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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTERIO DE EDUCACION Y CULTO
ADMINISTRACION NACIONAL DE TELECOMUNICACIONES
REPUBLICA DEL PARAGUAY

# STUDY ON THE ESTABLISHMENT OF EDUCATIONAL TELEVISION BROADCASTING NETWORK IN THE REPUBLIC OF PARAGUAY

# FINAL REPORT
# SUPPORTING REPORT

SEPTEMBER 1993

NHK Integrated Technology Inc.
in association with
Yachiyo Engineering Co., Ltd.

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# 1. TV receiverś typical performance of PAL-N system (Related to M/R II -4.2)

Table 1.1 TV receiver's typical performance of PAL-N system

| Item | Performance | |
|---|---|---|
| | Delux type | Portable type |
| 1. Intermediate Frequency (IF)<br>Vision<br>Sound | 45.75 MHz<br>41.25 MHz | |
| 2. Noise limiting sensitivity<br>VHF<br>UHF | Less than 45 dB<br>Less than 5.17 dB | Less than 45 dB<br>Less than 48 dB |
| 3. Attenuation of lower adjacent channel | More than 33 dB | More than 35 dB |
| 4. Attenuation of upper adjacent channel | More than 12 dB | More than 40 dB |
| 5. Suppression ratio of image interference<br>VHF<br>UHF | More than 60 dB<br>More than 45 dB | More than 45 dB<br>More than 40 dB |
| 6. Suppression ratio of IF interference | More than 60 dB | More than 50 dB |
| 7. Intermodulation interference U=88 dBu | Interference shall not be observed | No data |
| 8. Crossmodulation interference U=88 dBu | Ditto | No data |
| 9. IF beat interference U=88 dBu | Ditto | No data |
| 10. Spurious radiation from local oscillator<br>VHF low band<br>VHF high band<br>UHF band | Less than 54 dBu/m<br>Less than 64 dBu/m<br>Less than 65 dBu/m | Less than 57 dBu/m<br>No data<br>No data |
| 11. Maximum sensitivity<br>VHF<br>UHF | Less than 25 dBu/m<br>Less than 30 dBu/m | Less than 30 dBu/m<br>Less than 30 dBu/m |
| 12. Video output S/N at the input level of noise limiting sensitivity plus 20 dB | More than 40 dB | No data |
| 13. Sound output S/N at the input level of maximum sensitivity | More than 40 dB | No data |

# 2. Site selection for Asuncion station
# (Related to M/R II-5.1)

## 2 Site selection for Asuncion station

### 2.1 Selecting Conditions

In selecting the site, sufficient consideration should be given to the following points.

(1) Educational television broadcasts will occupy a crucial position as a educational method, so the center should be easily accessible by the education ministry and related agencies.

(2) A large number of teachers and students will visit the broadcast center to help with program production, participate in programs, and for observation, so a convenient site with good access routes where people, cars, and things can easily and smoothly move in and out, should be chosen.

(3) A location with the infrastructure (electricity power, telephone service, city water, sewers) already in place.

(4) When future additional construction is considered, a site with room for planned expansions.

(5) The direction of the antenna for the TV receivers in common with the two existing private television stations.

(6) Since the higher the transmitting antenna, the broader the coverage area, an elevated location would be best.

## 2.2 Survey Results of the 4 Sites

### (1) Site 1 (The Site Map is shown in Figure 2.2.1)

Located 3 km south of Luque, a suburb 15 km east of Asuncion, on a wide expanse of ANTELCO land, situated on one corner of the south edge of the Institute of Communications and Technology (I.P.T.), which is now under construction. It is approximately 250 meters from north to south and approximately 210 meters from east to west, an area of about 5.25 ha. It is a grassy plain with a slope toward the west.

On the eastern edge of this ANTELCO site, there are a large number of short wave receivers and radio monitoring facility antennas.

The elevation of this site is 120 meters, which is fairly high, but the Asuncion International Airport is only 6.5 km away. There would be conflict with ICAO (International Civil Aviation Organization) regulations restricting the height of buildings and structures in a vicinity of an airport.

The top soil for the upper 5 to 6 meters in this area is red clay, which cannot be counted on to support much of a load. The bedrock beneath this layer can support 7 to 8 $t/m^2$, so it would have to be used as the supporting layer.

For electric power there is a large scale transformer nearby, and it would be no problem to bring it all the way to ANTELCO.

For water, well water would be used. There is well water at a depth of around 80m below ground level. This underground water will be processed through a purification tank.

Figure 2.2.1 Plan of Site-1 (Luque)

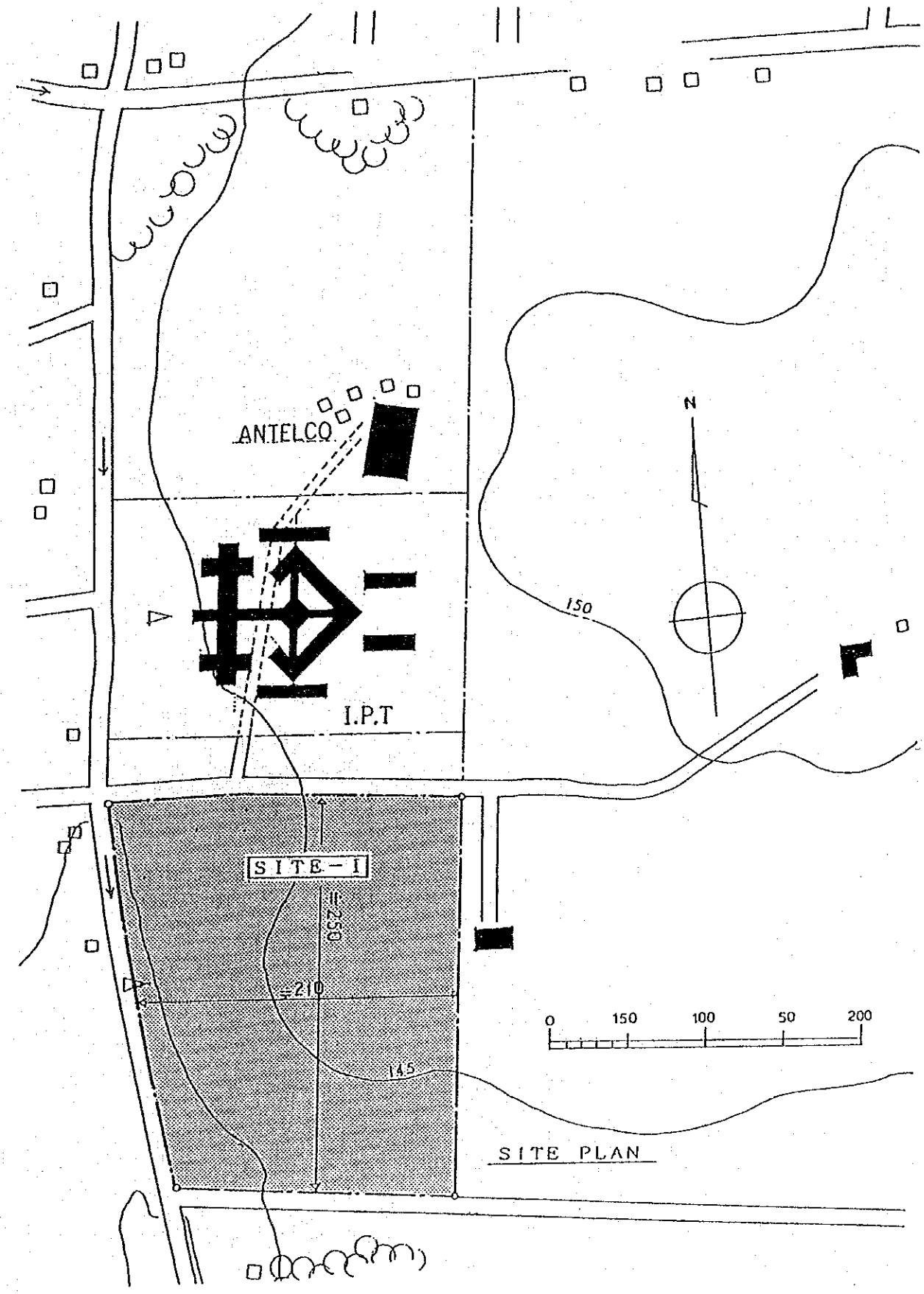


Figure 2.2.2 Detailed Map of Site-1

(2) Site 2 (The site map is shown in Figure 2.2.3, Figure 2.2.4 and Figure 2.2.5)

This site is used by the National Sports Council and approximately in the center of this city. It is one part of the northern section of the area being used for the soccer field of the national physical education university (Escuera Nacional de Educacion Fisica). The Field is elongated north to south, about 500 meters long and 100-150 meters wide. The area proposed for this project extends from the northern edge for about 150 meters to the south. The western edge of the tract of land extends into the national physical education school, and connects with a road that leads to the school for high school teachers. It shares its northern and eastern borders with this school. Eusebio Ajala Avenue (Avenida Eusebio Ayala) runs along the northern side. A gate has been built as an exit to this street.

However, the tract of land does not actually border on the avenue, but is recessed about 50 to 70 meters. There are a large number of building supply and automobile related stores along the avenue, so that it would be a convenient location of securing Supplies and materials.

Within the proposed tract, the ground surface is somewhat low so that measures to drain the accumulated water would be necessary. Overall this location has an elevation of nearly 150 meters, one of the highest sites in Asuncion. As a site for an educational TV station, there would be no problem with accessibility since it is in the middle of the city.

In addition, it would be a very convenient location since it would be a part of an educator's cultivation institute along with the teachers' school and lecture halls. The area is large enough for the station grounds, and a fairly spacious parking lot could be included. However, the proposed 160 meter-high steel support tower does not stay entirely in the tract of land but a part of its anchor extends out of the site. It would thus straddle one of the roads, and a part of the anchor would have to be built beside the track field ground.

As fa as the soil base, according to this study, it is necessary to make borings in three locations. However, according to expert information, the surface soil is red clay mixed with sand with a load bearing capacity on the order of 5 $t/m^2$. This layer varies somewhat, so we can't make a blanket statement, but it probably is six meters or so at the deepest points. Underneath is a bedrock layer capable of supporting 30 to 40 $t/m^2$.

**Figure 2.2.3 Detailed Map of Site-2, 3**

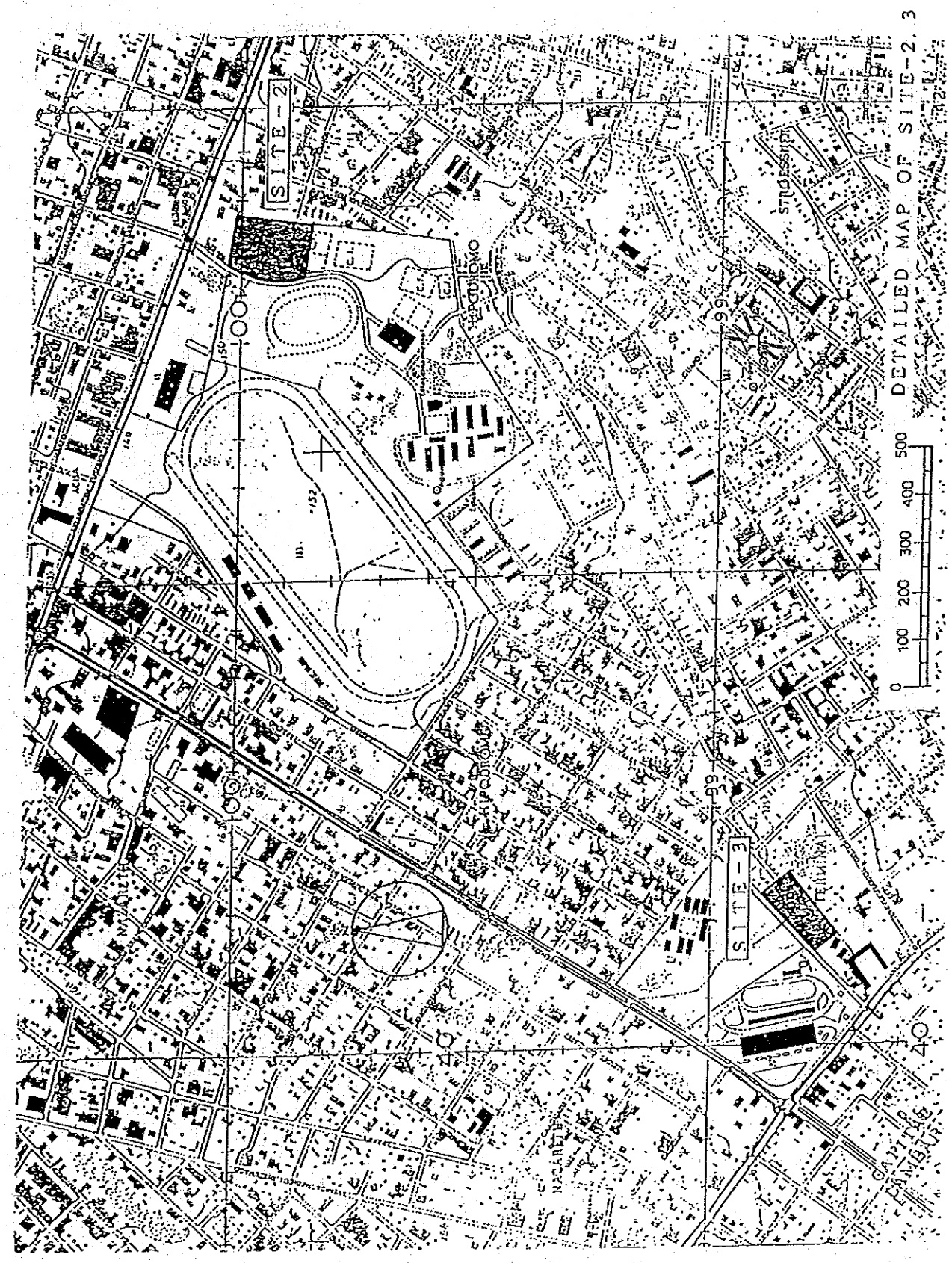
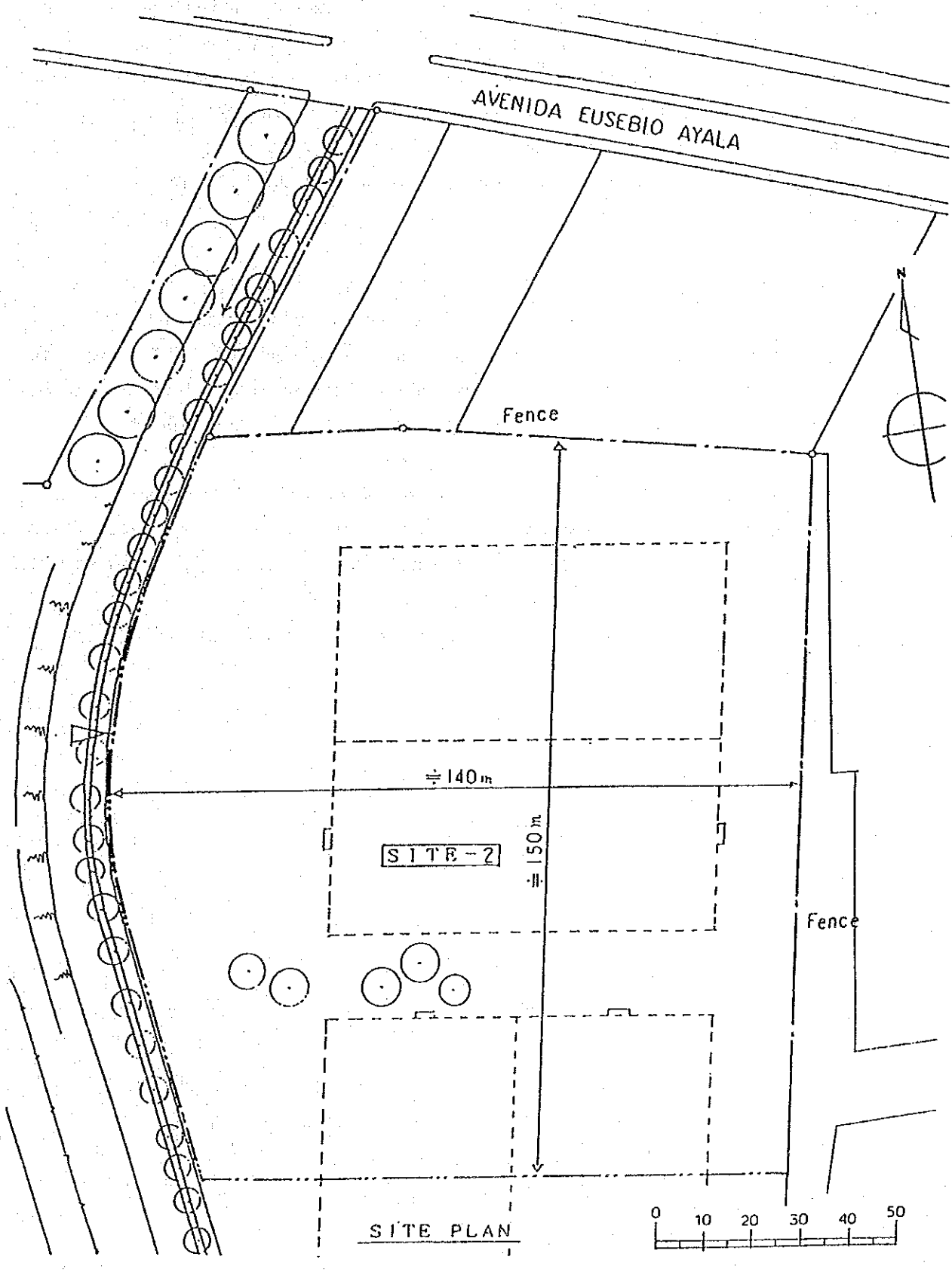


Figure 2.2.4 Map on Campus of ISE and Escuela Nacional de Educ. Fisica

**Figure 2.2.5 Plan of Site-2 (Asuncion)**



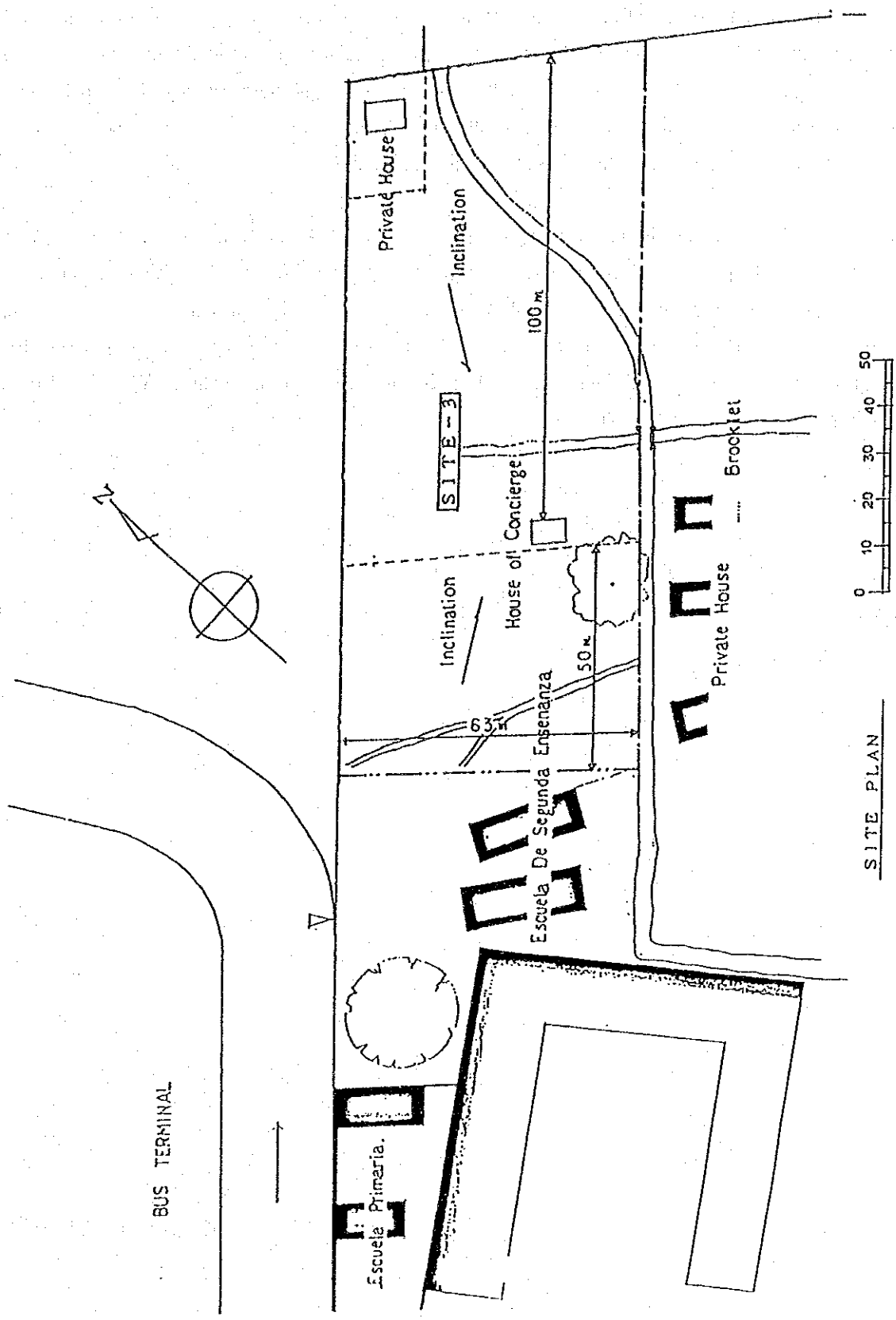
(3) Site 3 (The site map is shown in Figure 2.2.6)

This site is located about 2 km south west of Site 1. This land belongs to the Education Ministry and is being used as an elementary school to the right of a bus terminal. It faces on Fernando de la Mora Avenue (Avenida Fernando de la Mora). Behind the elementary school are two junior high schools, so the rear portion could potentially be used as well. It is about 60 meters wide and over 150 meters deep, but the central part is low and is crossed by a drianage ditch, There is a private bridge built across the ditch. At present there are two squatters' houses on the site, but we are told that eviction is possible.

Access would be a problem since the land is off the main road, and entry would have to be through the one-way street used exclusively by bus terminal busses or by a back street which (exits out to the main street after about 500 meters). Furthermore, the tract of land is not very wide so that it would of course be too narrow not only for the steel support tower, but even as land for the buildings.

The elevation is 135m, relatively low compared with the other sites. The base soil is thought to be the same as site 2, but a river (Arroyo Lambare) flows approximately 800 meters from the southern boundary. The soil condition up to about four hundred meters from the southern boundary is extremely poor. This layer extends to approximately 180meters below the surface, so that caution is required.

**Figure 2.2.6 Plan of Site-3 (Asuncion)**



(4) Site 4 (The site map is shown in Figure 2.2.7 and Figure 2.2.8)

This is a tract of land planned to be used as a school athletic ground located in the suburb of San Lorenzo on the eastern side of Asuncion. The potential area is 170 meters north to south and 100m easter to west. A gymnasium is being built on the eastern side of the proposed site, and there is an elevated water tank and school grounds on the northern side. Overall the land is flat.

San Lorenzo is about 13km from the center of Asuncion, so is a little too far. In addition, the tract of land is not wide enough for the steel support tower. The elevation is 140 meters. The top soil (red clay mixed with sand) in the vicinity of San Lorenzo is quite deep, usually around 12 meters. Underneath is a gravel layer (pebbles mixed with sand) with a load bearing capacity of 30 $t/m^2$. The top soil can support no more than 0.5 $t/m^2$.

**Figure 2.2.7 Detailed Map of Site-4**

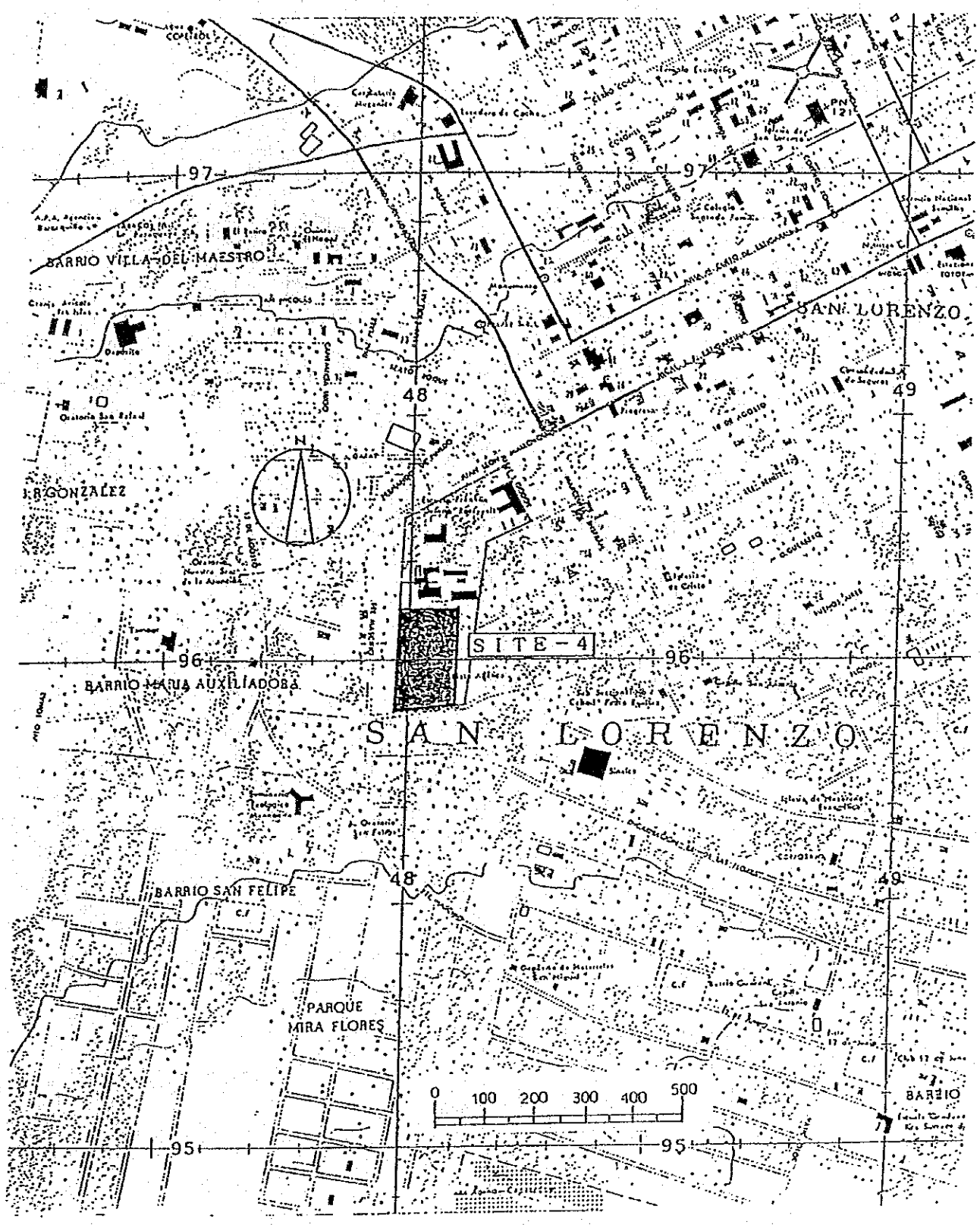
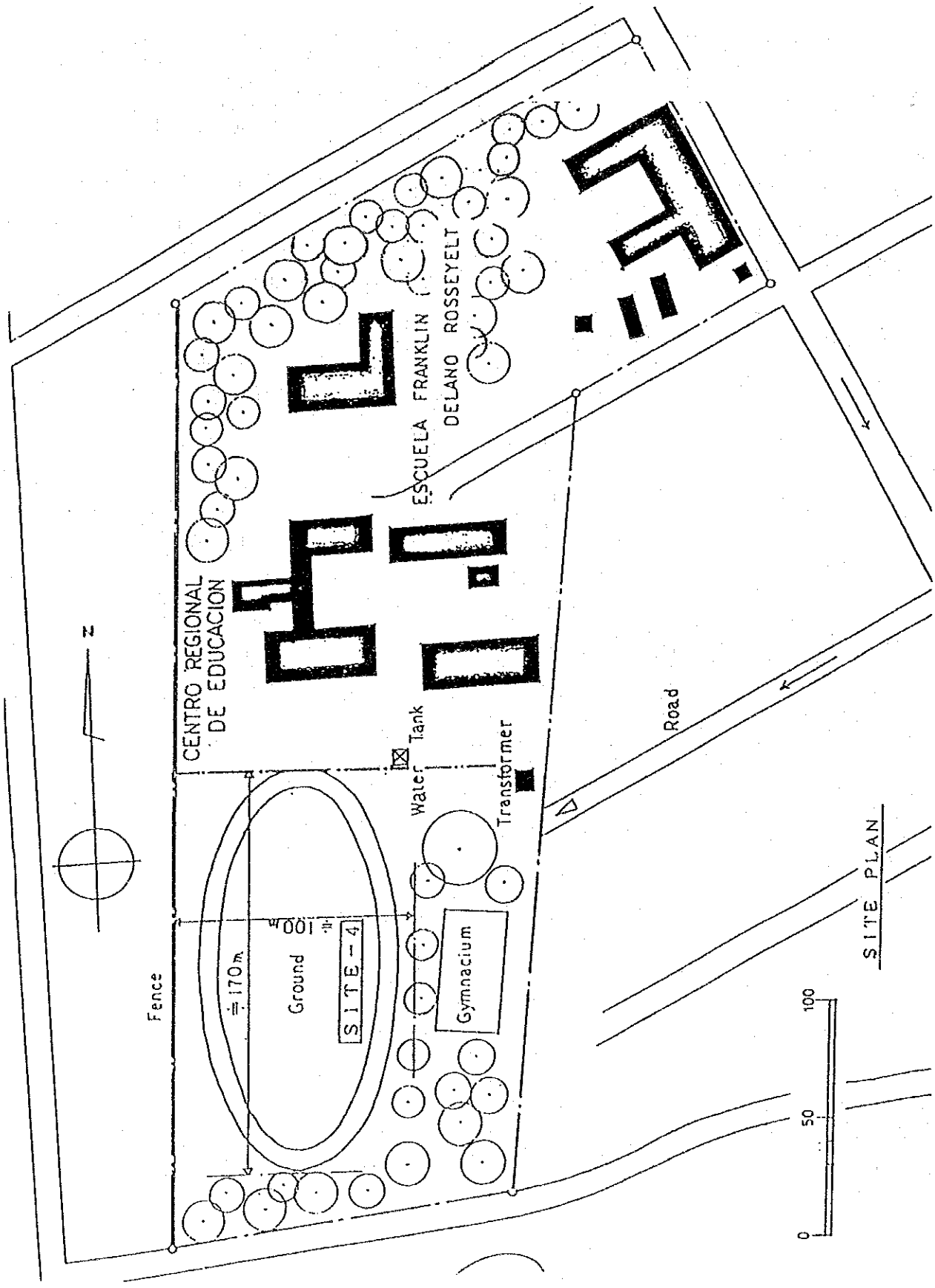


Figure 2.2.8 Plan of Site-4 (San lorenzo)



3. ANTELCO's opinion concerning site selection of Asuncion station (Related to M/R II -5.1)

## 3. ANTELCO's Opinion Concerning Site Selection of Asuncion Station

ANALISIS DE DATOS TECNICOS PARA LA DETERMINACION DEL SITIO DE LA PLANTA TRANSMISORA PARA TV EDUCATIVA

| PUNTOS ANALIZADOS | L.S.E. | L.P.T. | OBSERVACION |
|---|---|---|---|
| 1. Diferencia de cota entre la cota del sitio y un radio de 3 a 15 km. | Ganancia de altura 33 m. | Ganancia de altura 5 m. | No podemos considerarlo como un factor gravitante ya que la diferencia entre ambos es de 28 m. y se puede afirmar que el marco de error en las cartas topográficas del I.G.M. es de 15 a 20 m. |
| 2. Ganancia de altura convertida en potencia | 1, 45 veces | 1, 032 veces | Por la consideración anterior, la ganancia de potencia pueden ser comparables en un caso o hasta duplicar los valores mostrados, por lo tanto es un dato que no puede ser tomado como absoluto y solo un estudio mas preciso (que no es necesario) podría dar un valor cercano a la realidad. Estos valores son normalmente comprobados solo en la práctica |
| 3. Altura de torre necesario | 180 m. | 190 m. | |
| 4. Profundidad a la parte firme del suelo y capacidad portante del suelo | 4 ~ 6 m.<br>30 ~ 40 ton /m2 | 6 ~ 7 m.<br>20 ton/m2 | En cuanto a la profundidad hasta la parte firme no hay diferencias ya que ambos pueden llegar a los 6 mts.<br>La capacidad portante del suelo en ambos casos es mucho mayor que lo requerido para este tipo de estructuras |
| 5. Infraestructura social | Posee servicio de agua corriente y desague cloacal | No posee servicio de agua corriente y desague cloacal | Aunque la zona del L.P.T. no posee servicio de agua corriente, el predio de L.P.T. cuenta ya actualmente con provisión de agua tratada. El problema de desague cloacal está solucionado. Estos dos factores no incidirán en el costo del proyecto ya que son obras que deberán ser encarados por la CORPOSANA en el marco de sus proyectos de ampliación totalmente independiente de si la planta transmisora esté o no ubicada en ese lugar |
| 6. Costo de construcción de torre | 1 | 1, 5 | Aunque el porcentaje del 50 % o más para una diferencia de 30 m. es un poco sobredimensionada, la incidencia de este sobrecosto no sería un monto importante para tenerlo en cuenta |
| 7. Terreno disponible | 20.000 m2 | 52.000 m2 | La mayor disponibilidad del terreno del L.P.T., abre múltiples posibilidades para el desarrollo de futuros proyectos |
| 8. Máxima altura de torre permitida por DINAC. por obstruccion a aparatos aéreos | | 90 m. | |

ANALISIS DE DATOS TECNICOS PARA LA DETERMINACION DEL SITIO DE LA PLANTA TRANSMISORA PARA TV EDUCATIVA

| PUNTOS ANALIZADOS | L.S.E. | L.P.T. | OBSERVACION |
|---|---|---|---|
| 10. Facilidades para el mantenimiento | No posee infraestructura para el mantenimiento | Posee toda la infraestructura necesaria para el mantenimiento del sistema tanto en Recursos Humanos como en Recursos Técnicos (Instrumentos, adaptadores, conectores, etc.) | |
| 11. Facilidades de acceso | A pesar de los medios de transporte existentes, el exceso de tráfico dificulta su acceso, especialmente para los vehículos que transitan de Este a Oeste | No tiene dificultad de tránsito. Los caminos de acceso tienden a aumentar y mejorar. En menos de dos años su accesibilidad será mucho mejor que el L.S.E. | |

# 4. Results of site survey on broadcasting network (Related to M/R II -5.1)

## 4 Result of site survey on broadcasting network

The survey team composed of Japanese and Paraguayan engineers was organized in two groups and conducted the survey on 30 sites. Following tables show survey itinerary, survey points and instruments used for survey.

### 4.1 Survey itinerary

Each group conducted site survey respectively as shown below.

Table 4.1.1 Survey Itinerary

| Period | Group A | Group B |
|---|---|---|
| 9/12 - 12/12 | S. J. Bautista | Villarrica |
| 14/12 - 18/12 | Mcal. Estigarribia | Encarnacion |
| 20/12 - 24/12 | Paraguari | Ciudad del Este |
| 28/12 - 31/12 | Asuncion | Asuncion |
| 4/1 - 10/1 | Saltos del Guaira | Concepcion |
| | San Pedro | P. J. Caballero |

Table 4.1.2 Survey Points

| | |
|---|---|
| (1) Asunction | (20) S. Ignacio |
| (2) Ciudad de Este | (21) Caapucu |
| (3) Encarnacion | (22) Filadelfia |
| (4) P.J.Caballero | (23) Piribebuy |
| (5) Saltos del Guaira | (24) Yaguaron |
| (6) San Pedro | (25) Humaita |
| (7) M.Estigarriba | (26) Gral. Diaz |
| (8) Villarrica | (27) Curuguaty |
| (9) Pilar | (28) San Estanislao |
| (10) Concepcion | (29) Presid. Franco |
| (11) S.J.Bautista | (30) Cerro Ybyturuzu |
| (12) Paraguari | |

## 4.2 Survey Items

The survey items conducted necessary for broadcasting network planning are as follows:

(a) Measurement of electric strength (VHF and UHF) of commercial TV stations;

(b) Measurement of latitude and longitude of the site surveyed;

(c) Measurement of site space;

(d) Investigation of electric power condition;

(e) Investigation of airport condition;

(f) Investigation of transmitting facilities near by commercial TV stations;

(g) Observation of ANTELCO's tower and site condition;

(h) Evaluation of receiving picture of commercial TV;

(i) Collection of information on favorable channels etc. specially in the boarder area.

## 4.3 Survey instrument

Instrument used in the survey are as follows:

(a) Spectrum analyzer and printer
(b) GPS (Global Positioning System) receiver
(c) Portable generator 900W
(d) PAL-N/PAL-B/NTSC TV receiver
(e) Yagi antenna (5 elements)
(f) Dipole antenna
(g) Magnet

## 4.4 Summary of survey result

1) Topographic condition and geographical feature of Paraguay is very suitable for wide coverage of TV transmitting in general. Although some small hills exist in the vast flat field, no significant obstacle for TV radiation can be found.

2) In rural areas most of the people concentrate in regional cities, towns and villages. Few people reside along main road connecting those cities where electric power system available.

3) In isolated villages where power distribution network is not covered considerable number of people receives TV signals using antenna equipped on high mast or tower and car battery as its power source.

4) Measured data of the electromagnetic field intensity by spectrum analyzer will be analyzed further in Japan.

# Data Sheet of Site Survey

Station Name Asuncion

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 25 ° 19 ′ 08 ″<br>W 57 ° 34 ′ 58 ″ |
| 2. | Name of site | I.S.E. Site |
| 3. | Altitude | 165m |
| 4. | Site area | 200m × 150m |
| 5. | Kinds of ground | Flat land.<br>Mixed soil of sand and clay |
| 6. | Owner of site | National Gymnasium Cooperation |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | Yes (No)<br>( ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 23K ) Voltage |
| 11. | CH number and ERP by CP | CH6 40kW |
| 12. | Received field strength (dBμ/m) | |

| CH 2 | CH 7 | CH 9 | CH 10 | CH 11 | CH 13 | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 63.5 Clorinda | 45 Clorinda | 108 Asuncion | 70 Gral Belgrano | 57.6 Formosa | 100.5 Asuncion | | | |

Comments:

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) _____ CH 9 (13)<br>Tx output (kW) 30 (30) Antenna Type _____<br>Nothing. |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | (Yes) No<br>(It is necessary solution with Ministy of defence. ) |
| | (b) Existence of CATV company and its name | (Yes) No<br>(INGETEL S.R.L., T.V.O.S.R.L. ) |
| | (c) Future construction plan of commercial TV station | CH 4 ERP (kW)<br>Tx output (kW) Nothing |

# Data Sheet of Site Survey

Station Name Ciudad del Este

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 25 ° 30 ' 05 "<br>W 54 ° 38 ' 02 " |
| 2. | Name of site | Ciudad del Este city |
| 3. | Altitude | 220m |
| 4. | Site area | 20m x 10m |
| 5. | Kinds of ground | Flat land.<br>Mixed soil of saud and clay |
| 6. | Owner of site | ANTELCO |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 94 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | CH2 5KW |
| 12. | Received field strength (dBμ/m) | |

| CH 3 | CH 4 | CH 5 | CH 8 | CH 10 | CH 12 | CH 21VHF | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 42<br>Cascabal | 59<br>Puerto Iguazu | 65<br>Foz do Iguzu | 108<br>Ciudad del Este | 89<br>Foz do Iguazu | 89<br>Foz do Iguazu | 83 | | |

Comments: As brasil is using CH3, it had better avoid the using of CH2.

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) 25 (5) CH 8 (46)<br>Tx output (kW) 5 (5) Antenna Type _____<br>( ) is another commercial TV station |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>(International airport is under construction. As the airport is far from the city. The height of transmitter tower will not be limitted by ICAO regulation. ) |
| | (b) Existence of CATV company and its name | (Yes) No<br>(MAGU S.R.L. ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name: Encarnacion

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 27 ° 19 ' 05 "<br>W 55 ° 51 ' 05 " |
| 2. | Name of site | Encarnacion city |
| 3. | Altitude | 110m |
| 4. | Site area | 150m x 200m |
| 5. | Kinds of ground | Grass.<br>Mixed soil of sand and clay |
| 6. | Owner of site | Private land. |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 95 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | CH5 40kW |
| 12. | Received field strength (dBμ/m) | |

| CH 7 | CH 9 | CH 12 | CH | CH | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 97 Encarnacion | 67 Encarnacion | 79.8 Posada | | | | | | |

Comments: Encarnacion is the border city with Argentine.

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) 50 (30) CH 7 (9)<br>Tx output (kW) 5 (1) Antenna Type _____<br>( ) is another commercial TV station |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>(An airport is the west of Encarnacion city, but there is to be transferred to the north direction. Location of the new airport is not fixed yet. ) |
| | (b) Existence of CATV company and its name | (Yes) No<br>( ENCARNACION VIDEO CABLE ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name: Villarrica

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 25 ° 43 ' " <br> W 56 ° 15 ' " |
| 2. | Name of site | Near Cordillera Ybyturuzu and N. road |
| 3. | Altitude | 250m |
| 4. | Site area | 150m x 150m |
| 5. | Kinds of ground | Flat land. <br> Mixed soil of sand and clay |
| 6. | Owner of site | |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | Yes (No) <br> ( ) m high |
| 9. | Existence of access road and required distance | Yes (No) <br> ( 500 ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No <br> ( 500 ) m length |
| | (b) Voltage of power line | ( 23K ) Voltage |
| 11. | CH number and ERP by CP | CH10 10kW |
| 12. | Received field strength (dBμ/m) | |

| CH 7 | CH 9 | CH 012 | CH 13 | CH | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 50 Clorinda | 36 Asuncion | 60 Villarrica | 34 Asuncion | | | | | |

Comments:

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) 3.5 CH 12 <br> Tx output (kW) 0.25 Antenna Type |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No) <br> (9.5km from transmitting point <br> Anglet of the runway N:0° ) |
| | (b) Existence of CATV company and its name | (Yes) No <br> (TELE CABLE S.R.L. ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW) <br> Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name P.J. Caballero

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 22 ° 32 ' 03 "<br>W 55 ° 44 ' " |
| 2. | Name of site | P.J. Caballero city |
| 3. | Altitude | 650m |
| 4. | Site area | 10m × 6m |
| 5. | Kinds of ground | Flat land.<br>Mixed soil of sand, gravel and clay |
| 6. | Owner of site | ANTELCO |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 93 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | CH5 + 3KW |
| 12. | Received field strength (dBμ/m) | |

| CH 4 | CH 5 | CH 7 | CH 9 | CH 12 | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 70 Ponta Pora | None | 46 Ponta Pora | 84 P.J. Caballero | 40 Ponta Pora | | | | |

Comments: Pedro Jnan Caballero is the border city Brazil.

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) 5 CH 9<br>Tx output (kW) 0.25 Antenna Type |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>(10km from transmitting point<br>Angle of the runway N:40° ) |
| | (b) Existence of CATV company and its name | Yes (No)<br>( ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name Saltos del Guaira

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 24 ° 03 ' 56.4 "<br>W 54 ° 18 ' 19.2 " |
| 2. | Name of site | Saltos del Guairal city |
| 3. | Altitude | 360m |
| 4. | Site area | 20m x 10m |
| 5. | Kinds of ground | Flat land.<br>Mixed soil of sand and clay. |
| 6. | Owner of site | ANTELCO |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 96 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | CH13- 10kw |
| 12. | Received field strength (dBμ/m) | |

| CH 2 | CH 4 | CH 7 | CH 9 | CH 11 | CH 12 | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 68.9 Guaira | 37.2 M.C Rondon | 40.5 Ignatemi | 60.2 M.C Rondon | 66.2 Guaira | 40.8 Ignatemi | | | |

Comments:

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) 10 CH 13<br>Tx output (kW) _____ Antenna Type _____ |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>( ) |
| | (b) Existence of CATV company and its name | Yes (No)<br>( ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name San Estanislao

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 24 ° 39 ' 50.8 "<br>W 56 ° 26 ' 37.2 " |
| 2. | Name of site | ANTELCO |
| 3. | Altitude | 180m |
| 4. | Site area | 20m × 10m |
| 5. | Kinds of ground | Flat land.<br>Mixed soil of sand and clay. |
| 6. | Owner of site | ANTELCO |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 75 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | CH4 1kw |
| 12. | Received field strength (dBμ/m) | |

| CH 3 | CH 4 | CH 9 | CH 13 | CH | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 56.0 | 39.0 | 66.2 Asuncion | 65.1 Asuncion | | | | | |

Comments: CH3; 63.8MHz (radio communication)
CH4; 71.92MHz (radio communication)

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) _____ CH _____<br>Tx output (kW) _____ Antenna Type _____<br>(Nothing) |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>( ) |
| | (b) Existence of CATV company and its name | Yes (No)<br>( ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name Filadelfia

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 22 ° 21 ' 31.1 "<br>W 60 ° 02 ' 07.2 " |
| 2. | Name of site | filadelfia city |
| 3. | Altitude | 139m |
| 4. | Site area | 20m x 10m |
| 5. | Kinds of ground | flat land.<br>Mixed soil of sand and clay. |
| 6. | Owner of site | ANTELCO |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 100 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | |
| 12. | Received field strength (dBμ/m) | |

| CH 7 | CH 9 | CH 13 | CH | CH | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| None Concepcion | None Asuncion | 110.1 Estigarribia | | | | | | |

Comments:

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) _____ CH 7<br>Tx output (kW) _____ Antenna Type _____<br>(Nothing) |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>( ) |
| | (b) Existence of CATV company and its name | Yes (No)<br>( ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name Pilar

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 26 ° 50 ' 30 "<br>W 58 ° 17 ' 27 " |
| 2. | Name of site | Pilar city |
| 3. | Altitude | 57m |
| 4. | Site area | 20m x 10m |
| 5. | Kinds of ground | flat and wet land. |
| 6. | Owner of site | ANTELCO |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 86.5 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | CH12 40kw |
| 12. | Received field strength (dBμ/m) | |

| CH 2 | CH 7 | CH 9 | CH 11 | CH 13 | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 63.5 | 80.6 Pilar | 53.2 Resistencia | 64.0 Formosa | 63.5 Corriente | | | | |

Comments:

| | | | |
|---|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) _____ CH 7<br>Tx output (kW) _____ Antenna Type yagi | |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>( ) | |
| | (b) Existence of CATV company and its name | (Yes) No<br>(VIDEO CABLE PILAR S.R.L. ) | |
| | (c) Future construction plan of commercial TV station | CH 7 ERP (kW)<br>Tx output (kW) 1.0 (Power up) | |

# Data Sheet of Site Survey

Station Name Concepcion

| Survey Items | Contents |
|---|---|
| 1. Location of site | S 23 ° 24 ' 33 "<br>W 57 ° 26 ' 72 " |
| 2. Name of site | Concepcion city |
| 3. Altitude | 70m |
| 4. Site area | 9m × 4.5m |
| 5. Kinds of ground | Flat land.<br>Mixed soil of sand gravel and clay |
| 6. Owner of site | ANTELCO |
| 7. Drawing of site | |
| 8. Existence of ANTELCO tower and its height | (Yes) No<br>( 92 ) m high |
| 9. Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| (b) Voltage of power line | ( 220 ) Voltage |
| 11. CH number and ERP by CP | CH5 10kw |
| 12. Received field strength (dBμ/m) | |

| CH 7 | CH 12 | CH | CH | CH | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 86<br>Concepcion | 58 | | | | | | | |

Comments:

| | | |
|---|---|---|
| 13. Transmitting scale of commercial TV station | | ERP (kW) 2.5 CH 7<br>Tx output (kW) 0.25 Antenna Type |
| Others 14. | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>(An airport is the south of concepcion, but there is to be transfered to the east direction. Location of the new airport is not fixed yet. ) |
| | (b) Existence of CATV company and its name | (Yes) No<br>(North Cable Vision ) |
| | (c) Future construction plan of commercial TV station | CH 11 ERP (kW)<br>Tx output (kW) 1 Nothing |

# Data Sheet of Site Survey

Station Name: san Ignacio

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 26 ° 51 ' 15.8 "<br>W 57 ° 02 ' 06.3 " |
| 2. | Name of site | R1 km 221.5° North of Ignacio city |
| 3. | Altitude | 176m |
| 4. | Site area | 140m x 140m |
| 5. | Kinds of ground | Flat land.<br>Mixed soil of sand and clay |
| 6. | Owner of site | Don Adolfo Arnold |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | Yes (No)<br>( ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 23K ) Voltage |
| 11. | CH number and ERP by CP | CH11 10kw |
| 12. | Received field strength (dBμ/m) | |

| CH 7 | CH 8 | CH 9 | CH 11 | CH 12 | CH 13 | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 46<br>Encarnacion | 70.7<br>Itayuru | None | Evaluation 1<br>Formosa | Evaluation 2<br>Villarrica | 58<br>San Patricio | | | |

Comments:

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) 20 (10) CH 10 (11)<br>Tx output (kW) 2 ( ) Antenna Type _____<br>( ) is another commercial TV station |
| 14. Others | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>( ) |
| | (b) Existence of CATV company and its name | (Yes) No<br>(TELECABLE SAN IGNACIO S.R.L. ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

# Data Sheet of Site Survey

Station Name Paraguari

| Survey Items | | Contents |
|---|---|---|
| 1. | Location of site | S 25 ° 34 ' 14.1 "<br>W 57 ° 04 ' 50.6 " |
| 2. | Name of site | Compania Capilla cue |
| 3. | Altitude | 460m |
| 4. | Site area | 20m × 10m |
| 5. | Kinds of ground | Inclinated land about 1m at the site.<br>Mixed soil of sand and clay |
| 6. | Owner of site | ANTELCO |
| 7. | Drawing of site | |
| 8. | Existence of ANTELCO tower and its height | (Yes) No<br>( 37 ) m high |
| 9. | Existence of access road and required distance | (Yes) No<br>( ) m length |
| 10. | (a) Existence of power line and required distance | (Yes) No<br>( ) m length |
| | (b) Voltage of power line | ( 220 ) Voltage |
| 11. | CH number and ERP by CP | CH5 10kw |
| 12. | Received field strength (dBμ/m) | |

| CH 9 | CH 11 | CH 13 | CH | CH | CH | CH | CH | CH |
|---|---|---|---|---|---|---|---|---|
| 94.2 | 56.2 | 79.3 | | | | | | |

Comments:

| | | |
|---|---|---|
| 13. | Transmitting scale of commercial TV station | ERP (kW) _____ CH _____<br>Tx output (kW) _____ Antenna Type _____<br>Nothing |
| Others 14. | (a) Disturbance between TV tower and airport and its explanation if any | Yes (No)<br>( ) |
| | (b) Existence of CATV company and its name | Yes (No)<br>( ) |
| | (c) Future construction plan of commercial TV station | CH ERP (kW)<br>Tx output (kW) (Nothing) |

## 5. Site survey and current situation on building construction (Related to M/R II-5.2)

## 5. Site Survey and Current Situation on Building Construction

### 5.1 Asuncion

City Planning : Which regard to the roads that radially extend from Asuncion in the southeastern direction and AVENIDA MADAME LYNCH, an avenue that crosses those two roads and urns along the city's borderline in a loop form, the study team has learned that there is a plan to widen the three roads into bigger boulevards, each with a median strip.
The Sites, such as ISE site and Gonzalez primary school, both of which are surrounded by the above-mentioned three roads, may be considered as being within easy access as the central part of the metropolitan area.

Ground : In the city area of Asuncion with many up and down, which stands on a rockbed, the surface is made up mostly of sand with red soil (red clayey soil) mixed. The ground is generally shallow and even the deepest portion of the ground is only about 5m. Since the resistive strength of the surface soil is only about $5t/m^2$, the foundation needs to be lowered to the rockbed when a solid building is constructed. The rockbed can be expected to have the resistive strength of $30\text{-}40t/m^2$. However, along the small and middle-size rivers flowing in the city, the rockbeds are scraped out and the foundation has become weak. Some of the supportive layers reach as much as 20m in depth. Lambare which are cities near Asuncion, are said to have good grounds.

Geological Survey
: In Asuncion, there are about seven boring firms which also conduct regional surveys as well by sending experts from Asuncion. Since two days would be enough to carry out the geological survey on each site, it would be better to send out a team of engineers and have it conduct the work by moving from one site to another.
The expenses required are estimated at 800,000 Guaranis in conduction the surveys at three locations, boring the ground down to the depth of 10m each. The amount mentioned above includes the costs of conducting a wide-ranging series of tests with SPT (Standard Penetration Test) to collecting of samples on three sites,

although it does not include the transportation costs in case the survey is to be conducted on a site away from Asuncion.
Further expense of about 700,000 Guaranis would be necessary when laboratory tests, such as, 3-axis compression test, are carried out.

Earthquakes : Paraguay being located where the geological stratum is old, there is no volcano and so it is a country with very few earthquakes. Hence, no consideration is given to the possibility of earthquake when buildings and other structures are constructed in this country. However, this does not mean to say that there is no earthquake at all.
All earthquake does occur at the rate of once in 15 years but such earthquakes are not of very large scale. Recently, an earthquake occurred in 1980 with a tremor of the 6th degree on the seismic scale, but no damage is said to have been reported.

Floodwater : The River Paraguay that literally encloses the city of Asuncion has no record behind it of having flooded, even though its water does either increase or decrease in an annual cycle. Hence, both the Presidential office and the parliament building are constructed on the riverside.

Building Conditions

: The manufacturing of bricks in Paraguay began around the time the Spaniards started constructing cities in this country.
Ever since then, bricks have continued to be one of the main building materials up to this day. Before the bricks, lumber used to be the principal building material for the indigenous people. The bricks of earlier times were apparently of poor quality; both the sistering temperature and the strength were low. Until about half a century ago, the thickness of walls of the buildings was generally about 45cm. today, however, the quality has improved and, coupled with a change occurred to the construction methods, the thickness of the walls has since been reduced to 10-30cm in general.

In the old city area, one can see a number of buildings which appear to be more than 50 years old. Those buildings are mostly modelled on the European style, and all of them are composed mainly of bricks. The exterior decoration is done with terra cotta

and mortar. There is scarcely any stone building; most of the buildings are made to look like stone structures by the way the bricks are piled and the surfaces are finished. The buildings constructed in the modern era have their main structure done in ferro-concrete, with the walls filled up with the bricks piled up in double layers. Using this construction method, buildings up to about 20 stories have been constructed. As no consideration is given to earthquake load, the cross-sections of pillars and beams are surprisingly small from Japanese point of view.

Building materials

: Thanks to its geographical position that neighbors with Brazil and the Argentine, both of which abound in supply of a great variety of building materials, various types of materials are imported into Paraguay. However, the materials produced in Paraguay itself are restricted to such kinds as sand, gravel, cement, iron reinforcement rods, lumber, bricks, and corrugated galvanized iron sheets.
In the town neighboring the Chaco, across the river from Asuncion, is a big cement factory.

Asuncion abounds in the supply of bricks and ceramic products. Since Itagua produces high-quality clay, some of the leading manufacturers of bricks and ceramic goods have their factories in Itagua and Asuncion.

In Paraguay, steel sections, which have now become principal structural steel in the industrialized countries, are expensive and not easily available on the market. Consequently, in Paraguay, structures using steel sections can rarely been seen. Instead, one can see a large number of box-type truss and triangle net truss, both of which are formed by assembling deformed iron reinforcements by welding them together. Such trusses are used in constructing big span structures, such as factories and gymnasiums and as reinforcements for concrete pillars.

Most of the fittings are made of wood, but such fittings as jalousies made of steel are also produced in Paraguay.
However, such items as aluminum sashes, curtainwalls and glass are all imported from Brazil.

Decorative materials are almost entirely imported from Brazil and the Argentine.

Steel towers : Almost all of the antennas of ANTELCO and commercial broadcasting stations are imported from either Brazil or the United States.

Their framework members are generally thin. Almost all of ANTELCO's steel towers are products of METALCO of Brazil. Principal manufacturers which are currently in operation are:

HARALD S.A. (Brazil)
Location : Sao Paulo, A+6 Street 2400
Phone : 041-3463388
FAX : 041-2486031
Engineer in charge : Mr. Newforn Coraiola (president)

STAINLESS INC. (U.S.A.)
Location : 210 South 3rd Avenue, North Wallace, Penn.
Phone : 215-6994871
FAX : 215-6999594
Officer in charge : Mr. Owen Ulmer (president)

METALCO CONSTRUCOES METALICAS S.A. (Brazil)
Location : São Paulo, Matriz Av. Carlos Livieiro 561
Phone : 011-9461161
FAX : 011-9463368

Neither of the above-mentioned companies has a branch office in Paraguay. The engineers who are in charge of maintenance of the steel towers of ANTELCO and commercial broadcasting stations are acting as points of contact.

Construction costs

: In Paraguay, designing, construction and supervision are not clearly defined in terms of occupational category; it appears that, in Paraguay, an architect is actually in control of designing, construction and supervisory work. Consequently, in the case of construction companies, there is no such company as a "general constructor" and the construction companies in Paraguay are all

very much like subcontractors in Japan. At present, the following companies are the main construction companies in Paraguay:

1. ALBERTO BARRAIL E HIJOS
2. BARRAIL HNOS.
3. ECCA S.A.
4. BAUMAN
5. ING. ANAD Y CIA
6. TECNODIL
7. C.C.C. S.A.

Land Prices : The land prices in main cities are given, with maps, in "COSTOS DE LA CONSTRUCCION," a monthly magazine concerning construction costs. According to this magazine, the land prices are high at the central section of the old city area and the high-class residential area in the northeastern part of the city of Asuncion, the prices being 35,000-80,000 $G_S/m^2$.

It appears, however, that it is hardly possible to obtain a tract of land of a reasonable size within the city area.

Even so, it seems a bit strange as compared with Encarnacion and Ciudad del Este, the land prices in Capital Asuncion are not so high.

Facilities of Commercial TV Stations

CANAL-9 (ASUNCION)

: Constructed in 1966 on the outskirts of the old city area to the west of Asuncion, the Studio Center with a total floor space of 2,400m$^2$ stands on the site of 4,500m$^2$. The station has two studios large and small, whose specifications are as follows:

| | Studio No. 1 | Studio No. 2 |
|---|---|---|
| Floor Area | 113m$^2$ | 569m$^2$ |
| Size | 9.8m × 11.55m | 18.8m × 30.3m |
| Height (up to grid) | 6m | 7m |
| Floor | Needle-punch cards | vinyl tiles |
| Walls | Carpets or felt | Covered with glass-wool cloth |
| Ceiling | Bare concrete | glass-wool covered with silver-colored cloth |
| Roof | Ferro-concrete slabs | Ferro-concrete covered with corrugated iron-sheet roofing |

As for the Studio No. 1, sound-absorption and sound-insulation are both quite good. But as for the Studio No. 2, the sound-insulation of the roof portion is inadequate and the inner walls have a poor appearance at the portions above the grid pipes, with the brick walls exposed because of incomplete finish. In both of the Studios No. 1 and 2, the airconditioners are installed uncovered, resulting in generation of considerable level of running noise.

CANAL-13 (Lambare)

: In the southern part of Asuncion lies the city of Lambare of the Central Department as though the latter is eating into the former. Located in the center of the triangular portion thus formed stand the buildings of CANAL-13, right in the middle of a residential area into which a stone-paved road runs. The CANAL-13, established in 1981, comprises a 280m high stayed tower and a transmitting center with a floor space of about 2,000m$^2$, both built on a site of about 300m × 300m in area.

There are two video studios; a medium-size studio for production of live programs and a small one for newscasts.

The production of full-scale programs is conducted in three scattered studios and the programs produced are transmitted on

microwave circuits to the headquarters.

As for the interiors of the two studios, the floors are covered with vinyl tiles, the walls with glass wool mat and the ceilings with asbestos corrugated sheets (Depth = 500) and covered with glass wool mat. The ceiling height is 4m.

One of the anchors of the stayed tower is installed outside the site, on the ground owned by a third party, with the wire crossing over the front road. The land-owner says that he has a 50-year land-lease effective with that third party.

## 5.2 Ciudad del Este

City Planning : Although the city office has a City Planning Section, it appears that city planning has only started.

Climate : What requires special mention is the occurrence of tornados. Although detailed data are not available, the high frequency of tornados can be surmised from the records of damages suffered by forests and farmlands. According to the records of data from the LANDSAT, as many as 13 large-scale damages occurred in 1965 alone. The largest of such damages extended over an area of 1.5km × 70km. This tornado is one of the factors that need to be fully taken into account in the designing such installations as steel towers.

The rainfalls in Ciudad del Este surpass those in Asuncion, at 1,700mm per year. (About 1,300mm in Asuncion.)

Ground : The ground in the city and its periphery is covered almost entirely with reddish-brown clay of varying thickness depending on the location, the thickest portion reaching 12m. The resistive strength of the ground is about 5t/$m^2$ but the ground is not fit for supporting base, as the surface earth consists of red, dry sandy soil called 'limo.'

Under the reddish brown clay lies a hard layer called 'basalt' whose N value obtained from a standard penetration test is 25-33 and whose resistive strength is 60-70t/$m^2$, a level high enough for the ground to be used as the supporting layer. This basalt layer is as thick as 37m at the thickest point and has a rockbed under it.

Geological Survey

: There are a number of geological survey firms in the city, among which is one that owns five sets of boring machines.

So, there is no problem about investigating the proposed site. However, a laboratory test can be conducted only in Asuncion. A boring survey would cost about 450,000GS (20,000Gs/m × 10m × 2 locations × 1.1), the boring being conducted to the depth of 10m at two location.

Building Conditions

: In the central part of the city, one can see many buildings of medium and tall sizes. Many of them are office buildings and apartments with the lower floors used as department stores.
Some of them are 10 stories or taller. The main structures of these buildings are mostly composed of ferro-conrete, Ragmen framework. The medium-size and small buildings of 2-3 stories are generally of a structure combining ferro-concrete pillars and beams and brick walls. General private homes are mostly built with bricks but some of them are of wooden roof-truss type with clay-tile (Spanish tile) roofing.
On the other side of the River Parana, forest of 20-30 storied skyscrapers in the city of Foz do Iguazu (Brazil) can be seen from the city of the ciudad de Este.

Building Materials

: For building materials, the city depends heavily on imports, excepting some of the materials such as cement, gravel, sand, slates and stones. Imports from Brazil are especially large.
As this city functions as the main trading center for such imports from Brazil, it is in a position to enjoy rich supply of building materials and so, in that respect, this city stands in a no less advantageous position as compared with Asuncion.

Land Prices : The land price of the wide greenery park in the city, being owned by Itaipy which possesses the world's largest hydroelectric power plant, is extremely high at US$25/$m^2$. Near the facilities of CANAL-8 station in the southwestern part of the city, however, the land price is said to be US$10-12.5/$m^2$.

Construction Costs

: Because the city has a rich supply of building materials and the labor costs are lower as compared with Asuncion, the construction costs in Ciudad del Este is lower than in Asuncion. For example, a single-story house of general type (pillars and beams in ferro-concrete, brick walls and with wooden roof-truss and beams covered with Spanish tiles) can be built at a cost of about 400,000$G_S$/$m^2$.

## 5.3 Encarnacion (Cap. Miranda)

Location of ANTELCO:

The ANTELCO relay station is located 14km north of Encarnacion along the Route 6, at a point 1.7km to the east of the road. The site is 125m × 135m and approximately 2ha. Almost in the center stands a triangular truss guyed wire tower of 113.05m in height.

There is also a flat brick house constructed to the south of the tower. The northwest corner of the site serves as a gate, and there is a home of about 70m$^2$ for the caretaker family. There is a grassfield and pineforest in the area between the caretaker's home and the station, but in the other parts there are cotton, sugar millet, and mandioca fields. The entire site is flat and has an elevation of 274m.

ANTELCO tower:

With a height of 113.05m and a width of 1.385m, the main section of the triangular truss guyed wire tower has an L-angle of 100 × 100 × 16 and the lattice has an L-angle of 65 × 65 × 5. The original was constructed in 1978 by the Brazilian manufacturer METALCO. The 21% of the main part of the pillar extending 24m up from the ground was reinforced in 1993. The reinforcement consisted of replacing the gusset plates of the various fulcrums with new shapes and attaching L-75 × 75 × 11 alongside the outside of the main pillar. Moreover, another set of anchors was built in addition to the three existing anchors.

## 6. Site of transmitting point, channel and transmitting scale etc. (1st channel plan stations)

(Related to M/R II -5.4)

## 6 Site of Transmitting Point, Channel and Transmitting Scale etc.

Related to the 1st Plan (13 stations) and 2nd Plan (10 stations), channel number and transmitting scale etc. are shown in Paragraph 6.1 ~ 6.13 and Table 6.1.1 ~ 6.13.1 for 1st Plan, and Table 7.1.1 ~ 7.10.1 for 2nd Plan.

### 6.1 Asuncion

1) Location

Many parcels of public land, which are higher altitude than the two already existing commercial TV stations, have been studied to select the optimum location for Asuncion Transmitting Station in order to secure the largest service area as possible and, as a result, the ISE (higher teacher's school) premises would be considered to be the most suitable site for the ETV center as a combined building with studio and Transmitter.

2) TV Channel planning in connection with latent field strength from other TV stations.

Measured data of latent field strength in various sites of Asuncion showed that there are incoming TV signals of Ch.2, Ch.7, Ch.10 and Ch.11 from Argentine. With existing commercial stations' Ch.9 and Ch.13, only Ch.6 is available for ETV use which has been agreed by 4 countries' meeting. Therefore, Ch.6 shall be assigned for the new ETV transmission in Asuncion.

In addition, since it is said that a new commercial TV channel will use Channel 4 in the near future, this broadcasting network plan has made the channel assignment by paying attention.

Regarding the interference between the channel for the educational TV station and other FM waves, studied results show no trouble.

3) Service Area

This service area has been set so that it is the same as those of already existing commercial TV stations. Asuncion and Central Prefecture have such a topographical feature that TV waves transmitted to eastward will be blocked by mountains and do not reach Cordillera Prefecture, but those transmitted to north and south can propagate considerably longs distances across plains. In addition, since Asuncion and Central Prefecture have large populations, one Metropolitan Asuncion Station can cover 1,610,000 inhabitants, corresponding to 39% of the total population of Paraguay.

Detailed data for surrounding cities of Asuncion Metropolitan area are shown in Table 6.1.3.

4) Transmitting Scale

Since the altitude of the planned transmitting points is higher than those of the already existing commercial TV stations by 30~50m and the height of the antenna tower can be reduced, the proposed height of the antenna tower is set at 160m. The ERP is set at 90kW by taking the low channel of VHF band I. Transmitting scales and resolutions of the Four-Country Meeting are listed in Table 6.1.1.

Presidential house locates near border river with Argentine which is 9km from the transmitting point, and therefore radiation power in the said direction must be reduced by 10dB from maximum radiation power. At the result that TV interference will not be given to the Argentine side.

## Map of Asuncion City

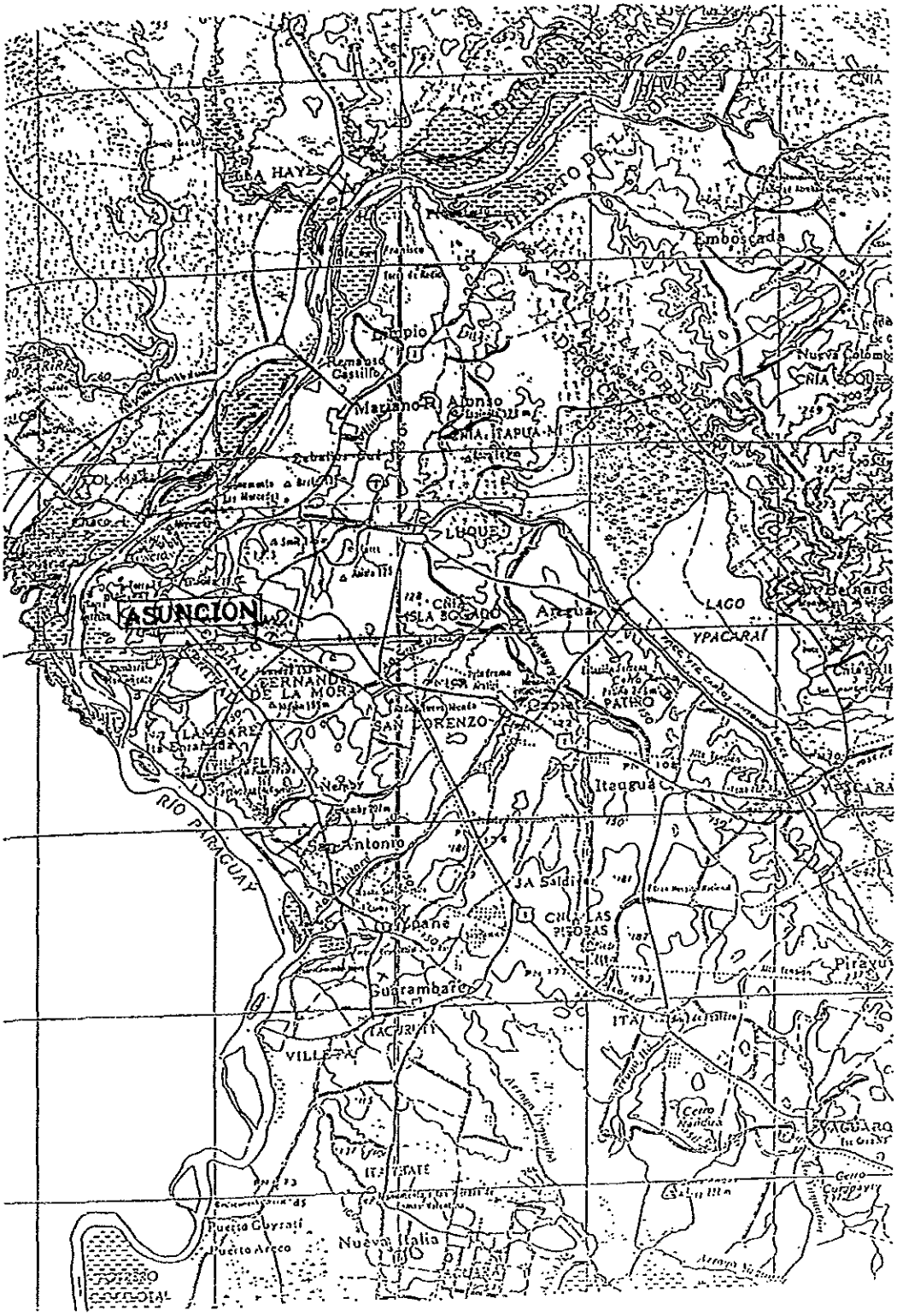


Table 6.1.1 Transmitting Specification of Asuncion Station

| Articles | | | |
|---|---|---|---|
| 1. Name of station | Asuncion (Department : ) | | |
| 2. Plan by CP *1 | CH : 6 (VHF) | Freq : 85 MHz | ERP (kW) : 40 |
| | Antenna height (m) : 120 | | |
| | Limiting condition of antenna radiation : No condition | | |
| 3. Site of location | Latitude : 25° 19' 08" | Longitude : 57° 34' 58" | |
| | Altitude (m) : 165 | | |
| | Location : I.S.E site | | |
| 4. Selected channel : CH 6 | Center freq : 85 MHz | | |
| 5. ERP (kW) : 90 | 6. Transmitter power (kW) : 10 | | |
| 7. Antenna gain (dB) : 9.5 | (Times) : 8.8 | | |

8. Antenna constitution

| Name of antenna : 2D | | | | |
|---|---|---|---|---|
| Planes | A | B | C | D |
| Antenna | 2D | 2D | 2D | 2D |
| Stages | 6 | 6 | 6 | 2 |
| Power ratio | 3 | | | 1 |

Radiation condition :
(1) -10dB reduction for Argentine

| | |
|---|---|
| 9. Tower height (m) : 160 | 10. Center height of antenna (m) : 147 |
| 11. Type of tower : Guyed wire tower (New tower) | |
| 12. Total number of population in the service area : | 1,592,000 |

*1 CP : Cuatripartita (Four country make an agreement related to VHF channels; Paraguay, Brazil, Argentine and Uruguay)

Table 6.1.2 (1/4) Latent field strength in Metropolitan Asuncíon

| CH | Measuring Point | | | | Station's name of coming TV wave |
|---|---|---|---|---|---|
| | C° Mojon | Point A | Camino Alto | ISE | |
| CH21 | 55.3 dBμ/m | 63.5 dBμ/m | 46.5 dBμ/m | | Clorinda (Argentina) |
| CH3 | | | | | |
| CH4 | | | | | |
| CH5 | | | | | |
| CH6 | | | | | |
| CH7 | | 45 dBμ/m | | | Clorinda (Argentina) |
| CH8 | | | | | |
| CH9 | 88 dBμ/m | 108 dBμ/m | 85.8 dBμ/m | | Asuncíon (SNT) |
| CH10 | | 70 dBμ/m | | | General Belgranu (Argentina) |
| CH11 | 57.6 dBμ/m | | 51.2 dBμ/m | | Formosa (Argeutina) |
| CH12 | | | | | |
| CH13 | 100.5 dBμ/m | 90 dBμ/m | 95.1 dBμ/m | | Asuncíon (RPC) |
| | | | | | |
| FM90.7MHz | 95 dBu/m | | | | Asuncíon |
| FM92.3MHz | 96 dBμ/m | | | | Lambare |
| FM97.1MHz | 95.8 dBμ/m | | | | Asunción |
| FM105.1MHz | | | | 92 dBμ/m | No identified |
| FM90.7MHz | | | | 75 dBμ/m | Ditto |
| FM97.1MHz | | | | 71 dBμ/m | Ditto |
| FM90.7MHz | | | | 86.7 dBμ/m | Asuncíon |
| FM92.3MHz | | | | 85.2 dBμ/m | Lambare |
| FM94.3MHz | | | | 100.1 dBμ/m | Fernando de la Mora |
| UHF | None | | | | |
| | | | | | |

Table 6.1.2 (2/4) Latent field strength in Metropolitan Asunción

| CH | Measuring Point | | | | | Station's name of coming TV wave |
|---|---|---|---|---|---|---|
| | Ita | J. A. Saldivar | Guarambare | Caacupe | Cruce R. II (for Piribebui) | |
| CH 2 | dBμ/m | dBμ/m | dBμ/m | dBμ/m | dBμ/m | |
| CH 3 | | | | | | |
| CH 4 | | | | | | |
| CH 5 | | | | | | |
| CH 6 | | | | | | |
| CH 7 | | | | | | |
| CH 8 | | | | | | |
| CH 9 | 52 | 75 | 78 | 65 | 48.8 | |
| CH 10 | | | | | | |
| CH 11 | | | | None | | |
| CH 12 | | | | | | |
| CH 13 | 58 | 75 | 80 | 58.3 | 51.7 | |
| CH 21 | | | | | | |
| CH 22 | | | | | | |
| CH 23 | | | | | | |
| CH 25 | | | | | | |
| CH 27 | | | | | | |
| CH 29 | | | | | | |
| CH 31 | | | | | | |
| CH 33 | | | | | | |
| UHF | | | | None | None | |
| FM 90.7MHz | | | | 52 | | |
| FM 90.3MHz | | | | 55 | | |
| | | | | | | |

Table 6.1.2 (3/4) Latent field strength in Metropolitan Asuncion

| CH | Measuring Point | | | | Station's name of coming TV wave |
|---|---|---|---|---|---|
| | San Lorenzo | Point B | Point C | Point D | |
| CH 2 | dBμ/m | 30 dBμ/m | 44 dBμ/m | dBμ/m | |
| CH 3 | | | | | |
| CH 4 | | | | | |
| CH 5 | | | | | |
| CH 6 | | | | | |
| CH 7 | | | | | |
| CH 8 | | | | | |
| CH 9 | 78 | 93 | 89 | 98 | |
| CH 10 | | | | | |
| CH 11 | | | | | |
| CH 12 | | | | | |
| CH 13 | 80 | 100 | 83 | 100 | |
| UHF 21 | 58 | 60 | | 81 | |
| UHF 22 | | | | 83 | |
| UHF 23 | 58 | 60 | | | |
| UHF 25 | 58 | 60 | | 83 | |
| UHF 27 | 58 | 60 | | 85 | |
| UHF 29 | 58 | 60 | | 83 | |
| UHF 31 | 58 | 60 | | 85 | |
| UHF 33 | 58 | 60 | | 85 | |
| | | | | | |
| FM | | | | | |
| | | | | | |
| | | | | | |

Table 6.1.2 (4/4) Latent field strength in Metropolitan Asuncíon

| CH | Measuring Point | | | | | Station's name of coming TV wave |
|---|---|---|---|---|---|---|
| | Luque | Middle point of Luque and Aregua | Aregua | Ypacarai | Itauguá | |
| CH 2 | dBμ/m | dBμ/m | dBμ/m | dBμ/m | dBμ/m | |
| CH 3 | | | | | | |
| CH 4 | | | | | | |
| CH 5 | | | | | | |
| CH 6 | | | | | | |
| CH 7 | | | | | | |
| CH 8 | | | | | | |
| CH 9 | 68 | 72 | 60 | 64 | 78 | |
| CH 10 | | | | | | |
| CH 11 | | | | | | |
| CH 12 | | | | | | |
| CH 13 | 67 | 72 | 58 | 65 | 82 | |
| CH 21 | | | | | | |
| CH 22 | | | | | | |
| CH 23 | | | | | | |
| CH 25 | | | | | | |
| CH 27 | | | | | | |
| CH 29 | | | | | | |
| CH 31 | | | | | | |
| CH 33 | | | | | | |
| UHF | | | | | | |
| FM | | | | | | |
| | | | | | | |
| | | | | | | |

Table 6.1.3 Numbers of population of Asuncion station

| Transmission point | Cities | Distance | Urban population | Total population | Altitude |
|---|---|---|---|---|---|
| ASUNCION | | | 502,426 | 502,426 | 150m |
| | Mariano Roque Alonso | 13km | 39,240 | 39,240 | 50m |
| | Limpio | 20km | 26,282 | 35,411 | 50m |
| | Luque | 11km | 83,591 | 114,802 | 100m |
| | Areguá | 19km | 6,326 | 24,795 | 100m |
| | Fernando de la Mora | 2km | 95,287 | 95,287 | 150m |
| | San Lorenzo | 7km | 133,311 | 133,311 | 100m |
| | Capiatá | 14km | 83,189 | 83,189 | 100m |
| | Itagua | 24km | 13,838 | 37,553 | 100m |
| | Ypacarai | 31km | 7,098 | 14,362 | 100m |
| | J. Augusto Saldivar | 19km | 2,007 | 20,974 | 150m |
| | Itá | 30km | 14,256 | 36,863 | 120m |
| | Guarambaré | 22km | 6,987 | 12,306 | 110m |
| | Ypané | 17km | 3,928 | 9,110 | 100m |
| | Ñemby | 8km | 27,206 | 38,738 | 100m |
| | Nueva Italia | 34km | 1,638 | 7,094 | 100m |
| | San Antonio | 11km | 7,411 | 15,040 | 100m |
| | Villa Elisa | 6km | 29,891 | 29,891 | 100m |
| | Villeta | 20km | 7,447 | 16,893 | 70m |
| | Lambare | 5km | 99,681 | 99,681 | 100m |
| ( PRESIDENTE HAYES ) | Benjamin Aceval | 37km | 6,203 | 11,095 | 60m |
| | Villa Hayes | 26km | 11,843 | 23,533 | 60m |
| [ CORDILLERA ] | Nueva Colombia | 33km | 375 | 3,516 | 140m |
| | Altos | 34km | 3,117 | 9,094 | 200m |
| | San bernardino | 28km | 2,167 | 8,441 | 100m |
| | Caacupé | 44km | 12,368 | 31,311 | 200m |
| | Emboscada | 32km | 3,242 | 8,293 | 150 m |
| | Atyra | 41km | 3,186 | 10,800 | 150m |
| | Arroyo y Esteros | 57km | 1,282 | 18,234 | 90m |

| Transmission point | Cities | Distance | Urban population | Total population | Altitude |
|---|---|---|---|---|---|
| [PARAGUARI] | Pirayú | 38km | 3,139 | 12,817 | 100m |
| | Yaguarón | 39km | 5,312 | 22,524 | 150m |
| | Acahay | 80km | 2,913 | 14,256 | 150m |
| | Carapeguá | 59km | 4,844 | 28,032 | 100m |
| | Quindy | 80km | 3,276 | 16,699 | 100m |
| | San Rogue G. de Sta. Cruz | 68km | 2,171 | △ 10,832 | 100m |

△ means area in which can receive TV wave for half population

**Figure 6.1.1 Peripheral cities of Asuncion station**

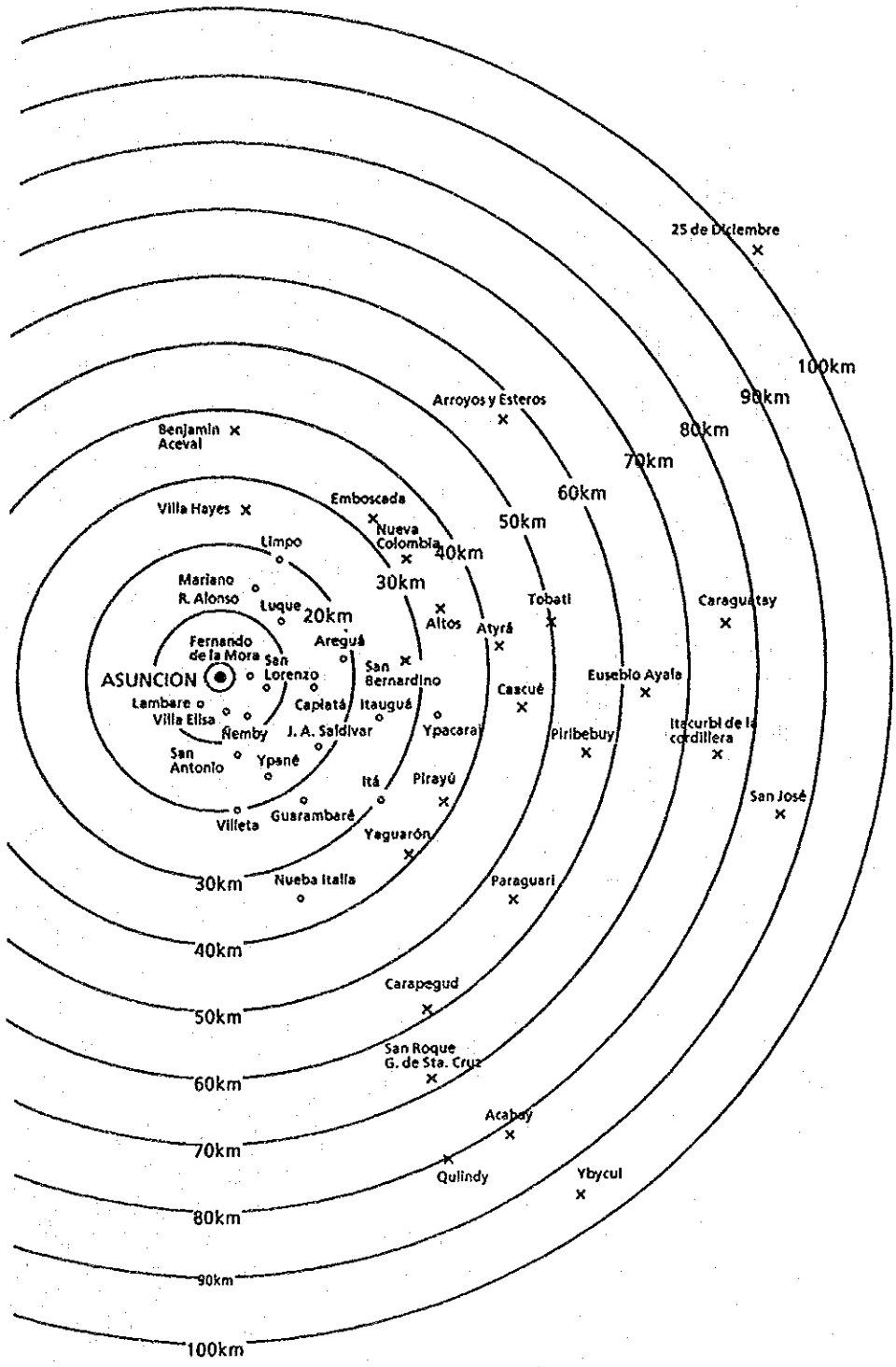
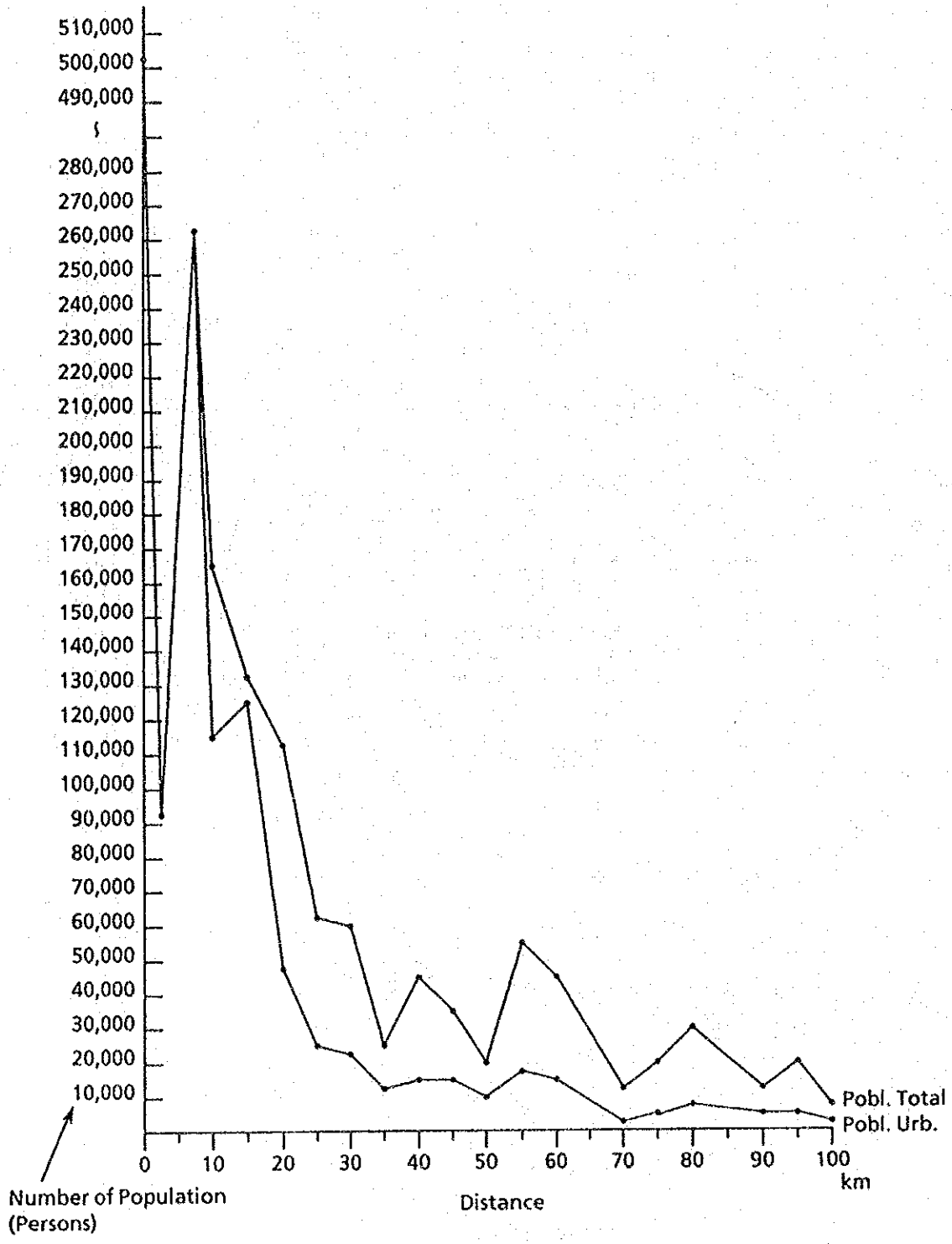


Figure 6.1.2 Population distribution



## 6.2 Cuidad del Este Station

### 1) Location

It has been decided that this transmitting station is installed in Este City so that an already existing ANTELCO tower can be used for this station also.

### 2) Channel

Although Channel 2 was assigned at the Four-Country Frequency Assignment Meeting, the proposed channel is not usable, because waves of the adjacent channel (Ch.3) arrive from Cascabal station in Brazil with a field strength of 42dBu/m.

As a result of studies from various points of cities, it has been decided to use UHF due to the following reason:

- Since it has become clear from a data of population distribution made in the outskirts of the proposed Este Station that the inhabitants of the said province live within a 20km radius from the station, long-distance propagation is no required, therefore UHF can cover the inhabitants.

- One of the two already existing commercial TV stations has already serviced UHF broadcasting.

Channel 18+ must be used for the UHF broadcast in accordance with the principle of frequency assignment described in Main Report II 4.2.3, because one of the already existing commercial stations is using Channel 21 in Brazil. At present, UHF waves are not controlled by the Four-Country Frequency Assignment Meeting Agreement. In addition, studied results indicate that no interference will occur even when the TV waves are combined with FM waves.

3) Service Area

The farthest city to be serviced is Santa Rosa del Monday, which is about 44km south of the proposed transmitting point, since UHF waves do not reach the area of transhorizon propagation. Mbaracayu City, which is about the same distance north of the transmitting point, is out of views due to mountains blocking it.

4) Transmitting Scale

Since UHF waves have more attenuation urban environmental clutter, the ERP (kW) must be increased to compensate the above attenuation. However the ERP value largely varies depending upon the correction value of suburb on UHF waves. The ERP is set at 90kW based on the FCC curve and the UHF curve used in Japan. In addition, the radiation power toward Brazil is reduced by 5dB, because this city is located in the area bordering Brazil. Transmitting specification are listed in Table 6.2.1.


COLONIA CARAY
HERNANDARIAS
Villa San Francisco
Puerto Embalse
Minga Guazu
CIUDAD DEL ESTE
PTE. FRANCO
RIO MONDAY
TRES FRONTERAS
Puerto Margarita
SAN MIGUEL
Puerto Flores
Puerto 22 de Mayo
PENINSULA
Puerto Bertoni
LOS CEDRALES
COL. TAVAPY
SANTA LUCIA
YACAREY
BARRIO MARIA AUXILIADORA
Puerto Ordoñez
COLONIA MESQUITA
Santa Rosa del Monday
CURUPAITY
COLONIA TABUCAI
Puerto Tabuca
Puerto Iruña

Table 6.2.1 Transmitting Specification of Ciudad del Este Station

| Articles | | | |
|---|---|---|---|
| 1. Name of station | Ciudad del Este (Department : Alto Parana ) | | |
| 2. Plan by CP *1 | CH : 2 (VHF) | Freq : 57 MHz | ERP (kW) : 5 |
| | Antenna height (m) : 60 | | |
| | Limiting condition of antenna radiation : -3dB for Puerto Igazu | | |
| 3. Site of location | Latitude : 25° 30' 36" | Longitude : 54° 38' 14.2" | |
| | Altitude (m) : 220 | | |
| | Location : Ciudad del Este city | | |
| 4. Selected channel : CH 18+ | Center freq : 497 MHz | | |
| 5. ERP (kW) : 90 | 6. Transmitter power (kW) : 10 | | |
| 7. Antenna gain (dB) : 9.6 | (Times) : 9.1 | | |

8. Antenna constitution

| Name of antenna : 4D | | | | |
|---|---|---|---|---|
| Planes | A | B | C | D |
| Antenna | 4D | 4D | 4D | 4D |
| Stages | 3 | 1 | 3 | 3 |
| Power ratio | 1 | 1 | 1 | 1 |

Radiation condition :
(1) -5dB reduction for Brazil and Argentine

| | |
|---|---|
| 9. Tower height (m) : 92 | 10. Center height of antenna (m) : 94 |
| 11. Type of tower : Self supported tower (ANTELCO) | |
| 12. Total number of population in the service area : | 281,600 |

*1 CP : Cuatripartita (Four country make an agreement related to VHF channels; Paraguay, Brazil, Argentine and Uruguay)

Table 6.2.2 Latent Field Strength in Ciudad de Este City

| CH | Measuring point | | | | Station's name of coming TV wave |
|---|---|---|---|---|---|
| | 25°30, 84′<br>54°36, 77′ | 25°30, 82′<br>54°31, 5′ | 25°32, 9′<br>54°36, 69′ | 25°30, 84′<br>54°36, 77′ | |
| CH2 | | | | | |
| CH3 | 42 dBμ/m | 42 dBμ/m | 35 dBμ/m | | Cascabal (Brazil) |
| CH4 | 59 dBμ/m | 49 dBμ/m | 49 dBμ/m | | Puerto Iguazu (Argentine) |
| CH5 | 65 dBμ/m | 65 dBμ/m | 51 dBμ/m | | Foz do Iguazu (Brazil) |
| CH6 | | | | | |
| CH7 | | | | | |
| CH8 | 96 dBμ/m | 108 dBμ/m | 80 dBμ/m | | C. del Este (SNT) |
| CH9 | | | | | |
| CH10 | 89 dBμ/m | 80 dBμ/m | 64 dBμ/m | | Foz do Iguazu (Brazil) |
| CH11 | | | | | |
| CH12 | 89 dBμ/m | 80 dBμ/m | 81 dBμ/m | | Foz do Iguazu (Brazil) |
| CH13 | | | | | |
| UHF (CH21) | 82 dBμ/m | 83 dBμ/m | 67 dBμ/m | | No identified |
| CH58 | | | | | Foz do Iguazu (Brazil) |
| FM96.1MHz | | | | 72 dBμ/m | Ciudad del Este |
| FM102.5MHz | | | | 64.5 dBμ/m | Ciudad del Este |
| FM89.1MHz | | | | 90 dBμ/m | No identified |
| FM97.7MHz | | | | 71.5 dBμ/m | No identified |
| FM105.62MHz | | | | 74.5 dBμ/m | No identified |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Table 6.2.3 Numbers of population in the service area of Ciudad de Este station

| Transmission point | Cities | Distance | Urban population | Total population | Altitude |
|---|---|---|---|---|---|
| CIUDAD DEL ESTE | | | 133,893 | 133,893 | 220m |
| | Hernandarias | 15km | 28,464 | 42,940 | 220m |
| | Minga Guazú | 14km | 8,905 | 31,733 | 250m |
| | Santa Rosa del Monday | 44km | 1,758 | 12,733 | 300m |
| | Los Cedrales | 18km | 1,747 | 11,444 | 220m |
| | Presidente Franco | 4km | 32,171 | 39,384 | 200m |
| | Yguazu | 38.5km | 2,679 | 9,440 | 250m |

Figure 6.2.1 Peripheral cities of the Ciudad de Este station

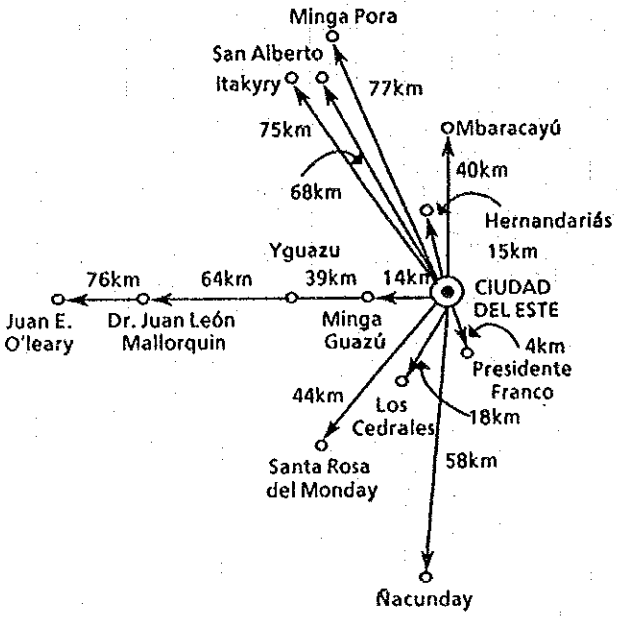
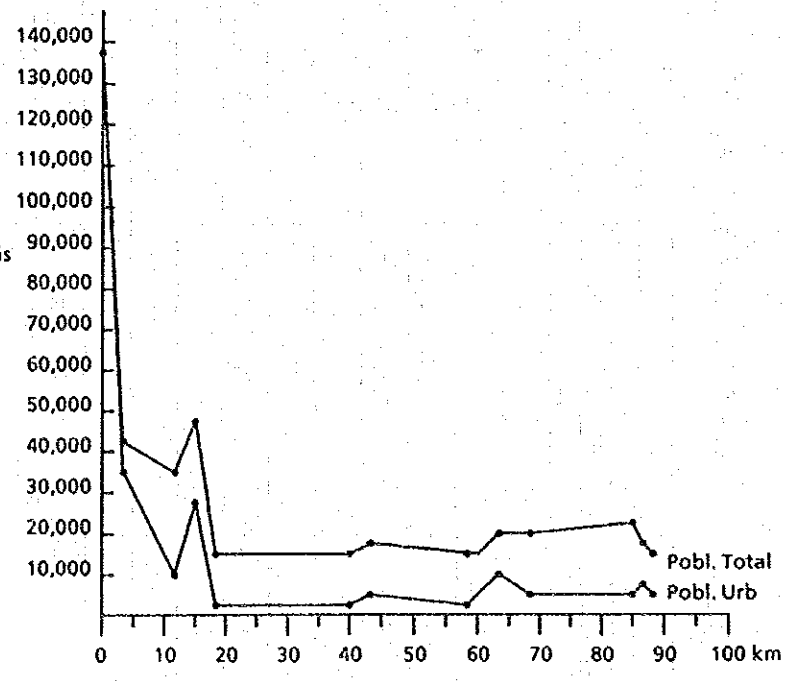



Figure 6.2.2 Populaiton distribution



## 6.3 Encarnacion Station

### 1) Location

Due to the following reasons, transmitting point of Encarnacion Station has been decided in Cap. Miranda city:

- Encarnacion has been located on lowlands beside a river; the sight is bad as a whole because the sight is blocked by mountains on the east and high plateaus lie on the north, with the topography affording relatively good sight being limited only the west. Therefore, wide service area can not be obtained.

- In addition, there is a dam construction plan including the urban area itself and most of people living in the city will move to the plateau side.

- The ANTELCO tower, which is constructed at a altitude of 195m and has an antenna height of 113m in Cap. Miranda city, can be used for this project.

### 2) Channel assignment and Latent Field Strength

Regarding the Encarnacion Station, no channel trouble is seen when Channel 18⁻ is used in Encarnacion city.

Data of latent field strength is shown at supporting report Table 6.3.2.

### 3) Service Area and Population Covered

When TV waves are transmitted from Cap. Miranda City, the TV waves can reach Gral. Delgado City situated at a distance of 74km from Cap. Miranda city and a wide service area can be obtained. The population of this service area is estimated at 138,000.

When the transmitting point is settled at Cap. Miranda City, a doughnut phenomenon is expected in population distribution.

Data are given in supporting report Table 6.3.3.

4) Transmitting Scale

The farthest city in the service area is considered to be Cnel. Bogado City (43km) and the ERP is set at 90kW. Regarding the antenna, the radiation power toward Argentine shall be reduced by 5dB, because this station is located in a border area. The list of transmitting specification is given in Table 6.3.1

Table 6.3.1 Transmitting Specification of Encarnacion Station

<table>
<tr><td colspan="4">Articles</td></tr>
<tr><td>1. Name of station</td><td colspan="3">Encarnacion (Department : Itapua )</td></tr>
<tr><td rowspan="3">2. Plan by CP *1</td><td>CH : 5 (VHF)</td><td>Freq : 79 MHz</td><td>ERP (kW) : 40</td></tr>
<tr><td colspan="3">Antenna height (m) : 120</td></tr>
<tr><td colspan="3">Limiting condition of antenna radiation :<br>-3dB for Argentine</td></tr>
<tr><td rowspan="3">3. Site of location</td><td colspan="2">Latitude : 27° 11' 36"</td><td>Longitude : 55° 46' 9"</td></tr>
<tr><td colspan="3">Altitude (m) : 276</td></tr>
<tr><td colspan="3">Location : Cap. Miranda (ANTELCO)</td></tr>
<tr><td colspan="4">4. Selected channel : CH 18 Center freq : 497 MHz</td></tr>
<tr><td colspan="2">5. ERP (kW) : 90</td><td colspan="2">6. Transmitter power (kW) : 10</td></tr>
<tr><td colspan="4">7. Antenna gain (dB) : 9.6 (Times) : 9.12</td></tr>
<tr><td colspan="4">8. Antenna constitution
<table>
<tr><td colspan="5">Name of antenna : 4D</td></tr>
<tr><td>Planes</td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>Antenna</td><td>4D</td><td>4D</td><td>4D</td><td>4D</td></tr>
<tr><td>Stages</td><td>3</td><td>3</td><td>1</td><td>3</td></tr>
<tr><td>Power ratio</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>
Radiation condition :<br>(1) -5dB reduction for Argentine</td></tr>
<tr><td colspan="2">9. Tower height (m) : 113</td><td colspan="2">10. Center height of antenna (m) : 95</td></tr>
<tr><td colspan="4">11. Type of tower : Guyed wire tower (ANTELCO)</td></tr>
<tr><td colspan="2">12. Total number of population in the service area :</td><td colspan="2">194,000</td></tr>
</table>

*1 CP : Cuatripartita (Four country make an agreement related to VHF channels; Paraguay, Brazil, Argentine and Uruguay)

Table 6.2.3 Latent field strength in Encarnacion city

| CH | Measuring point | | | Station's name of coming TV wave |
|---|---|---|---|---|
| | 25°32, 9′<br>54°36, 69′ | 25°30, 82′<br>54°31, 5′ | 25°30, 84′<br>54°36, 75′ | |
| CH2 | | | | |
| CH3 | | | | |
| CH4 | | | | Argentine has a plan of new station with CH4 |
| CH5 | | | | |
| CH6 | | | | |
| CH7 | 97 dBμ/m | 97 dBμ/m | 95 dBμ/m | Encarnacion (SNT) |
| CH8 | | | | |
| CH9 | 67 dBμ/m | 58 dBμ/m | 63 dBμ/m | Encarnacion (RPC) |
| CH10 | | | | |
| CH11 | | | | |
| CH12 | 65 dBμ/m | 77 dBμ/m | 79.8 dBμ/m | Posada (Aregentina) |
| CH13 | | | | |
| FM92.1MHz | | | 83 dBμ/m | Encarnacion |
| FM95.7MHz | | | 83 dBμ/m | Encarnacion |
| FM100.1MHz | | | 87 dBμ/m | No identified |
| FM102.5MHz | | | 107 dBμ/m | No identified |
| FM104.6MHz | | | 96 dBμ/m | No identified |
| FM93.0MHz | | | 60 dBμ/m | No identified |
| FM94.1MHz | | | 52 dBμ/m | No identified |
| FM96.9MHz | | | 47 dBμ/m | No identified |
| FM97.9MHz | | | 77 dBμ/m | No identified |
| FM98.8MHz | | | 76 dBμ/m | No identified |
| FM102.1MHz | | | 76 dBμ/m | No identified |
| FM106.1MHz | | | 72 dBμ/m | No identified |
| UHF | None | | | |

Table 6.3.3 Numbers of Population in the service area of Encarrnacion station

| Transmission point | Cities | Distance | Urban population | Total population | Altitude |
|---|---|---|---|---|---|
| [ITAPUA] | | | | | |
| Cap. Miranda | | | 1,283 | 6,287 | 200m |
| | Encarnacion | 19km | 55,359 | 68,962 | 100m |
| | Cambyretá | 19.3km | 461 | 13,926 | 210m |
| | Nueva Alborada | 11km | 267 | 6,589 | 220m |
| | Bella Vista | 25km | 1,734 | 7,951 | 200m |
| | Obligado | 20.3km | 3,582 | 9,507 | 150m |
| | Hohenau | 16km | 3,017 | 7,959 | 150m |
| | Trinidad | 9.5km | 1,409 | 4,295 | 100m |
| | Pirapó | 43km | 1,437 | △7,025 | 150m |
| | Jesús | 15.5km | 1,841 | 5,242 | 200m |
| | Fram | 25km | 2,004 | △ 6,080 | 150m |
| | Gral. Delgado | 74km | 1,256 | 6,314 | 100m |
| | Cnel. Bogado | 46km | 7,220 | 14,786 | 100m |
| | Carmen del Paraná | 38km | 3,167 | 4,808 | 50m |
| | San Cosme y Damián | 58km | 1,839 | 6,756 | 100m |
| | Cap. Meza | 59km | 450 | 18,502 | 100m |
| | Gral. Artigas | 53km | 3,476 | △ 11,106 | 130m |

Figure 6.3.1 Peripheral cities of Encaruacion station

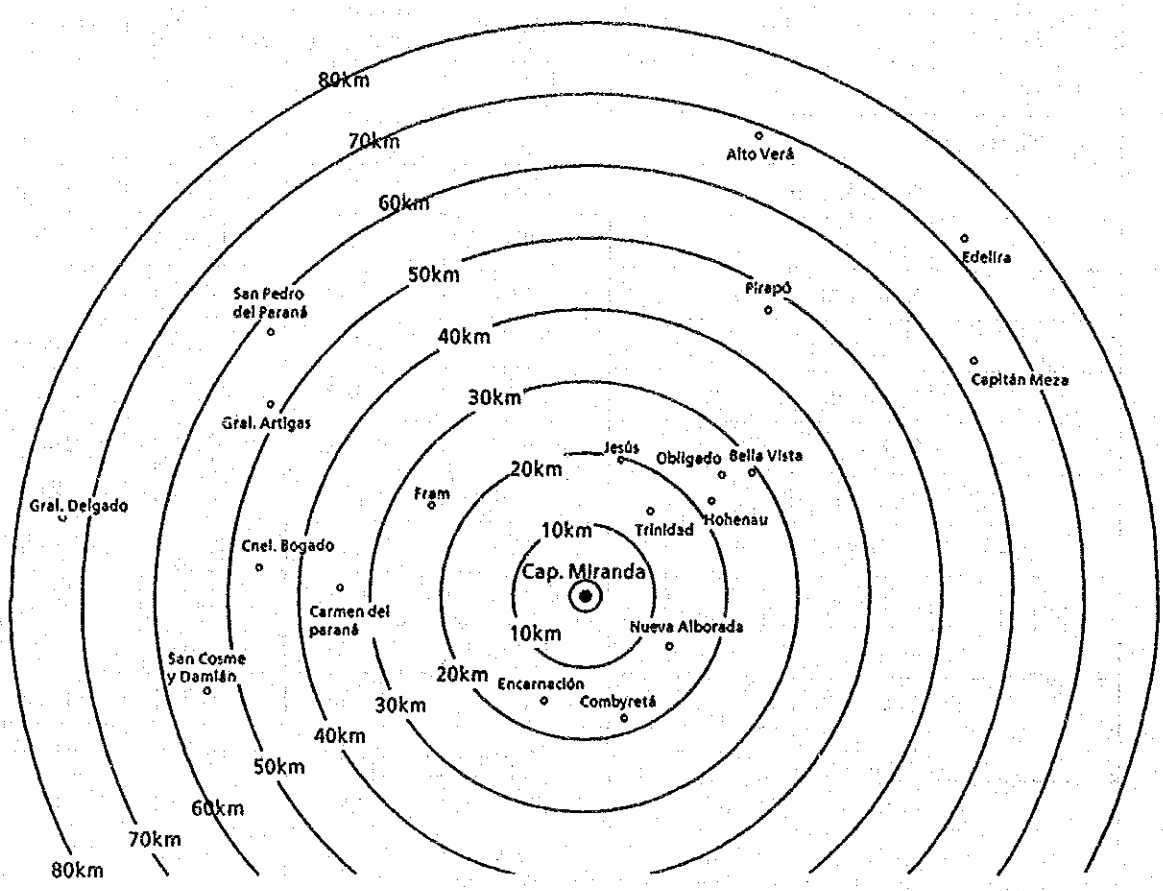
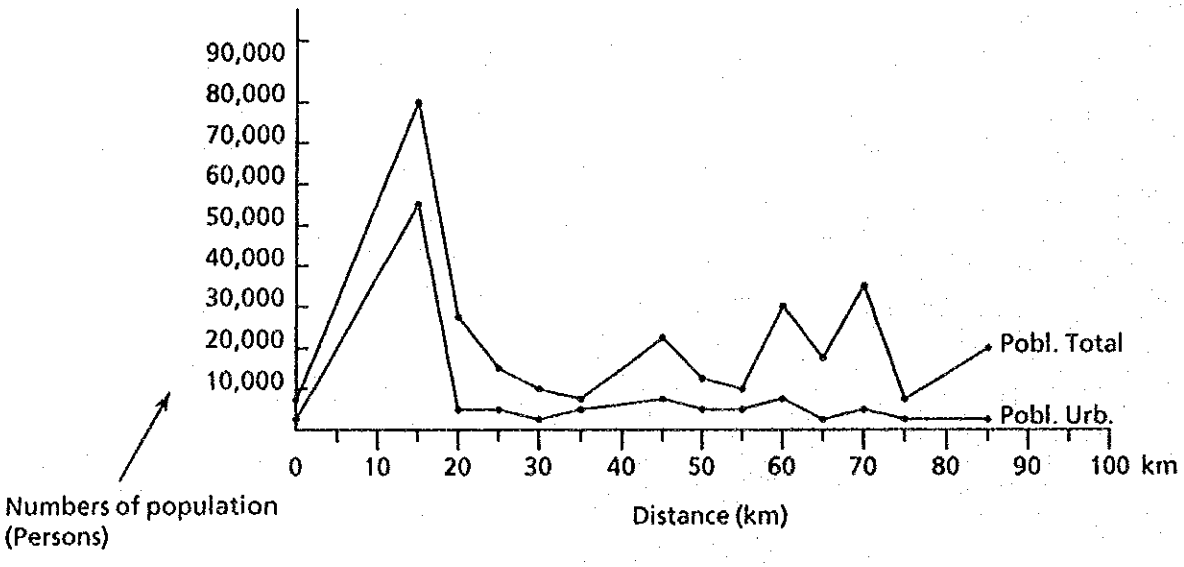



Figure 6.3.2 Population distribution



## 6.4 Villarrica Station

### 1) Location

In order to realize a wide service area (including Guaira, Caaguazu, Caazapa Prefecture) around Villarrica City in the central part of Paraguay, the optimum location which is high altitude and near a power line, has been sought. As a result, the Cerro Naville (291m high), about 10km from Villarrica, has been selected. While the southeastern side of this transmitting point will become a shadow area due to a 850m high mountain, however, this transmitting point is the most suitable for this purpose. The shadow area will be covered with a repeater station in the secondary plan.

### 2) Channel Assignment and Latent Field Strength

Although Channel 10 was assigned to this station at the Four-Country Frequency Adjustment Meeting, use of Channel 10 is considered to be unsuitable, because Channel 9 from the commercial station in Asuncion is received at 36dBu/m. In addition, a commercial TV station which is scheduled to start in Asuncion in the near future intends to use Channel 4. Therefore, the channel for this station is Channel 2 which is most favorable to cover the vast inland areas. No trouble is found against FM waves even when Channel 2 is used.

Supporting report (Table 6.4.2) shows latent field strength.

### 3) Service Area and Population Covered

A considerable wide service area can be secured, because the proposed transmitting point is high altitude and plains lie north to south. Especially, Caaguazu Prefecture on the north has a large population. When TV waves area transmitted from Villarrica, the population in the service area becomes 489,000 which is remarkable larger than that (282,000) of Este station and this station will cover the second largest population after Asuncion Station.

Supporting report (Table 6.4.2) shows population distribution in the Villarrica station.