.07	0.04	0.28	Poco parado levaram o motor para conserto e nao houve volta
	4-Aug	DIVINA PASTORA	POV. ASENTAMENTO							10° 42,137'	37° 11,046'	0	70.00	1.37	0.53	26.1	7.71	0.09	4.86	Poco que abastece 55 familias
12-F	31-Aug	ESTANCIA	FAZ. CASQUEIRO	FRUTENE						11° 11,592'	37° 24,524'		40.00	3.60	0.40	27.5	5.25	10.20	3.87	Poco da FRUTENE utilizado na agricultura, irrigacao e uso domestico
69-F	9-Sep	FEIRA NOVA	FAZENDA TANQUE NOVO	LUIS ROBERTO SANTOS						10° 17,986'	37°17,156'	324	59.80	9.04						Poco entupido foi visitado 4 pocos nessa cidade porem estavam todos abandonados e entupidos nao existe cisterna nessa regiao
54-F	4-Sep	FREI PAULO	FAZ. REQUEIJAO	MANOEL MESSIAS GOIS	52.00	7,500	25.00	44.00	1,838.4	10° 32,599'	37° 35,636'	25	52.00	39.69	0.31	30.0	7.15	0.32	5.74	Poco que serve para uso na pecuaria e domestico
77-F	16-Sep	GARARU	POV. JIBOIA	COHIDRO P. M. G.	66.00	11314	3.60	22.70	2,698.4	9°57,909'	37°10,918'	42	59.70		0.30	28.7	7.98	0.95	99.90	Poco sendo recuperado pela Cohidro fase final
86-F	16-Sep	GARARU	POV. QUEIMADAS	MIGUEL DA MANTEIGA						9°57,999'	37°09,631'	117	59.70	1.22	0.30					Poco catavento quebrado impossivel pegar agua para analise
	27-Aug	GENERAL MAYNARD	POV. PEDRO CONCLAVES	ANTONIO J. DE J. PINA						10° 42,070'	36° 58,744'	25	60.00	9.33	0.67	31.8	7.77	68.10	3.66	Poco para o consumo da Populacao
79-F	9-Sep	GRACHO CARDOSO	POV. JUAZEIRO		55.00	3600	28.00	43.00	2,906.0	10° 14,050'	37°15,152'	246	59.60	4.60	0.40	25.3	6.93	0.57	4.25	Poco funcionando serve agua ao povoado e fazendas vizinhas
01-F	31-Aug	INDIAROBA	FAZ. DR. LEANDRO	DESO						11° 30,507'	37° 31,639'	285	40.00	40.03	0.73	31.6	7.87	12.08	1.93	Poco abandonado
50-F	3-Sep	ITABAIANA	ITABAIANA	DESO						10° 42,020'	37° 25,698'	40	60.00	+0.38	0.66	28.3	6.72	16.06	0.67	Poco da COHIDRO para a DESO
78-F	9-Sep	ITABI	POV. NEGRAS	MANOEL DE ZEQUINHA	31.00	1200	4.00	10.00	13,541.6	10° 05,116'	37°07,711'	0	59.61	3.51	0.39	28.8	7.62	1.22	4.36	Poco parado tamponado
10-F	25-Aug	ITAPORANGA	CAMACARI MIRIM	P.M. ITAPORANGA	60.00	13,200	0.85	15.97		10° 58,809'	37° 21,178'			0.00	0.74	23.9	6.44	12.20	3.37	Funcionando
11-F	24-Aug	ITAPORANGA	POSTO SAO PAULO	GILTON C. PEIXOTO	84.00	880	3.20	45.80		11° 02,095'	37° 21,913'	84		1.37	0.54	25.8	6.30	32.90	0.33	Sem utilizacao atual
40-F	10-Sep	JAPARATUBA	POV. SAPUCAIA		30.00	976	9.70	21.83	77.2	10° 36,654'	36°54,142'	0	69.36	9.90	0.64	27.1	9.24	0.01	5.63	Poco que abastece todo povoado reservatorio 10 mil ligado 9 horas dos populacao 1.000 pessoas
40-F	10-Sep	JAPARATUBA	POV. SAPUCAI		60.00	978	13.60	45.80	81.2	10° 36,627'	36°54,213'	249	59.00		100.00					Poco parado
62-F	15-Sep	JAPOATA	PLATO NEOPOLIS SAO FRANCISCO CITRUS	JOSE FRANCISCO B. ELIAS						10° 22,671'	36° 44,768'	225	99.00	46.00	1.00	26.2	5.51	0.02	5.10	Poco que serve para irrigacao de maracuja e outros
	14-Sep	JAPOATA	POV. LADEIRAS	DESO P. M. J.						10° 24,552'	36° 45,551'	0	119.32	49.27	0.68					Poco taponado pronto pra jogar na rede que vai abastecer o povoado impossivel pegar agua para analise muito fundo
61-F	11-Sep	JAPOATA	POV. TATU							10° 21,989'	36°45,501'	63	59.25	14.10	0.75	27.6	6.02	0.04	3.95	Poco que abastece o povoado
27-F	24-Aug	LAGARTO	CRUZEIRO VERDE	GILBERTO						10° 55,950'	37° 41,181'	243		0.00	0.72	25.9	7.33	73.10	0.50	Poco da DESO, sem uso
28-F	17-Sep	LAGARTO	POV. SOBRADO	COHIDRO P. M. L.	60.00	1200	18.00	50.00	322.4	10°57,445'	37°37,710'	177	54.70	3.95	0.30	27.0	7.11	0.08	99.90	Poco tamponado para servir o povoado
27-F	17-Sep	LAGARTO	POV. PE DE SERRA	DESO P. M. L.						10°57,368'	37°35,910'	0	30.46	3.86	0.54	27.6	6.84	0.05	99.90	Poco tamponado para ser jogado na rede que serve Lagarto
36-F	17-Sep	LAGARTO	POV. PE DE SERRA	DESO						10°61,173'	37°35,816'	66	31.06	4.96	0.94	27.2	6.72	0.03	99.90	Poco tamponado para servir Lagarto
24-F	27-Sep	LARANJEIRAS	POV. VARZEA	DENIR	60.00	22,000	3.60	5.50	576.8	10° 48,571'	37° 08,556'	48	25.00	0.74	0.96	27.2	7.21	92.50	3.21	Poco que abastece 400 habitantes
52-F	2-Sep	MACAMBIRA	MACAMBIRA CASA DE FARINHA							10° 40,760'	37° 31,939'	177	60.00	2.65	0.19	29.6	7.11	273.90	3.92	Poco abastece a casa de farinha
64-F	11-Sep	MALHADA DOS BOIS	POV. CRUZ DA DONZELA	ALTAMIRO						10° 32,914'	36° 54,899'	123	63.68	5.60	0.32	27.8	6.68	0.02	2.92	Poco cavado pela Cohidro para o povoado, contudo foi abandonado com chegada de agua do San Francisco
48-F	3-Sep	MALHADOR	POV. ESTEVAO	JOSE DOS SANTOS						10° 39,156'	37° 19,575'	117	60.00	0.15	0.35	26.9	7.10	0.03	4.44	Poco parado
41-F	27-Aug	MARUIM	POV. RODAGEM	BETO						10° 44,874'	37° 05,620'	141		6.51	0.63	25.4	7.49	47.70	4.79	Poco da Hidrosolo para uma populacao de 150 familias
49-F	3-Sep	MOITA BONITA	MOITA BONITA							10° 34,779'	37° 21,050'		40.00	3.60	0.30	27.5	6.91	0.04	4.73	Poco que serve ao campo de futebol
	9-Sep	MURIBECA	MURIBECA							10° 26,707'	36° 57,188'	0	119.15	9.50	0.85	29.0	5.58	0.02	4.44	Poco que abastece a cidade de Muribeca
70-F	3-Sep	N. S. APARECIDA	LAGOA DO CROAR	DERIVALDO	50.00	220	7.70	39.35	1,536.4	10° 21,902'	37° 31,027'			2.04	0.96	26.6	7.86	36.20	6.51	Parado com Catavento
77-F	18-Sep	N. S. DE LOURDES	POV. PORCOES							10°05,401'	37°00,712'	144	61.90	29.90	0.10					Poco entupido impossivel pegar agua para analise
23-F	27-Aug	N. S. DO SOCORRO	N. S. DO SOCORRO	DESO						10° 51,637'	37° 07,731'	42	35.00	8.71	0.29	29.0	6.97	25.80	2.82	Poco abandonado filtros quebrados
81-F	1-Sep	N. S. GLORIA	POV. BAIXA LIMPA/BAIXA DO COXO	MARIA SILVA DOS SANTOS	84.00	1,158	19.40	59.73	24,625.2	10° 12,165'	37° 29,493'	156		>30	0.49					Catavento
66-F	8-Sep	N. S. DORES	EMBRAPA	EMBRAPA						10° 37,937'	37° 11,843'	177	60.00	29.00	0.60	30.1	6.53	0.03	6.29	Poco taponado parado
60-F	15-Sep	NEOPOLIS	NEOPOLIS	DESO						10° 19,665'	36° 34,809'	24	59.59	1.14	0.41	28.1	7.16	0.05	0.21	Poco temporado para ser jogado na rede que abastece Neopolis
59-F	11-Sep	PACATUBA	POV. ESTIVA DO RAPOSO							10° 26,539'	36° 39,601'	111	59.48	2.30	0.52	26.9	5.90	0.01	4.65	Abastece a populacao do povoado
38-F	11-Sep	PACATUBA	PACATUBA	DESO						10° 27,861'	36° 38,424'	5	69.36	4.58	0.64	27.8	6.46	0.01	5.18	Atender a populacao da cidade
	26-Aug	PEDRA MOLE	TAPADO I	P. M. PEDRA MOLE	60.00	2,640	11.20	21.60	493.6	10° 36,049'	37° 42,578'	342		3.60	0.50	33.8	7.40	217.20	1.79	Funcionando
56-F	26-Aug	PEDRA MOLE	POV. GRAVATA	MILTON BATISTA	64.00	9,428	23.40	24.56	1,457.2	10° 35,396'	37° 38,755'	177	61.60	42.64	0.46					
15-F	25-Aug	PEDRINHAS	POV. MATO GROSSO/E. M. TEREZA M. DA SILVA	RAIMUNDO A'VILA						11° 13,349'	37° 41,013'	66		1.03	0.17	26.5	8.14	166.70	5.92	
56-F	26-Aug	PINHAO	FAZ. NELSON PINTO		60.00	13,200	16.60	17.60	4,513.2	10° 34,298'	37° 44,323'	126		27.90	0.15	27.1	7.61	>990	7.89	
37-F	10-Sep	PIRAMBU	POV. BAIXA GRANDE		116.00	4400	64.00	65.85	75.6	10° 37,574'	36°49,376'	0	119.36	49.36	0.64	28.6	6.13	0.01	4.16	Serve a toda populacao do povoado 2 chafarizes mas ou menos 2 mil pessoas
93-F	28-Aug	POCO REDONDO	BARRA DA ONCA	ANTONIO DOS SANTOS						9° 50,780'	37° 36,336'	96	60.00	5.16	0.84	29.8	7.84	96.70	5.94	
35-F	2-Sep	POCO VERDE	POV. SITIO DOS ANJOS	P. M. P. V.						10° 45,548'	37° 59,954'	375	60.00	8.29	0.53	26.2	7.15	248.30	4.16	Abastece 500 pessoas
36-F	2-Sep	POCO VERDE	POV. TABULEIRINHO	P. M. P. V.	52.00	10,000	15.00	44.00	1,314.8	10° 45,268'	38° 01,113'	489	70.00	12.37	0.63	27.2	6.79	27.92	3.41	Poco que vai servir ao club e populacao
	2-Sep	POCO VERDE	FAZ. MOCO							10° 45,341'	38° 00,668'	471		8.34	0.46	27.3	8.39	56.00	5.82	Uso domestico, irrigacao e pecuaria
89-F	16-Sep	PORTO DA FOLHA	POV. LAGOA DO RANCHO		55.00	1500	25.00	40.00		9°59,021'	37°25,995'	189	59.70		0.30					Poco entupido agua salgada ja existe agua encanada que vem do Sao Francisco por isso esta abandonado
88-F	16-Sep	PORTO DA FOLHA	POV. LAGOA DA VOLTA		65.20	5000	8.00	45.00		9°53,706'	37°24,980'	107	59.90		0.10					Poco entupido ha muitos anos
90-F	16-Sep	PORTO DA FOLHA	FAZ. PARAISO JUNCO I	HELDER	60.00	1189	15.54	44.15	2,411.6	9°57,034'	37°14,735'	198	59.60	24.60	0.40	31.4	8.22	0.36	99.90	Poco funcionando para consumo da fazenda
91-F	16-Sep	PORTO DA FOLHA	POV. JUNCO II							9°57,789'	37°14,181'	0	60.70	15.70	0.30	29.6	8.84	0.87	9.79	Poco com problema no catavento
74-F	14-Sep	PROPRIA	POV. SAO MIGUEL							10° 16,715'	36° 47,966'	0	63.65	6.04	0.35	29.9	5.69	0.13	1.86	Poco que serve ao pov. mais ou menos 1.000 habitantes
16-F	25-Aug	RIACHAO DOS DANTAS	POV. CAMPESTRE							11° 10,003'	37° 41,862'	273		6.23	0.49	25.9	5.69	67.90	4.36	
43-F	4-Sep	RIACHUELO	POV. BONFIM							10° 42,052'	37° 11,322'	0	30.00	12.03	0.57	26.1	6.82	0.05	1.71	Reservatorio que abastece 1000 habitantes
53-F	3-Sep	RIBEIROPOLIS	CAMPO DE FUTEBOL	P.M. RIBEIROPOLIS						10° 31,997'	37° 26,223'	267	60.00	16.45	0.23	28.3	6.79	109.80	3.77	Poco da Hidrosolo para a DESO
42-F	27-Aug	ROSARIO DO CATETE	FAZ. MARRECAS	JOSE ROBERTO						10° 41,566'	37° 00,816'	9	60.00	3.73	0.14	26.4	7.50	84.90	4.34	Para uso na pecuaria e domestico
66-F	1-Sep	S. M. DO ALEIXO	CAENDAS II							10° 25,415'	37° 23,940'	168		+0.55	0.45	27.2	6.17	72.50	1.37	
66-F	1-Sep	S. M. DO ALEIXO	MALHADAS DOS NEGROS							10° 25,482'	37° 23,220'	183		SURG		28.0	5.93	38.10	1.25	
68-F	1-Sep	S. M. DO ALEIXO	CAENDAS							10° 25,661'	37° 24,401'	192		+0.13		28.4	5.73	28.50	0.70	
13-F	25-Aug	SALGADO	POCO N°7	DESO						11° 01,998'	37° 28,898'			+0.09	0.11	28.4	7.13	52.90	2.48	Sem utilizacao atual
09-F	27-Aug	SAO CRISTOVAO	POV. PINTOS	EDUARDO						10° 59,208'	37° 17,138'	51		1.22	0.78	27.4	5.76	15.40	2.83	Ligado uma vez na semana
	14-Sep	SAO FRANCISCO	SAO FRANCISCO	POCO DESO						10° 21,290'	36° 53,670'	0	59.18	1.62	0.82	26.4	7.16	0.06	3.00	Poco do Deso que abastece a cidade de Sao Francisco
52-F		SIMAO DIAS	CORACAO DE MARIA / PAU DE COLHER	OSVALDO	80.00	102	10.00	62.90		10° 46,518'	37° 52,542'	394	60.00	7.91	0.49	28.7	7.74	240.40	2.00	Poco sem utilizacao
35-F	2-Sep	SIMAO DIAS	POV. SAO DOMINGOS							10° 47,074'	37° 54,305'	261	60.00	9.93	0.53	28.8	8.75	240.90	7.75	Uso domestico e na agricultura
45-F	8-Sep	SIRIRI	POV. PIRANHAS	JOSE OLIVEIRA						10° 37,402'	37° 05,403'	0	60.00	3.96	0.50	28.4	7.46	0.04	1.45	Poco taponado parado
22-F	10-Sep	SANTO AMARO	POV. SAPE	POCO PETROBRAS PORTO SE						10° 47,659'	36°57,618'	24	59.00	8.63	1.00	29.9	8.40	0.02	3.46	Poco parado tamponado para servir ao porto de Sergipe
02-F	31-Aug	STA LUZIA DO ITANHI	COLONIA PRIAPU	LALU						11° 24,593'	37° 29,421'	0	60.00	0.01	0.55	26.6	5.97	2.67	1.27	Poco temporariamente Tamponado (abastece 92 familias)
19-F	24-Aug	T. BARRETO	POV. BATATA							11° 06,619'	37° 37,523'	228		10.62	0.58	25.6	8.39	>990	2.01	Instalado com catavento
06-F	31-Aug	TOMAR DO GERU	POV. BRIJINHO	ESC. MUN. JOAO COTIA	40.00	4,200	10.00	25.00		11° 23,566'	37° 49,543'	379	60.00	7.76	0.06	24.6	6.40	33.10	4.38	Poco que abastece a escola

POCOS RASOS

No	DATA	Municipality	Location	Property	LATITUDE	LONGITUDE	ALT. (m)	PROF. (m)	N.E. (m)	BOCA (m)	DIAM. (m)	TEMP. (°C)	pH	COND. (mSm)	O D. (mg/l)	OBSERVACOES
45-R	9-Sep	SIRIRI	POV. PIRANHAS	ANTONIO OLIVEIRA SANTOS	10° 37,559'	37° 05,420'	0	8.21	1.95	0.39	1.59	28.2	5.40	0.02	2.55	Atualmente em uso
66-R	8-Sep	N.S. DAS DORES	N. S. DAS DORES	ARNALDO SOUZA LEITE	10° 28,284'	37° 11,563'		31.33	27.63	0.37	1.10	30.5	5.40	0.03	6.82	
54-R	4-Sep	FREI PAULO	POV. COITE	PEDRO MANOEL SANTANA	10° 33,585'	37° 28,864'	264	46.87	30.74	0.53	0.50	27.4	6.11	31.40	2.95	Excelente agua que serve a populacao
23-R	27-Aug	N.S.DO SOCORRO	POV. BOA NOVA	JOSE PEDRO DOS SANTOS	10° 51,980'	37° 07,611'	51	4.66	0.07	0.38	1.17	27.7	7.14	92.70	3.77	Usado para irrigacao e uso domestico
09-R	27-Apr	SAO CRISTOVAO	POV. PINTOS	EDUARDO	10° 59,211'	37° 13,083'	48	3.80	0.73	0.20	1.59	27.4	5.23	15.90	1.19	Excelente agua que serve para consumo domestico
24-R	27-Aug	LARANJEIRAS	POV. VARZEA	P.M. LARANJEIRAS	10° 48,567'	37° 08,760'	0	3.63	1.84	0.69	0.68	29.4	5.92	26.50	6.35	Usado pela populacao de 400 habitantes
	27-Aug	GENERAL MAYNARD	POV. SITIO PALMEIRA	PEDRO SANTOS	10° 41,929'	36° 58,912'	27	3.07	0.92	0.78	0.80	26.9	6.47	62.30	2.03	Usado por uma chacara
12-R	31-Aug	ESTANCIA	POV. NOVA ESTANCIA	MARIA DE LURDES SANTOS	11° 10,260'	37° 23,868'	78	7.68	5.55	0.52	1.39	25.7	5.43	3.00	1.76	Consumo domestico
47-R	3-Sep	AREIA BRANCA	POV. MANILHA D'CIMA	JOSE CARLOS DE ALMEIDA	10° 46,122'	37° 17,404'		10.38	7.93	0.52	1.30	26.7	5.56	12.70	3.45	Consumo domestico, irrigacao entre outros
14-R	25-Aug	BOQUIM	AV. JACOMIDIO BARRETO	MARIA JOSEFINA MENDONCA GUIMARAES	11° 08,673'	37° 36,986'	171	18.11	14.44	0.19		27.6	3.98	58.20	2.61	
13-R	25-Aug	SALGADO	POV. TURMA	JORGE ADELSON DE O. SANTANA	11° 02,277'	37° 29,004'	54	15.92	5.76	0.78		25.7	5.60	40.60	6.61	
04-R	25-Aug	ARAUA	POV. SAPE	JOSE FARIAS DE MENEZES	11° 17,981'	37° 36,020'	174	21.86	12.07	0.64	1.25	27.6	4.24	24.60	4.73	
04-R	25-Aug	ARAUA	POV. BULANDEIRA	JOSE DOMINGOS DOS SANTOS	11° 13,767'	37° 38,650'		16.35	12.07	0.65	1.20	26.4	4.64	15.50	2.33	
01-R	31-Aug	INDIAROBA	INDIAROBA	CLAUDIO RESTAURANTE	11° 31,098'	37° 30,724'		1.91	2.03	0.30	1.12	27.9	6.32	51.80	3.02	Consumo domestico
06-R	31-Aug	TOMAR DO GERU	POV. BREJINHO	MARIA FRANCISCA SANTOS	11° 23,611'	37° 49,491'		11.06	7.25	0.82	0.92	28.5	5.73	35.40	37.90	Excelente agua para consumo domestico e irrigacao
05-R	21-Aug	CRISTINAPOLIS	CRISTINAPOLIS	SERGIO MENEZES SANTOS	11° 28,350'	37° 44,835'	126	15.31	10.13	0.69	1.19	27.6	5.47	14.40	2.12	Excelente agua para consumo domestico e irrigacao
03-R	24-Aug	UMBAUBA	POV. GUARAREMA	MANOEL CARDOSO DA SILVA	11° 24,166'	37° 39,714'		15.24	12.32	0.68		26.5	5.12	10.90	4.79	
07-R	24-Aug	ITABAIANINHA	R. TOBIAS BARRETO	JULIA Mª DE JESUS	11° 16,354'	37° 48,020'		5.73	0.14	0.67		26.5	6.63	7.04	1.75	
11-R	24-Aug	ITAPORANGA	POV. TABOCAS	JOSE SILVA	11° 02,829'	37° 01,914'		0.98	3.06	0.44		25.6	5.48	27.10	0.36	
15-R	25-Aug	PEDRINHAS	POV. BELA VISTA	JOSEFA Mª DE JESUS	11° 12,582'	37° 40,245'	255	24.75	19.40	0.72		26.7	6.22	37.20	3.89	
10-R	25-Aug	ITAPORANGA	POV. SALVADOR	JOSE DAS VIRGENS	11° 00,063'	37° 19,811'		8.79	6.52	0.52		27.0	5.27	12.90	4.33	
16-R	25-Aug	RIACHAO DO DANTAS	POV. CAMPESTRE	ANTONIO RODRIGUES DA COSTA	11° 09,942'	37° 41,899'	246	9.99	7.17	0.65		26.4	5.41	48.40	1.40	
60-R	15-Sep	NEOPOLIS	NEOPOLIS	JOSE DA SILVA	10° 19,734'	36° 34,891'	0	1.33	0.83	0.17		28.4	4.19	0.02	5.91	Consumo Domestico
61-R	14-Sep	JAPOATA	POV. LADEIRAS	ADALBERTO DE JESUS	10° 24,568'	36° 45,572'	90	14.50	13.60	0.50	1.05	28.9	5.18	0.02	7.96	Consumo Domestico
62-R	14-Sep	JAPOATA	POV. LADEIRAS	ADELAIDE DE ALMEIDA	10° 24,623'	36° 45,595'		14.47	13.77	0.53	0.96	28.1	5.17	0.02	4.14	Consumo Domestico
64-R	11-Sep	MALHADA DOS BOIS	POSTO CAIOBA		10° 23,269'	36° 54,871'	0	15.70	1.30	0.30	1.50	27.8	6.50	0.04	1.21	Consumo do Posto
61-R	11-Sep	JAPOATA	POV. TATU	MARIA DO CARMO DE OLIVEIRA	10° 21,469'	36° 45,647'	0	18.76	13.92	0.24	0.52	28.1	5.80	0.09	1.44	Consumo Domestico e vizinhos
40-R	10-Sep	JAPARATUBA	POV. SAPUCAIA	REGINALDO DANTAS	10° 36,623'	36° 54,005'	159	14.85	11.85	0.15		27.8	5.85	0.00	3.92	Consumo Domestico excelente agua
65-R	9-Sep	AQUIDABA	POV. JUREMA	AGNALDO G. DA SILVA	10° 17,869'	37° 03,314'	216	8.16	8.06	0.64		27.3	6.21	0.10	3.81	Consumo Domestico
46-R	18-Sep	CAPELA	POV. PEDRAS	EDNALDO F. SANTOS	10° 29,303'	37° 06,354'	366	16.45	12.28	0.65		27.7	6.49	0.01	99.9	Serve para consumo domestico
02-R	31-Aug	SANTA LUZIA DO ITANHY	COLONIA PRIAPO	MUNDINHO	11° 24,593'	37° 29,474'	6	2.71	0.67	0.89	1.3	25.5	5.91	18.2	2.21	Uso Domestico
	4-Sep	DIVINA PASTORA	ASSENT. FLOR DO MUCURI	EDVAN LEITE SANTOS	10° 42,077'	37° 11,204'	0	5.27	0.45	0.30	1.1	27.4	6.19	0.02	1.24	Uso Domestico

POCOS TUBULARES PROFUNDOS

#	DATA	MUNICIPIO	LOCALIDADE	PROPRIETARIO	DADOS DA PERFURACAO					DADOS OBSERVADOS										CONDICOES DO POCO
					PROF. (m)	Q (l/h)	N.E. (m)	N.D. (m)	STD (mg/l)	LATITUDE	LONGITUDE	ALT. (m)	PROF. (m)	N.E. (m)	BOC A (m)	TEM P (°C)	pH	COND. (mS/m)	O.D. (mg/l)	
05-P	18-Nov	AQUIDABA	POV. JUREMA	ABILIO MORAIS SANTOS	60.00	2036	9.78	42.55	363.2	10° 17,989'	37°03,815'	108	60.00	4.22	0.48					Poco sem motor no momento pois e guardado em casa possivel roubo
47-P	6-Nov	AREIA BRANCA	POV. MANILHA D'CIMA	P. M. A. BRANCA	58.00	5,013	26.30	30.80		10° 46,129'	37° 17,313'	276	60.00		0.28					Poco c/ problema no catavento. Parado
47-P	6-Nov	AREIA BRANCA	POV. MANILHA	MANOEL CESARIO SOUZA						10° 46,109'	37° 17,970'									Poco com bomba quebrada
21-P	20-Nov	BARRA DOS COQUEIROS	BARRA DOS COQUEIROS	DESO POCO 08						10° 54,927'	37°01,677'	27	60.00	9.21	0.79	30.5	4.90	37.80	2.85	Poco Sistema Barra dos Coqueiros Deso 08 ligado todo dia
57-P	19-Nov	BREJO GRANDE	BREJO GRANDE	DESO						10° 25,837'	36° 27,986'	0		0.10	0.10	28.9	4.07	54.10	2.27	Poco que abastece a cidade
14-P	9-Nov	BOQUIM	PCA T. BARRETO	DESO P. M. B.						11° 08,799'	37° 37,736'	270	60.00	14.91	0.89	29.2	5.56	50.00	3.51	Poco da DESO
98-P	11-Nov	C.S.FRANCISCO	FAZ. CAICARA	EDELSON						9° 39,214'	37° 57,480'	228	60.00	12.67	0.65	32.1	4.75	170.00	7.54	
51-P	6-Nov	CAMPO DO BRITO	CAMPO DO BRITO	P.M. CAMPO DO BRITO						10° 45,158'	37° 29,990'	282	60.00	1.36	0.52	27.9	5.72	78.00	4.83	Poco parado
97-P	11-Nov	CANIDE DE SAO FRANCISCO	FAZ. FUTURANA/MONTE PEDRAL	JOSE FRANCA BELEM	61.00	559	3.45	44.10	3,929.2	9° 37,465'	37° 54,523'	243	60.00	4.52	0.68	33.0	4.56	840.00	4.76	
46-P	5-Nov	CAPELA	ENGENHO FLOR DA INDIA POV. PEDRAS	ARMANDO G. ANDRADE						10°29,186'	37°06,471'	162	19.00	7.15	1.00	28.8	1.18	33.40	7.22	Agua que serve a fazendas e engenho
73-P	13-Nov	CARIRA	POV. BONFIM							10° 25,721'	37° 47,516'	276			0.12					Catavento sem utilizacao
73-P	13-Nov	CARIRA	POV. BOA SORTE	COHIDRO P.M.C.	66.00	1,003	23.90	41.62	7,019.2	10° 26,164'	37° 49,265'	255	60.00		0.50	31.8	4.89	670.00	4.27	
	17-Nov	CARMOPOLIS	CARMOPOLIS	COHIDRO S.A.E.E.						10° 39,141'	36° 59,879'	36	60.00	24.26	0.79	27.7	4.53	23.40	5.76	Poco que abastece grande populacao
75-P	19-Nov	CEDRO DE SAO JOAO	POV. POCOS DOS BOIS							10° 15,754'	36° 52,774'	0	60.00		0.30					Nao existe poco nessa cidade o unico cavado ha alguns anos esta entupido
05-P	4-Nov	CRISTINAPOLIS	CRISTINAPOLIS	IBAMA						11° 28,348'	37° 44,852'	288	81.00	59.46	0.54	31.3	5.07	31.60	4.89	Consumo proprio e dos vizinhos
67-P	18-Nov	CUMBE	POV. SUCUPIRA	LUIS GONZAGA FEITOSA	61.00	2200	7.50	41.65	1576	10° 22,563'	37° 13,463'	279	75.00	6.89	0.53	25.4	2.74	16.20	0.20	Poco parado levaram o motor para conserto e nao houve volta
	12-Nov	DIVINA PASTORA	POV. ASENTAMENTO							10° 42,306'	37° 11,650'	330	70.00	30.47	0.53	26.1	4.35	90.00	4.19	Poco que abastece 55 familias
12-P	4-Nov	ESTANCIA	FAZ. CASQUEIRO	FRUTENE						11° 11,340'	37° 24,560'		40.00	4.33	0.44	31.6	3.13	10.60	7.54	Poco da FRUTENE utilizado na agricultura, irrigacao e uso domestico
69-P	18-Nov	FEIRA NOVA	FAZENDA TANQUE NOVO	LUIS ROBERTO SANTOS						10° 17,828'	37° 17,406'	87	60.00	10.85	0.30					Poco entupido foi vistado 4 pocos nessa cidade porem estavam todos abandonados e entupidos nao existe cisterna nessa regiao
54-P	6-Nov	FREI PAULO	FAZ. REQUEIJAO	MANOEL MESSIAS GOIS	52.00	7,500	25.00	44.00	1,838.4	10° 32,550'	37° 35,615'	213	52.00	39.69	0.31	30.6	4.20	320.00	4.69	Poco que serve para uso na pecuaria e domestico
77-P	18-Nov	GARARU	POV. JIBOIA	COHIDRO P. M. G.	66.00	11314	3.60	22.70	2,649.4	9°57,884'	37°10,944'	78	60.00	11.90	0.30	31.6	1.43	740.00	9.15	Poco sendo recuperado pela Cohidro fase final
80-P	18-Nov	GARARU	POV. QUEIMADAS	MIGUEL DA MANTEIGA						9°58,003'	37°09,680'	135	60.00	1.85	0.30					Poco catavento quebrado impossivel pegar agua para analise
41-P	3-Nov	GENERAL MAYNARD	POV. PEDRO GONCALVES	CVRD						10° 42,085'	36° 38,701'	156	60.00	9.23	0.77	30.9	1.05	61.70	3.52	Poco para o consumo da Populacao
79-P	18-Nov	GRACHO CARDOSO	POV. JUAZEIRO	COHIDRO P. M. G. C.	55.00	3600	28.00	43.00	2,906.0	10° 14,050'	37°15,172'	162	60.00	5.50	0.40	27.9	4.40	990.00	4.73	Poco funcionando serve agua no povoado e fazendas vizinhas
01-P	4-Nov	INDIAROBA	FAZ. DR. LEANDRO	DESO						11° 30,546'	37° 31,639'	0	60.00	+0.60	0.70	35.2	6.61	116.40	7.47	Poco abandonado
50-P	6-Nov	ITABAIANA	ITABAIANA	DESO						10° 42,028'	37° 25,710'	159	60.00	+0.04	0.66	27.5	5.67	141.40	2.91	Poco ainda tamponado, pronto para uso
78-P	18-Nov	ITABY	POV. NEGRAS	MANOEL DE ZEQUINHA	31.00	1200	4.00	10.00	13,541.6	10° 05,182'	37°07,712'	162	60.00	4.21	0.39					Poco parado tamponado
10-P	20-Nov	ITAPORANGA	CAMACARI MIRIM	P.M. ITAPORANGA	60.00	13,200	0.85	15.97		10° 58,810'	37° 21,217'	39	60.00		0.74	28.9	4.54	17.00	4.30	Funcionando
11-P	9-Nov	ITAPORANGA	PORTO SAO PAULO	GILTON C. PEIXOTO	84.00	880	3.20	45.80		11° 02,856'	37° 21,942'	30	70.00	2.06	0.54	27.5	4.19	40.00	2.61	Sem utilizacao atual
40-P	17-Nov	JAPARATUBA	POV. SAPUCAIA	JARDIM ENCANTADO P. M. P.	30.00	976	9.70	21.83	77.2	10° 36,625'	36°54,115'	230	69.00	9.66	0.64					Poco que abastece todo povoado reservatorio 10 mil ligado 9 horas da populacao 1.000 pessoas
40-P	17-Nov	JAPARATUBA	POV. SAPUCAI	ESC. MUN. ERIBALDO VIEIRA	60.00	978	13.60	45.80	81.2	10° 36,645'	36°54,261'	186			1.00					Poco parado
62-P	17-Nov	JAPOATA	PLATO NEOPOLIS SAO FRANCISCO CITRUS	JOSE FRANCISCO B. ELIAS						10° 22,597'	36° 44,688'	90	96.00	47.00	1.00	30.6	4.47	16.50	4.04	Poco que serve para engenho de mandioca e outros
	17-Nov	JAPOATA	POV. LADEIRAS	DESO P. M. J.						10° 24,597'	36° 45,610'	610	120.00	49.62	0.68					Poco tamponado pronto pra jogar na rede que vai abastecer o povoado impossivel pegar agua para analise muito fundo
61-P	17-Nov	JAPOATA	POV. TATU	COHIDRO P. M. J.						10° 21,977'	36°45,476'	87	59.00	15.40	0.75	34.2	4.17	39.00	3.60	Poco que abastece o povoado
27-P	20-Nov	LAGARTO	CRUZEIRO VERDE	GILBERTO						10° 55,926'	37° 41,167'	189	60.00	0.98	0.72	31.4	3.21	72.20	3.57	Poco da DESO, sem uso
28-P	20-Nov	LAGARTO	POV. SOBRADO	COHIDRO P. M. L.	60.00	1200	18.00	50.00	322.4	10°57,455'	37°37,702'	354	55.00	4.00	0.30	28.6	3.71	81.70	2.13	Poco tamponado para servir o povoado
27-P	20-Nov	LAGARTO	POV. PE DE SERRA	DESO P. M. L.						10°57,390'	37°35,935'	54	30.00	3.86	0.54	27.6	5.22	45.40	2.10	Poco tamponado para ser jogado na rede que serve Lagarto
36-P	20-Nov	LAGARTO	POV. PE DE SERRA	DESO						10°57,196'	37°35,882'	174	31.00		0.94	27.9	3.84	32.70	3.32	Poco tamponado para servir Lagarto
24-P	5-Nov	LARANJEIRAS	POV. VARZEA	P. M. LARANJEIRAS	60.00	22,000	3.60	5.50	576.8	10° 48,585'	37° 08,546'	0	60.00	2.11	0.19	29.4	1.56	55.70	4.95	Poco que abastece 400 habitantes
52-P	6-Nov	MACAMBIRA	MACAMBIRA CASA DE FARINHA	P.M. MACAMBIRA						10° 40,736'	37° 31,970'	312	60.00	9.15	0.19	28.6	3.50	285.70	4.84	Mediacao com o poco em funcionamento
64-P	17-Nov	MALHADA DOS BOIS	POV. CRUZ DA DONZELA	ALTAMIRO						10° 22,917'	36° 54,841'	126	60.00	6.18	0.32	28.7	6.63	13.10	6.03	Poco cavado pela Cohidro para o povoado, contudo foi abandonado com chegada de agua do Sao francisco
48-P	12-Nov	MALHADOR	POV. ESTEVAO	JOSE DOS SANTOS						10° 39,251'	37° 19,369'	300	60.00	0.15	0.35	29.6	4.18	20.00	2.22	Poco parado
41-P	3-Nov	MARUIM	POV. RODAGEM	BETO						10° 44,910'	37° 05,605'	141	60.00	6.10	0.57	29.2	2.77	62.40	4.43	Poco da Hidroacio para uma populacao de 150 familias
49-P	12-Nov	MOITA BONITA	MOITA BONITA							10° 34,775'	37° 21,132'	393	40.00	4.00	0.30	32.5	4.65	40.00	4.73	Poco que serve ao campo de futebol
	5-Nov	MURIBECA	MURIBECA	DESO						10° 26,657'	36° 57,289'	69	120.00	9.30	0.85	29.9	4.12	23.40	4.19	Poco que abastece a cidade de Muribeca
70-P	13-Nov	N.S. APARECIDA	LAGOA DO CROAR	DERIVALDO	50.00	220	7.70	39.35	1,536.4	10° 21,923'	37° 30,964'	270	60.00	3.19	0.96	33.6	9.73	400.00	3.09	Parado com Catavento
77-P	19-Nov	N.S. DE LOURDES	POV. PORCOES							10°05,390'	37°00,685'	132	61.00		0.10					Poco entupado impossivel pegar agua para analise
23-P	3-Nov	N.S. DO SOCORRO	N. S. DO SOCORRO	DESO						10° 51,675'	37° 07,753'	45	80.00	3.64	0.36	31.2	3.25	170.40	6.73	Novo poco construido devido ao desmoronamento dos filtros do antigo
81-P	19-Nov	N.S. GLORIA	POV. BAIXA LIMPA/BAIXA DO COXO	MARIA SILVA DOS SANTOS	84.00	1,158	19.40	59.73	24,625.2	10° 12,173'	37° 29,316'	162	60.00		0.49					Catavento
66-P	5-Nov	N.S.DORES	EMBRAPA	EMBRAPA						10° 27,915'	37° 11,828'	237	60.00	27.50	0.60	26.1	3.38	22.70	7.96	Poco taponado parado
60-P	19-Nov	NEOPOLIS	NEOPOLIS	DESO						10° 19,577'	36° 34,761'	81	60.00	1.49	0.41	29.2	1.27	48.00	0.27	Poco tamponado para ser jogado na rede que abastece Neopolis
59-P	19-Nov	PACATUBA	POV. ESTIVA DO RAPOUSO	DESO P. M. P.						10° 26,543'	36° 39,650'	0	60.00	2.01	0.52	32.3	3.57	10.30	5.65	Abastecer a populacao do povoado
58-P	19-Nov	PACATUBA	PACATUBA	DESO P. M. P.						10° 27,863'	36° 38,416'	102	70.00	4.96	0.64	29.6	3.79	12.80	4.65	Atender a populacao da cidade
	13-Nov	PEDRA MOLE	TAPADO I	P. M. PEDRA MOLE	60.00	2,640	11.20	21.60	493.6	10° 36,160'	37° 42,448'	243	60.00	4.30	0.50	31.1	2.79	160.00	15.92	Funcionando
56-P	13-Nov	PEDRA MOLE	POV. GRAVATA	MILTON BATISTA	64.00	9,428	23.40	24.36	1,457.2	10° 33,553'	37° 39,631'	384	61.00	45.74	0.46	26.4	2.91	680.00	3.13	
15-P	9-Nov	PEDRINHAS	POV. MATO GROSSO/E. M. TEREZA M. DA SILVA	RAIMUNDO A'VILA						11° 13,375'	37° 41,040'	171	60.00	1.83	0.17	30.6	4.40	130.00	6.22	
56-P	13-Nov	PINHAO	FAZ. NELSON PINTO	NELSON PINTO	60.00	13,200	16.60	17.60	4,513.2	10° 34,294'	37° 44,390'	334	60.00	31.05	0.15	29.8	0.40	760.00	10.30	
37-P	17-Nov	PIRAMBU	POV. BAIXA GRANDE	COHIDRO P. M. P	116.00	4400	64.00	65.85	75.6	10° 37,552'	36°49,358'	48	120.00	62.46	0.64	29.6	4.64	6.80	4.17	Serve a toda populacao do povoado 2 chafarizes mais ou menos 2 mil pessoas
93-P	11-Nov	POCO REDONDO	BARRA DA ONCA	COHIDRO P. M. P. R. ANTONIO DOS SANTOS						9° 50,777'	37° 36,286'	213	60.00	5.00	0.84	31.7	4.64	150.00	2.64	
35-P	10-Nov	POCO VERDE	POV. SITIO DOS ANJOS	P. M. P. V.						10° 45,570'	37° 59,983'	340	60.00	9.37	0.63	29.7	4.68	170.00	4.21	Abastece 500 pessoas
36-P	10-Nov	POCO VERDE	POV. TABULEIRINHO	P. M. P. V.	52.00	10,000	15.00	44.00	1,314.8	10° 45,214'	38° 01,897'	396	70.00	12.57	0.63	29.4	5.31	230.00	2.62	Poco que vai servir ao club e populacao
	10-Nov	POCO VERDE	FAZ. MOCO	GERVASIO RABELO SANTANA						10° 45,362'	38° 00,680'	313	60.00	6.38	0.46	31.1	5.53	90.00	6.70	Uso domestico, irrigacao e pecuaria
89-P	18-Nov	PORTO DA FOLHA	POV. LAGOA DO RANCHO		55.00	1500	25.00	40.00		9°58,975'	37°26,062'	213	60.00		0.30					Poco entupido agua salgada ja existe agua encanada que vem do Sao Francisco por isso esta abandonado
90-P	18-Nov	PORTO DA FOLHA	FAZ. PARAISO JUNCO I	HELDER	60.00	1189	13.54	44.15	2,411.6	9°57,012'	37°14,726'	18	60.00	27.65	0.40	33.3	0.38	55.80	7.93	Poco funcionando para consumo da fazenda
91-P	18-Nov	PORTO DA FOLHA	POV. JUNCO II							9°57,462'	37°14,236'	117	60.00		0.30					Poco com problema no catavento
74-P	19-Nov	PROPRIA	POV. SAO MIGUEL							10° 16,638'	36° 47,923'		63.00	8.05	0.35	33.4	4.65	124.70	4.24	Poco que serve ao pov. mais ou menos 1.000 habitantes
16-P	9-Nov	RIACHAO DOS DANTAS	POV. CAMPESTRE	COHIDRO P.M.R.D.						11° 09,996'	37° 41,863'	495	63.00	6.85	0.35	33.7	5.01	80.00	4.60	
43-P	12-Nov	RIACHUELO	POV. BOMFIM							10° 42,230'	37° 11,355'		30.00	10.83	0.57	26.1	6.13	50.00	1.75	Reservatorio que abastece 1000 habitantes
53-P	6-Nov	RIBEIROPOLIS	CAMPO DE FUTEBOL	P.M. RIBEIROPOLIS						10° 32,050'	37° 26,287'	531	60.00	15.75	0.25	28.9	4.86	102.70	2.10	Poco da Hidroacio para a DESO
42-P	3-Nov	ROSARIO DO CATETE	FAZ. MARRECAS	JOSE ROBERTO						10° 41,504'	37° 00,836'	63	60.00	4.33	0.10	26.7	0.47	80.40	6.03	Para uso na pecuaria e domestico
68-P	12-Nov	S.M. DO ALEIXO	CAENDAS II							10° 24,622'	37° 24,397'	342	60.00	+0.12	0.29	33.9	3.27	30.00	4.34	
68-P	12-Nov	S.M. DO ALEIXO	MALHADAS DOS NEGROS							10° 25,525'	37° 23,227'	264	60.00	0.10	0.30	37.7	0.95	30.00	3.94	
13-P	9-Nov	SALGADO	POCO Nº7	DESO						11° 01,983'	37° 28,897'	72		0.18	0.11	29.1	5.09	60.00	4.40	Sem utilizacao atual
09-P	3-Nov	SAO CRISTOVAO	POV. PINTOS	EDUARDO						10° 59,191'	37° 13,112'	0	34.22	1.92	0.78	28.8	0.82	13.30	6.35	Ligado uma vez na semana
	18-Nov	SAO FRANCISCO	SAO FRANCISCO	POCO DESO						10° 21,272'	36° 53,667'	26	60.00	1.33	0.82	28.3	3.42	1.84	5.41	Poco da Deso que abastece a cidade de Sao Francisco
52-P	10-Nov	SIMAO DIAS	CORACAO DE MARIA / PAU DE COLHER	OSVALDO	80.00	102	10.00	62.90		10° 46,348'	37° 52,513'	279	60.00	7.97	0.53	29.5	4.76	250.00	2.74	Poco sem utilizacao
35-P	10-Nov	SIMAO DIAS	POV. SAO DOMINGOS							10° 47,042'	37° 54,270'	327	60.00	17.47	0.53	32.9	0.21	390.00	8.09	Uso domestico e na agricultura
45-P	5-Nov	SIRIRI	POV. PIRANHAS	JOSE OLIVEIRA						10° 37,515'	37° 05,432'	138	60.00	3.72	0.50	28.2	4.15	4.55	1.92	Poco taponado parado
22-P	20-Nov	SANTO AMARO	POV. SAPE	POCO PETROBRAS PORTO SE						10° 47,731'	36°57,722'	45	60.00	10.10	0.30	30.3	4.73	31.60	2.31	Poco parado tamponado para servir ao porto de Sergipe
02-P	4-Nov	STA LUZIA DO ITANHI	COLONIA PRIAPU	LALU						11° 24,578'	37° 29,418'	0	60.00	0.47	0.53	29.2	4.67	20.80	3.70	Poco temporariamente Tamponado (abastece 92 familias)
19-P	16-Nov	T. BARRETO	POV. BATATA							11° 06,596'	37° 57,505'	297	60.00	14.72	0.58	29.1	5.59	490.00	4.46	Instalado com catavento
06-P	4-Nov	TOMAR DO GERU	POV. BREJINHO	ESC. MUN. JOAO COTIA	40.00	4,200	10.00	23.00		11° 21,602'	37° 49,533'	186	60.00	7.90	0.20	34.0	4.93	33.30	5.18	Poco que abastece a escola
03-P	4-Nov	UMBAUBA	GUARARIEMA	P.M. UMBAUBA	60.00	1,218	14.23	45.30	141.2	11° 24,183'	37° 39,649'	0	60.00	8.25	0.65					Poco Desativado

POCOS RASOS

#	DATA	MUNICIPIO	LOCALIDADE	PROPRIETARIO	LATITUDE	LONGITUDE	ALT. (m)	PROF. (m)	N.E. (m)	BOCA (m)	DIAM. (m)	TEMP. (°C)	pH	COND. (mSm)	O D. (mg/l)	OBSERVACOES
65-R	18-Nov	AQUIDABA	POV. JUREMA	AGNALDO G. DA SILVA	10° 17,907'	37° 03,334'	225	7.91	7.66	0.64	1.20	28.1	5.25	8.00	3.50	Consumo Domestico
04-R	9-Nov	ARAUA	POV. SAPE	JOSE FARIAS DE MENEZES	11° 17,962'	37° 36,028'	150	21 35	11.05	0.65	1.25	27.6	3.91	20.00	6.90	
04-R	9-Nov	ARAUA	POV. BULANDEIRA	JOSE DOMINGOS DOS SANTOS	11° 13,739'	37° 38,648'	357	15.48	11.68	0.52	1.24	27.7	2.80	20.00	2.62	
47-R	6-Nov	AREIA BRANCA	POV. MANILHA D'CIMA	JOSE CARLOS DE ALMEIDA	10° 46,160'	37° 17,319'	132	10.48	8.12	0.52	1.30	27.2	3.98	12.20	4.06	Consumo domestico, irrigacao entre outros
14-R	9-Nov	BOQUIM	AV. JACOMIDIO BARRETO	MARIA JOSEFINA MENDONCA GUIMARAES	11° 08,665'	37° 36,941'	57	17.31	15.31	0.19	1.12	32.1	3.98	50.00	3.87	
46-R	5-Nov	CAPELA	POV.PEDRAS	EDNALDO F. SANTOS	10° 29,280'	37° 06,380'	165	16.35	12.30	0.65	0.65	27.6	4.95	12.3	4.3	Serve para consumo domestico
05-R	4-Nov	CRISTINAPOLIS	CRISTINAPOLIS.	SERGIO MENEZES SANTOS	11° 28,335'	37° 44,831'	27	17.02	11.45	0.78	1.60	27.8	5.08	15.50	0.60	Excelente agua para consumo domestico e irrigacao
	12-Nov	DIVINA PASTORA	ASSENT. FLOR DO MUCURI	EDVAN LEITE SANTOS	10° 42,111'	37° 11,086'	0	5.3	2.8	0.30	1.1	28.5	6.59	20	1.35	Uso Domestico
12-R	4-Nov	ESTANCIA	POV. NOVA ESTANCIA	MARIA DE LURDES SANTOS	11° 10,234'	37° 23,910'	168	8.48	6.38	0.52	1.49	26.9	1.07	25.30	1.22	Consumo domestico
54-R	6-Nov	FREI PAULO	POV. COITE	PEDRO MANOEL SANTANA	10° 33,595'	37° 28,846'	258	46.48	31.48	0.52	0.53	30.6	3.70	26.30	4.15	Excelente agua que serve a populacao
41-R	3-Nov	GENERAL MAYNARD	POV. SITIO PALMEIRA	ROSA NUNES	10° 41,942'	36° 58,915'	0	3.23	1.33	0.77	0.80	28.4	0.02	30.00	2.75	Usado por uma chacara
01-R	4-Nov	INDIAROBA	INDIAROBA	CLAUDIO RESTAURANTE	11° 31,110'	37° 30,751'	27	2.48	2.28	0.42	0.89	31.5	2.26	74.30	3.96	Consumo domestico
07-R	16-Nov	ITABAIANINHA	R. TOBIAS BARRETO	JULIA Mª DE JESUS	11° 16,329'	37° 47,953'	189	5.18	1.26	0.67	1.16	28.6	5.46	40.00	8.40	
11-R	9-Nov	ITAPORANGA	POV. TABOCAS	JOSE SILVA	11° 02,799'	37° 21,871'	273	3.16	1.86	0.44	1.22	27.1	4.62	20.00	0.68	
10-R	20-Nov	ITAPORANGA	POV. SALVADOR	JOSE DAS VIRGENS	10° 59,987'	37° 19,873'	36	7.15	8.63	0.52	1.10	28.5	4.82	16.40	5.05	
40-R	17-Nov	JAPARATUBA	POV. SAPUCAIA	REGINALDO DANTAS	10° 36,613'	36° 54,022'	78	14.70	12.85	0.15	1.20	28.6	3.67	6.60	4.33	Consumo Domestico excelente agua
61-R	17-Nov	JAPOATA	POV. LADEIRAS	ADALBERTO DE JESUS	10° 24,589'	36° 45,542'	165	14.00	13.01	0.50	1.05	33.6	4.46	17.00	9.03	Consumo Domestico
62-R	17-Nov	JAPOATA	POV. LADEIRAS	ADELAIDE DE ALMEIDA	10° 24,575'	36° 45,572'	39	13.97	13.17	0.53	0.96	35.2	4.65	18.50	3.69	Consumo Domestico
61-R	17-Nov	JAPOATA	POV. TATU	MARIA DO CARMO DE OLIVEIRA	10° 21,575'	36° 45,572'	132	18.76	14.96	0.24	0.52	25.2	3.18	63.60	4.73	Consumo Domestico e vizinhos
24-R	5-Nov	LARANJEIRAS	POV. VARZEA	P.M. LARANJEIRAS	10° 48,593'	37° 08,758'	0	3.32	2.45	0.68	0.69	28.0	3.64	22.20	4.45	Usado pela populacao de 400 habitantes
64-R	17-Nov	MALHADA DOS BOIS	POSTO CAIOBA		10° 23,191'	36° 54,940'	186	15.40	2.65	0.30	1.50	31.0	4.73	39.90	3.15	Consumo do Posto
66-R	5-Nov	N. S. DAS DORES	N. S. DAS DORES	ARNALDO SOUZA LEITE	10° 28,321'	37° 11,592'	210	30.93	27.83	0.37	1.10	33.8	0.80	26.80	3.92	Consumo Domestico
23-R	3-Nov	N. S. DO SOCORRO	POV. BOA NOVA	JOSE PEDRO DOS SANTOS	10° 52,002'	37° 07,572'	0	7.68	1.02	0.32	0.80	27.5	1.70	88.60	2.81	Usado para irrigacao e uso domestico
60-R	19-Nov	NEOPOLIS	NEOPOLIS	JOSE DA SILVA	10° 19,788'	36° 34,915'	42	1.16	0.63	0.17	1.50	31.0	3.92	19.60	5.61	Consumo Domestico
15-R	9-Nov	PEDRINHAS	POV. BELA VISTA	JOSEFA Mª DE JESUS	11° 12,582'	37° 40,306'	204	24.28	20.68	0.72	1.30	27.7	2.10	30.00	4.55	
16-R	9-Nov	RIACHAO DO DANTAS	POV. CAMPESTRE	ANTONIO RODRIGUES DA COSTA	11° 09,900'	37° 41,879'	6	9.25	8.35	0.65	1.06	27.2	4.83	50.00	0.38	
13-R	9-Nov	SALGADO	POV. TURMA	JORGE ADELSON DE O. SANTANA	11° 02,342'	37° 28,983'	33	15.05	8.72	0.78	1.04	29.6	0.35	40.00	4.67	
02-R	4-Nov	SANTA LUZIA DO ITANHY	COLONIA PRIAPU	MUNDINHO	11° 24,564'	37° 29,463'	0	2.82	1.02	0.88	1.35	26.8	0.123	1.92	6.48	Uso Domestico
09-R	3-Nov	SAO CRISTOVAO	POV. PINTOS	EDUARDO	10° 59,239'	37° 13,136'	0	3.79	1.79	0.21	1.68	28.8	3.32	22.70	9.15	Excelente agua que serve para consumo domestico
45-R	5-Nov	SIRIRI	POV. PIRANHAS	ANTONIO OLIVEIRA SANTOS	10° 37,520'	37° 05,424'	310	7.61	3.21	0.39	1.95	28.7	0.36	12.70	2.10	Atualmente em uso
06-R	4-Nov	TOMAR DO GERU	POV. BREJINHO	MARIA JUVENAL SANTOS	11° 23,584'	37° 49,522'	123	13.39	8.69	0.81	0.93	27.4	5.15	25.60	2.86	Excelente agua para consumo domestico e irrigacao
03-R	4-Nov	UMBAUBA	POV. GUARAREMA	MANOEL CARDOSO DA SILVA	11° 24,219'	37° 39,616'	201	15.42	11.72	0.58	1.14	27.8	4.65	13.20	7.95	Serve a comunidade