

THE ARGENTINE REPUBLIC
REPORT
OF
THE FEASIBILITY STUDY AND THE PRELIMINARY DESIGN
FOR
THE AMPLIFICATION OF AN INSPECTION AND
REPAIRING WORKSHOP FOR ELECTRIC ROLLING STOCK

I
(FEASIBILITY STUDY)

SEPTEMBER 1986

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

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(JICA)

国際協力事業団	
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PREFACE

In response to the request of the Government of the Argentine Republic, the Japanese Government decided to conduct a feasibility study and prepare a preliminary design on the Project for the Amplification of an Inspection and Repairing Workshop for Electric Rolling Stock and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Argentine Republic a study team headed by Mr. Shuichi Sawano of the Japan Railway Technical Service from March to April 1985, and from November to December 1985.

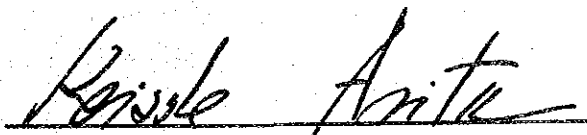
The team had discussions on the Project with the officials concerned of the Government of the Argentine Republic including officials from the Argentine Railways and conducted a field survey.

After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Argentine Republic for the close cooperation extended to the team.

September 1986



Keisuke Arita

President
Japan International
Cooperation Agency

September 1986

Mr. Keisuke Arita
President
Japan International Cooperation
Agency
Tokyo, Japan

Dear Sir,

LETTER OF TRANSMITTAL

We have the pleasure of submitting to you herewith the final report on the feasibility study and the preliminary design for the amplification of an inspection and repairing workshop for Electric Rolling Stock in the Argentine Republic.

The Study was conducted during the period from February 1985 to September 1986, including the field survey carried out from March to April 1985; also, an additional survey for the preliminary design was carried out from November to December 1985.

In the Study, the demand forecast up to the year 2000 was conducted, the number of electric railcars required calculated, and the scale of the workshop determined. Based on the scale of the workshop, the most appropriate plan for implementation was selected from among several construction plans for the workshop through technical and financial investigations. The preliminary design was then worked out to carry this implementation plan into action.

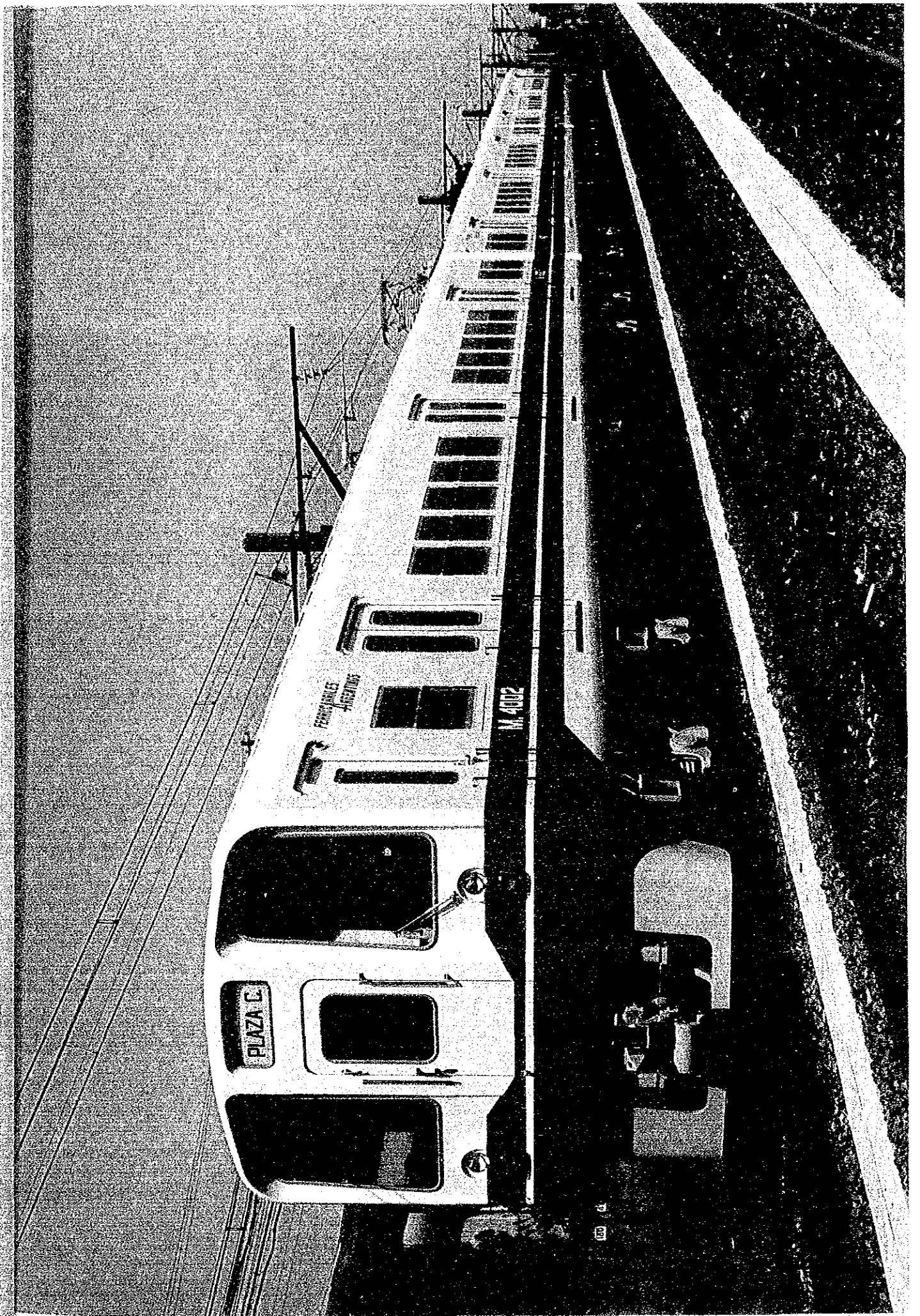
We hope that the study will serve as an access to the future implementation of the Project and accordingly contribute to the nationwide development of the Argentine Republic through the improvement of railway transport.

We wish to express our sincere gratitude to the officials of your agency, Advisory committee, the Embassy of Japan in Argentina, as well as to those concerned in the government of the Argentine Republic, for the kind assistance and cooperation they extended to the Study Team.

Very truly yours,






Tatsuya Ishihara

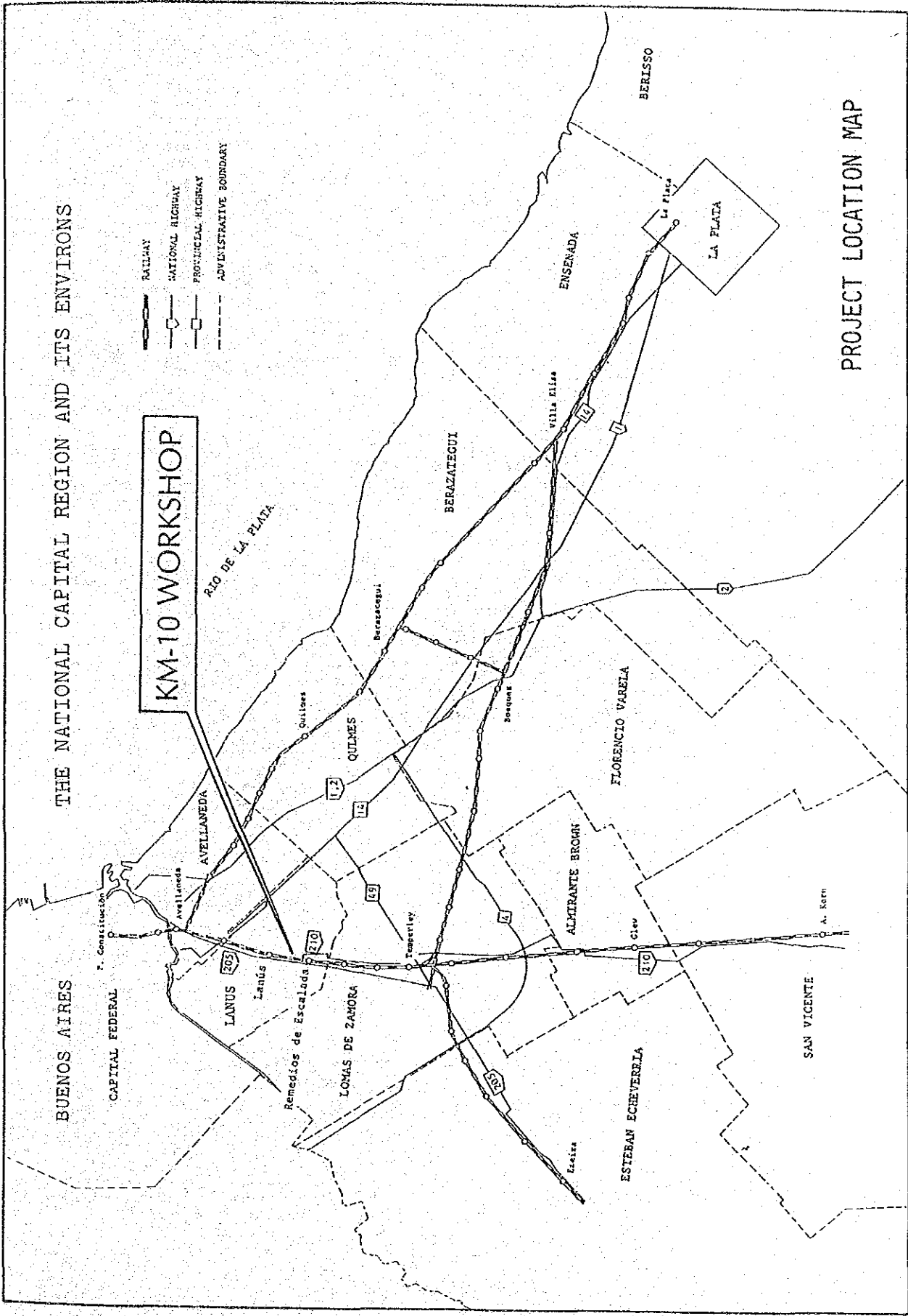
President
Japan Railway Technical Service



THE NATIONAL CAPITAL REGION AND ITS ENVIRONS

KM-10 WORKSHOP

-  RAILWAY
-  NATIONAL HIGHWAY
-  PROVINCIAL HIGHWAY
-  ADMINISTRATIVE BOUNDARY



PROJECT LOCATION MAP

SUMMARY OF THE STUDY

SUMMARY OF THE STUDY

The purpose of this study is to determine the site for the Inspection/Repairing Workshop for electric railcars to be put into service following the 2nd Step electrification (Plaza Constitución - La Plata) of the General Roca Line, and the facilities to be installed to meet the operation requirements.

First, traffic demand forecasting for the year 2000 was carried out for the region where the electrification is planned. A railway transportation plan was drawn up based on the forecast and the number of electric railcars required to meet this traffic demand was calculated. The number of electric railcars thus obtained determined the scale of the workshop. To be specific, it was decided that the KM 10 Workshop (156 cars assigned) planned for the 1st Step electrification should be amplified to cope with the number of electric railcars required for the 2nd Step electrification. In drawing up the amplification plan, four proposals were chosen. Technical and financial studies for them were then carried out, and finally, the optimum plan was chosen.

The decision for the optimum plan was made after full discussion with counterpart personnel of the Argentine Railways in November - December, 1985, on which occasion, the Interim Report was submitted. Then the preliminary design was worked out to carry this optimum plan into action.

The following is a summary of the respective items.

1. Preconditions

This study was carried out on the basis of the following preconditions which were discussed with the Argentine Railways and decided at the time this study was begun.

- (1) It is difficult at this time to specify the timing of the 2nd Step electrification to La Plata. It is, however, presumed that it will have been carried out by the year 2000, and thus, passenger volume is

forecasted for this point in time. Based on these results, the amount of electric railcars required for electrification to La Plata should be calculated and the scale of the workshop should be so decided.

- (2) The workshop required to meet the 1st Step Electrification is assumed to have already been constructed and operating at a site 10 KM from P. Constitución on a scale capable of handling the 156 railcars assigned.
- (3) The inspection and repair system should be studied and the workshop layout made assuming that the electric railcars introduced for the 2nd Step Electrification are to have basically the same specifications as those introduced for the 1st Step Electrification.

2. Total Number of Electric Railcars Needed for the 2nd Step Electrification

It is necessary to know the total number of electric railcars in order to decide the scale of the workshop for the 2nd Step Electrification, and for this, the following procedures were taken.

- (1) The population in the southeastern suburban area of Buenos Aires in the year 2000, which will be served by the 1st Step and the 2nd Step Electrifications, was estimated and the trip generation/attraction was obtained.
- (2) The traffic volume per day and that per hour during the rush hours were calculated for each route on the General Roca Line. In this connection, the Plaza Constitución - Avellaneda section with the largest traffic had a traffic volume of 204,500 persons per day and a rush hour volume of 23,100 persons per hour.
- (3) The transportation plan was drawn up based on the traffic demand forecast and it was found that 28 trains would be needed. These trains, in principle, are composed of six-car formations but there are some nine-car and three-car formations.

- (4) As a result of this transportation plan, the total number of cars was set at 315, that is, 273 cars for daily operation, 15 cars for extra operation, and 27 cars to cover inspection/repairing.

3. Workshop Construction Plan in Accordance with the 2nd Step Electrification

Based on the number of electric railcars calculated in the preceding paragraphs, 54 sorts of amplification plans were studied according to the process shown in the following paragraphs, and four proposals were selected from among them.

- (1) The number of railcars required for the 1st and 2nd Step Electrification was calculated to be 315 cars as already mentioned. Since this number is practically the same as the 318 cars estimated by the Argentine Railways before, the number 318 will be used hereafter.
- (2) As the construction of the KM 10 Workshop (156 cars assigned) is scheduled to cope with the 1st Step Electrification, the scale of this workshop will be amplified to handle 318 assigned cars for the 2nd Step Electrification.
- (3) In drawing up the amplification plan, first, the following three processes for Overall Inspections were set up.

Process A: This is basically the same process as planned for the 1st Step KM 10 Workshop.

Process B: Entrance inspections by three-car unit is omitted from Process A, shortening the bogie disassembling and washing process by half a day to eliminate the waiting time for bogie washing.

Process C: In Process B, a bogie washing machine was used for washing wheels and axles as well, but in Process C, a wheels and axles washing machine is newly installed to eliminate the waiting time for wheels and axles washing.

- (4) Intervals between shop-ins for Overall Inspections and Intermediary Inspections were set at nine days, respectively, according to the inspection periodicity, the number of assigned cars, and the annual number of working days. The difference between Overall Inspection and Intermediary Inspection shop-in dates can be seen in nine ways, -3, -2, -1, 0, 1, 2, 3, 4, and 5. The figure -3, for instance, means that shop-in for Intermediary Inspections will occur three days earlier than that for Overall Inspections. Two proposals were drawn up regarding the direction in which No. 1 Workshop is to be extended.

Therefore, altogether there are 54 (i.e., $3 \times 9 \times 2$) different proposals.

- (5) In consideration of the capacity of each shop and the fluctuations of work amount, four proposals were chosen, Proposal Ia (A + 2), Proposal Ib (A + 2), Proposal II (C + 2), and Proposal III (C - 1).

- (6) The shop layout was studied in relation to these proposals.

4. Selection of the Optimum Plan for the Workshop Amplification

The optimum plan was chosen from among the four proposals after making a technical study first and then a financial study.

- (1) The technical study included studies of the load of machines in each shop and space usage conditions. As a result, it was found that the crane operating frequency and bogie disassembling/assembling frequency in the bogie shop in Proposal Ia and Proposal Ib were too high with not much extra handling capacity, making it difficult to maintain the standard Process in case some disorder should arise in the process. Therefore, Proposal II and Proposal III were chosen from the four proposals.

- (2) Next, a financial study was made of these two proposals.

- (3) Finally, as a result of a general evaluation, Proposal II was selected as the optimum for the workshop amplification plan because of its technical and financial superiority.
- (4) The results of the feasibility study (Interim Report) were reported to the Argentine Railways in November - December 1985, and as a result of discussions between the two parties on that occasion, the adoption of Proposal II was decided.

5. Preliminary Design

Based on the results of the above-mentioned feasibility study, the preliminary design was made to give shape to the workshop amplification plan.

- (1) In preparing the preliminary design, the relevant preconditions were first discussed and decided with the Argentine Railways counterparts.
- (2) Next, based on these preconditions the layout of the workshop as a whole and of individual shops within it were arranged and the inspection and repair machinery to be added was decided.
- (3) Furthermore, a study was made of tracks, catenary, buildings and their incidental facilities and equipments based on the preceding paragraphs.
- (4) Finally, a study was made of the work process for the execution of amplification work and construction costs, etc.

The preliminary design and drawings were each compiled as separate volumes besides the volume on the feasibility study.

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CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

1-1 Background of the Study

Buenos Aires, the capital of Argentina, is a large city with a population of approximately three millions. When its surrounding areas are included, Greater Buenos Aires have a population of about 10 millions comprising more than a third of the nation's total population. The current situation of population distribution indicates that the trend of the population to concentrate in city built-up areas has ended and population increase in suburban areas is becoming conspicuous.

It is under these conditions that passenger transportation service has been carried out between the city and its surrounding areas principally by trains (Fig. 1.1.1) and buses. Transportation service in the northern and western parts of the metropolis, in particular, is performed by D.C. electric trains. On the other hand, however, transportation service has reached an impasse in the southern part (Fig. 1.1.2) due to delays in the modernization of the General Roca Line which serves that area.

In view of these conditions, the Argentine Railways plans to improve transportation service through the A.C. electrification of 150 km of the suburban part of the General Roca Line all the way to La Plata, the capital city of the province of Buenos Aires.

However, after frequent delays in the commencement of construction for economic reasons, work was divided into two parts, 1st Step and 2nd Step, and construction began on the 1st Step (Fig. 1.1.3) in December 1981.

1st Step electrification sections:

Plaza Constitución - Temperley (western line)

Temperley - Ezeiza,

Temperley - Glew

Total: 44.8 km (besides 10.3 km for planned Glew - Alejandro Korn electrification prior to 2nd Step electrified service)

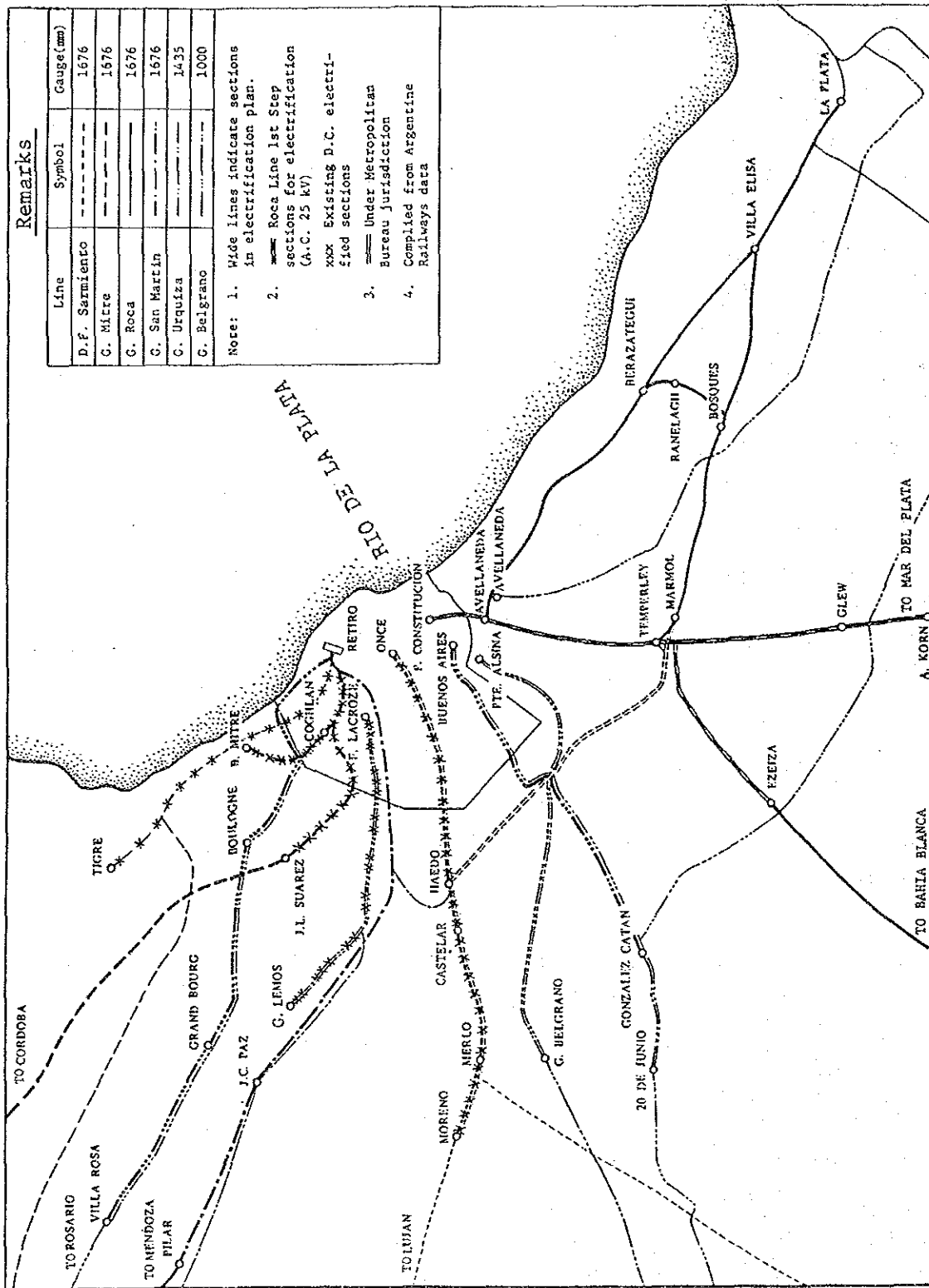


Fig. 1.1.1 Argentine Railways Route Map (Buenos Aires Suburban Lines)

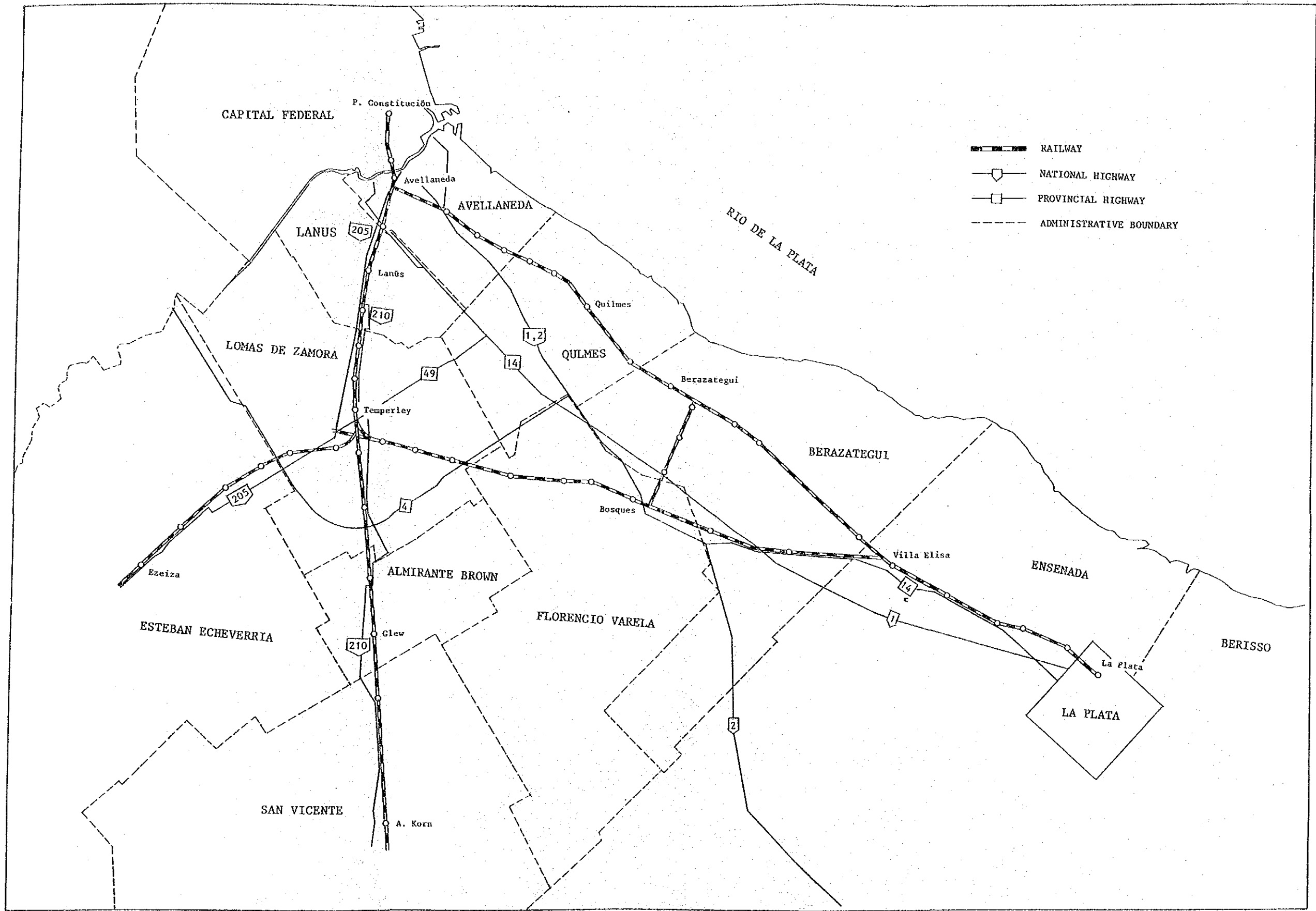


Fig. 1.1.2 Route Map for Area Southeast of Buenos Aires

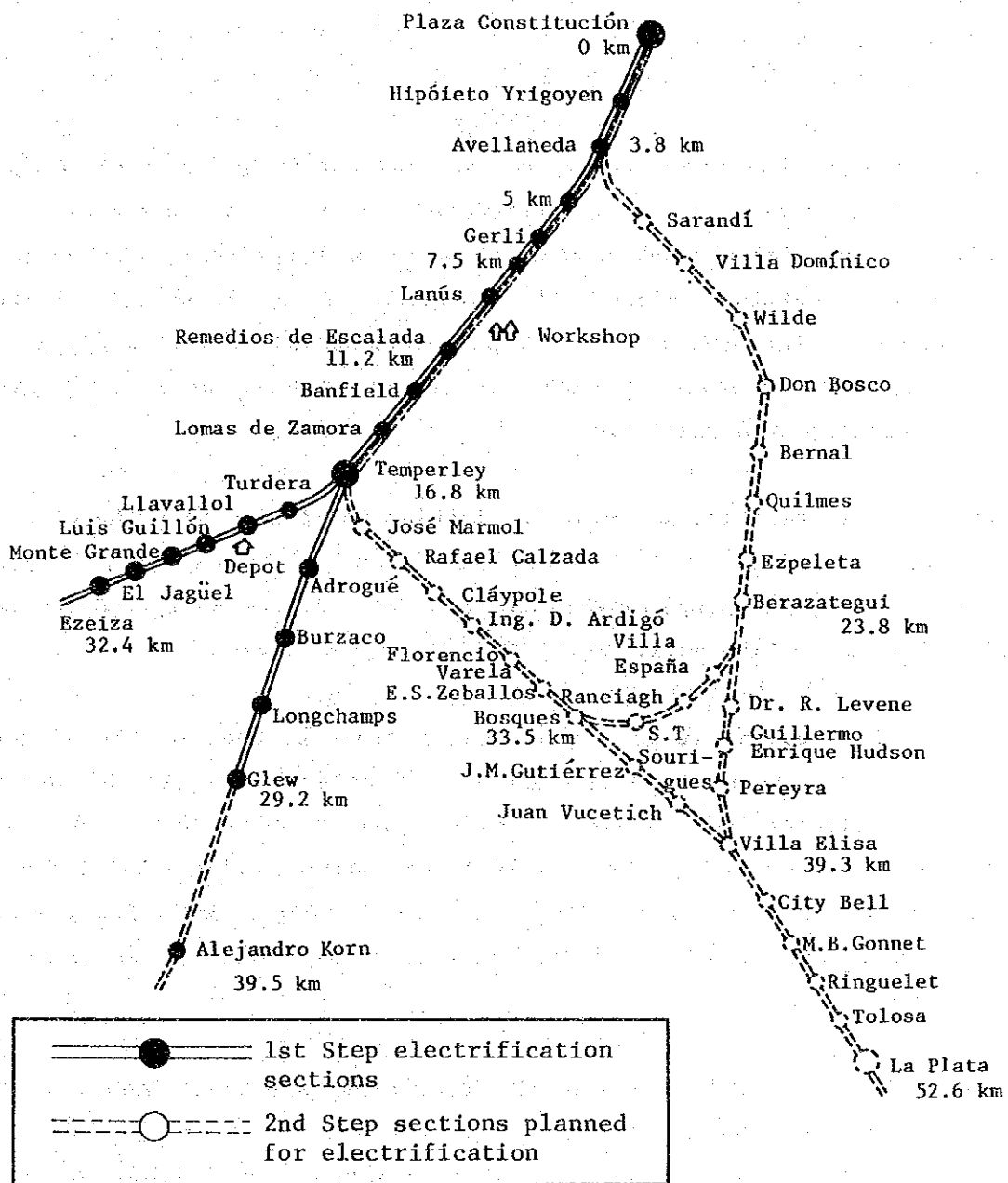


Fig. 1.1.3 General Roca Line Electrified Sections and Those Planned for Electrification

2nd Step electrification sections:

Plaza Constitucion - La Plata,
Avellaneda - Temperley (eastern line),
Temperley - Villa Elisa,
Bosques - Berazategui
Total: 105.6 km

Work has steadily progressed on the 1st Step electrification sections since then and electrified service is scheduled to begin in December 1985. (Actually, the service was inaugurated on November 9, earlier than the schedule, and is receiving passengers' welcome.) A total of 156 electric railcars will be introduced for this purpose, and an inspection/repairing workshop for this new rolling stock will be constructed at a point 10 km from Plaza Constitución Station.

Furthermore, the Argentine Railways is planning to proceed with the electrification of the 2nd Step sections with the opening of the 1st Step electrified sections, and preparations are under way for the early commencement of relevant construction work.

With such a background, it is urgent that a study be made of the electric railcar inspection/repairing system which will be necessary for the opening of 2nd Step electrified service. Under these circumstances, the Japan International Cooperation Agency (JICA) has agreed with the Argentine Railways to undertake a feasibility study and draw up a preliminary design for the amplification of an inspection/repairing workshop for electric rolling stock.

This study began in February 1985 in accordance with the Scope of Work agreed upon in July 1984.

1-2 Objective of the Study

Under the background described in the previous section, a study is made of how to cope with the inspection/repairing of the additional electric railcars for the 2nd Step electrification of the General Roca Line, based on the scale of the electric railcar inspection/repairing workshop needed for the 1st Step General Roca Line electrification. This specifically aims at undertaking the following tasks.

1-2-1 Feasibility Study for the Workshop Amplification Plan

The traffic demand forecast and transportation planning carried out by the Argentine Railways is reviewed in order to find out the total number of electric railcars necessitated by the opening of the 2nd Step electrified service on the suburban portion of the General Roca Line.

Since the total number of electric railcars found thereby will determine the scale of the workshop, a number of proposals for the amplification plan corresponding to this scale will be drawn up, and the one which is considered best will be chosen from technical and economic standpoints.

1-2-2 Preliminary Design

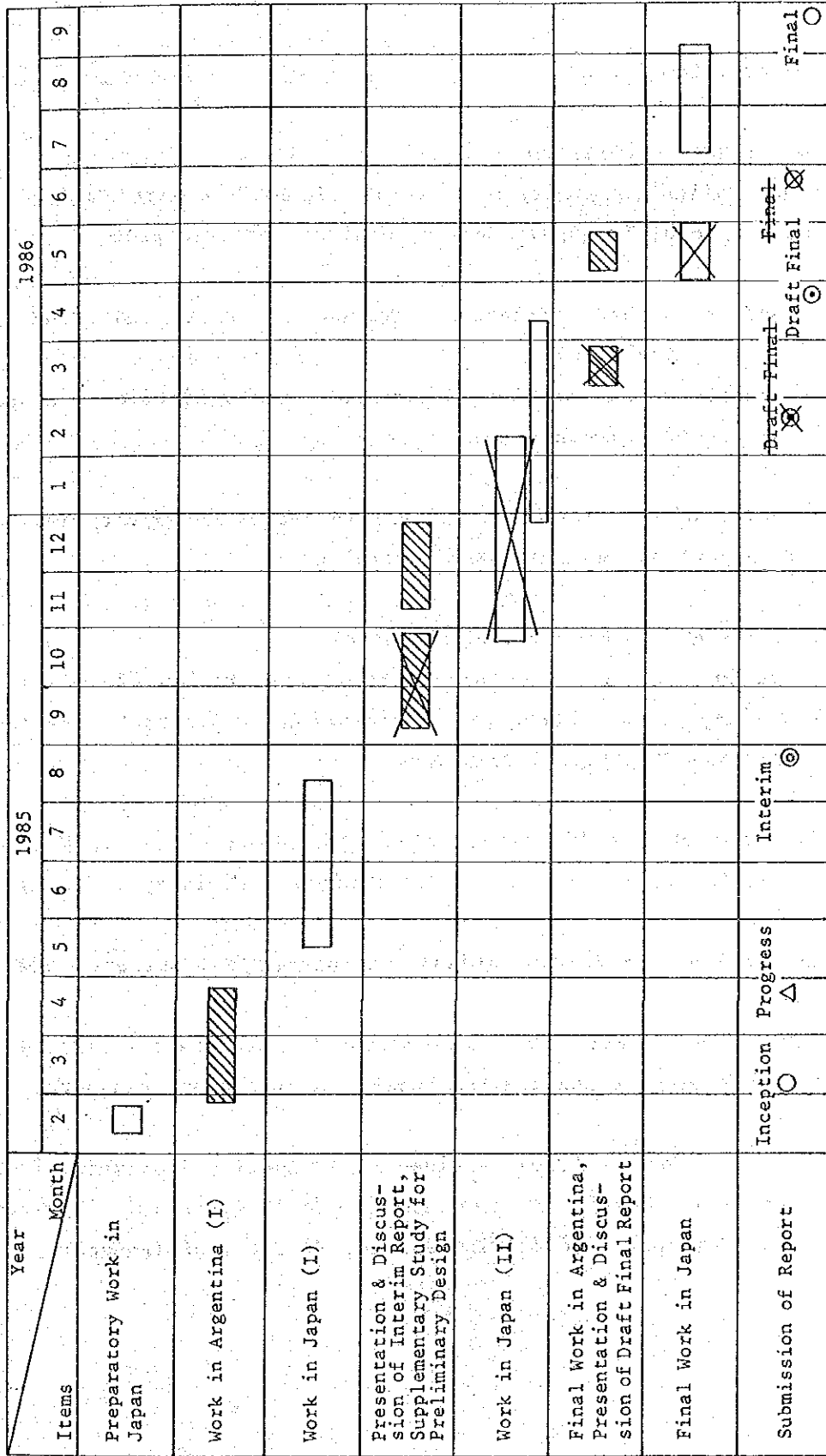
For the materialization of the amplification plan of KM 10 Workshop, the preliminary design will be worked out for the plan selected after the feasibility study.

Counterparts of the Argentine Railways will be given guidance on the "workshop construction plan" process. As this is to be carried out consistently from the "field survey" stage through the "explanation of the interim report and the additional survey for the preliminary design" stage and on to the "explanation of the draft final report" stage, technology transfer is planned to be carried out throughout all these stages.

The results of this guidance can be expected to bear fruit not only on the occasion of the present General Roca Line electric railcar inspection/repairing workshop construction, but also when it becomes necessary in the near future to study the construction of the General Mitre Line's electric locomotive inspection/repairing workshop.

1-3 Study Schedule

The study schedule is shown in Fig. 1.3.1.



Because of the circumstances of the Argentine Railways, the schedule for the "Presentation & Discussion of Interim Report, Supplementary Study for preliminary Design" was delayed by two months, and the following schedule have been amended accordingly. (November, 1985)

Fig. 1.3.1 Study Schedule

1-4 Personnel Organization for the Study

1-4-1 JICA Advisory Committee

- (1) Mr. Tatsumi HONDA -- Chairman
Director of Railway Facilities Division, Land Transport Engineering Department, Regional Transport Bureau, Ministry of Transport

- (2) Mr. Kazuo SATO -- Member (Transport Demand Forecast and Financial Analysis)
Director-General of the Railways Department, Kanto District Transport Bureau, Ministry of Transport
(Previously)
Deputy Director of the Division, Railway Passenger Transport Division, Regional Transport Bureau, Ministry of Transport

- (3) Mr. Tadashi IWASAKI -- Member (Rolling Stock)
Deputy Director of the Division, Safety Operation and Rolling Stock Division, Land Transport Engineering Department, Regional Transport Bureau, Ministry of Transport
(Previously)
Deputy Director of the Division, Safety Operation Division, National Railways Department, Secretariat to the Minister, Ministry of Transport

- (4) Mr. Fumio TSUTSUI -- Member (Civil Engineering) (February, 1985 - March, 1986)
Senior Research Staff of International Cooperation Division, International Transport and Tourism Bureau, Ministry of Transport

Mr. Koji SAITO -- Member (Civil Engineering) (April - September, 1986)
Senior Research Staff of International Cooperation Division, International Transport and Tourism Bureau, Ministry of Transport

1-4-2 Study Team Members

(1) Team leader/deputy leader

Mr. Shuichi SAWANO Team Leader

Mr. Susumu TSUMORI Deputy Leader/System Engineering

(2) Transport demand forecast

Mr. Setsuo MORITA

(3) Transport planning, rolling stock planning

Mr. Toshimitsu IRIE

(4) Rolling stock/workshop engineering

Mr. Hiromi SHIMOKAWA Workshop Plan

Mr. Yoichi IKEDA Inspection and Repair Plan

Mr. Wahei AIDA Work Plan/Layout

Mr. Shin-ichi OHASHI Machine Equipment Plan

(5) Architecture

Mr. Takao YOSHIIRI

(6) Financial analysis

Mr. Kimiaki IJUIN

1-4-3 Argentine Railways Executives

(March - April, 1985 when Field Survey was conducted)

Mr. Norberto CINAT	Director
Mr. Fernando FREDIANI	Manager, Electrification Planning Team I
Mr. Carlos PETTINAROLI	Electrification Coordinator

(November - December, 1985 when Interim Report was made)

Mr. Héctor ZANELLI	Vice-President F.A.
Mr. Jorge BILOTTI	Manager of Electrification Coordination
Mr. Carlos PETTINAROLI	Electrification Coordinator

(May, 1986 when Draft Final Report was made)

Mr. Héctor ZANELLI	Vice-President F.A.
Mr. Jorge BILOTTI	Manager of Electrification Coordination

1-4-4 Argentine Railways Counterpart Personnel

(March - April, 1985 when Field Survey was conducted)

- (1) Team leader
Mr. Diego FELIU BADALO Executive Vice-President Adviser
- (2) Expert on railway traffic demand forecasting
Mr. Daniel H. IGLESIAS Electrification Coordination
Department, Group IV (San Martin Line)
- (3) Transport planning specialist, rolling stock planning specialist
Mr. Carlos Rodolfo RIOS Electrification Coordination
Department, Group I (Traffic)

(6) Financial analyst
Mrs. Nora Cristina C. de EDO Technic Administrative Secretary,
F.A. Presidence Technical Department

(May, 1986 when Draft Final Report was made)

(1) Team Leader
Mr. Diego FELIU BADALO Executive Vice-President Advisor

(2) Inspection and repairing specialist
Mr. Hugo A. ORTEGA Electrification Coordination Department,
Group I (Rolling stock)
Mr. Haroldo A. MALAVOLA Ditto
Mr. Carlos Rodolfo RIOS Electrification Coordination Department,
Group I (Traffic)

(3) Architect
Ms. Olga Graciela MELGAREJO Electrification Coordination Department,
Group III
Mr. Jorge BALCELLS Ditto
Mr. Ricardo A. MARTINES Ditto
Mr. Rolando ROMANZI Ditto