

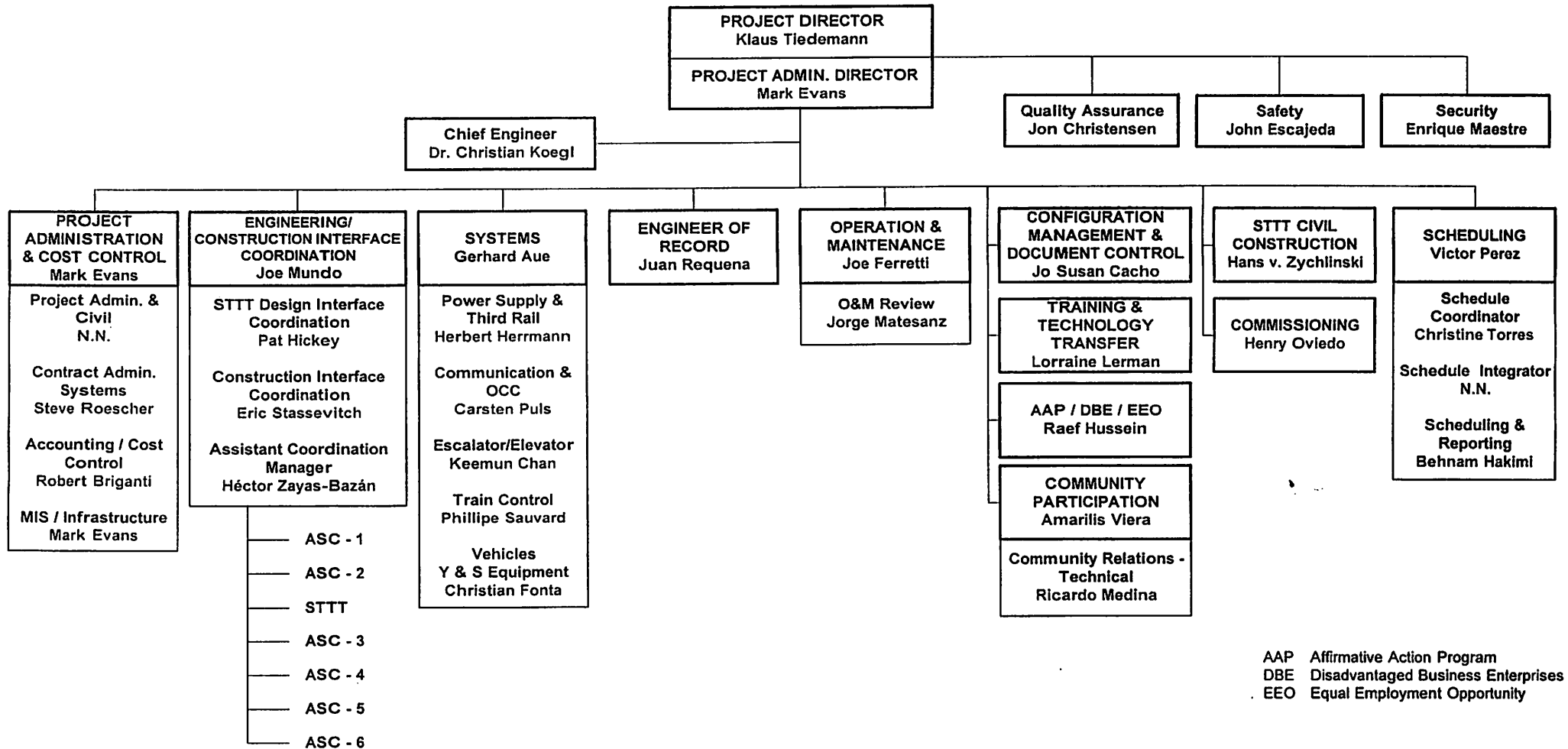
**V Encuentro UPR/MIT sobre el Tren Urbano
7-15 de enero de 1999**

**5th UPR/MIT Conference on Tren Urbano
January 7 – 15, 1999**

Jueves, 14 de enero de 1999 Coordinador	Dr. Nelson Irizarry	Thursday, January 14, 1999 Coordinator
Panel de Siemens Transit Team sobre coordinación, sistemas, operaciones y mantenimiento Mark Evans, Director de Administración del Proyecto Joe Mundo, Gerente de Coordinación Gerhard Aue, Gerente de Sistemas Joe Ferretti, Gerente de Operaciones y Mantenimiento	9:00 – 10:00	Panel Presentation by Siemens Transit Team on Interface Coordination, Systems, Operations & Maintenance Mark Evans, Project Administration Director Joe Mundo, Interface Coordination Manager Gerhard Aue, Systems Manager Joe Ferretti, Operations & Maintenance Manager
Receso	10:00-10:30	Break
Continúa Panel de Siemens	10:30-11:30	Continuation of Siemens Panel
Presentación sobre la extensión de Minillas Arq. Javier Mirandés, Gerente de Licitación de la Extensión de Minillas, Oficina del Tren Urbano	11:30-12:00	Presentation on Minillas Extension Arch. Javier Mirandés, Procurement Manager for Minillas Extension, Tren Urbano Office
Almuerzo	12:00-1:00	Lunch
4^{ta} Sesión de posters <i>(ver itinerario aparte para los posters del día)</i>	1:00-1:45	4th Poster Session <i>(see separate schedule for featured posters)</i>
Visita a la alineación en Helicóptero (Traslado al Aeropuerto de Isla Grande en vanes. Viajes se harán en grupos de 5 personas.)	1:45-5:00	Helicopter Tour of Tren Urbano Alignment (Transfer to Isla Grande Airport by vans. Tours will be 5 persons per trip.)

Siemens Transit Team

Overall Project Management Organizational Chart



AAP Affirmative Action Program
 DBE Disadvantaged Business Enterprises
 EEO Equal Employment Opportunity



TREN URBANO



SIEMENS Transit Team

Tren Urbano UPR/MIT Professional Development Program “Encuentro V”

INTERFACE COORDINATION Siemens Transit Team

**Joe Mundo
Interface Coordination Manager
STT/Parsons Brinckerhoff**



TREN URBANO



SIEMENS Transit Team

• Interface Coordination



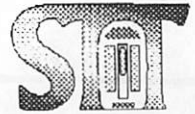
✓ What is it?

- ✓ Have we ever heard of it before?
- ✓ Did our engineering studies cover it?

✓ Why do we have it on the Tren Urbano project?



TREN URBANO

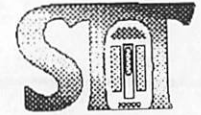


SIEMENS Transit Team

For the Tren Urbano Project
Interface Coordination is:
the **coordination** of the Project Wide Turn-
Key Contractor (STTT) **Systems**
Requirements (civil & spacial needs) with
the simultaneous **“civil work”** designs and
construction of each of the 6 independent
alignment section design/build contractors
(ASC's)



TREN URBANO



SIEMENS Transit Team

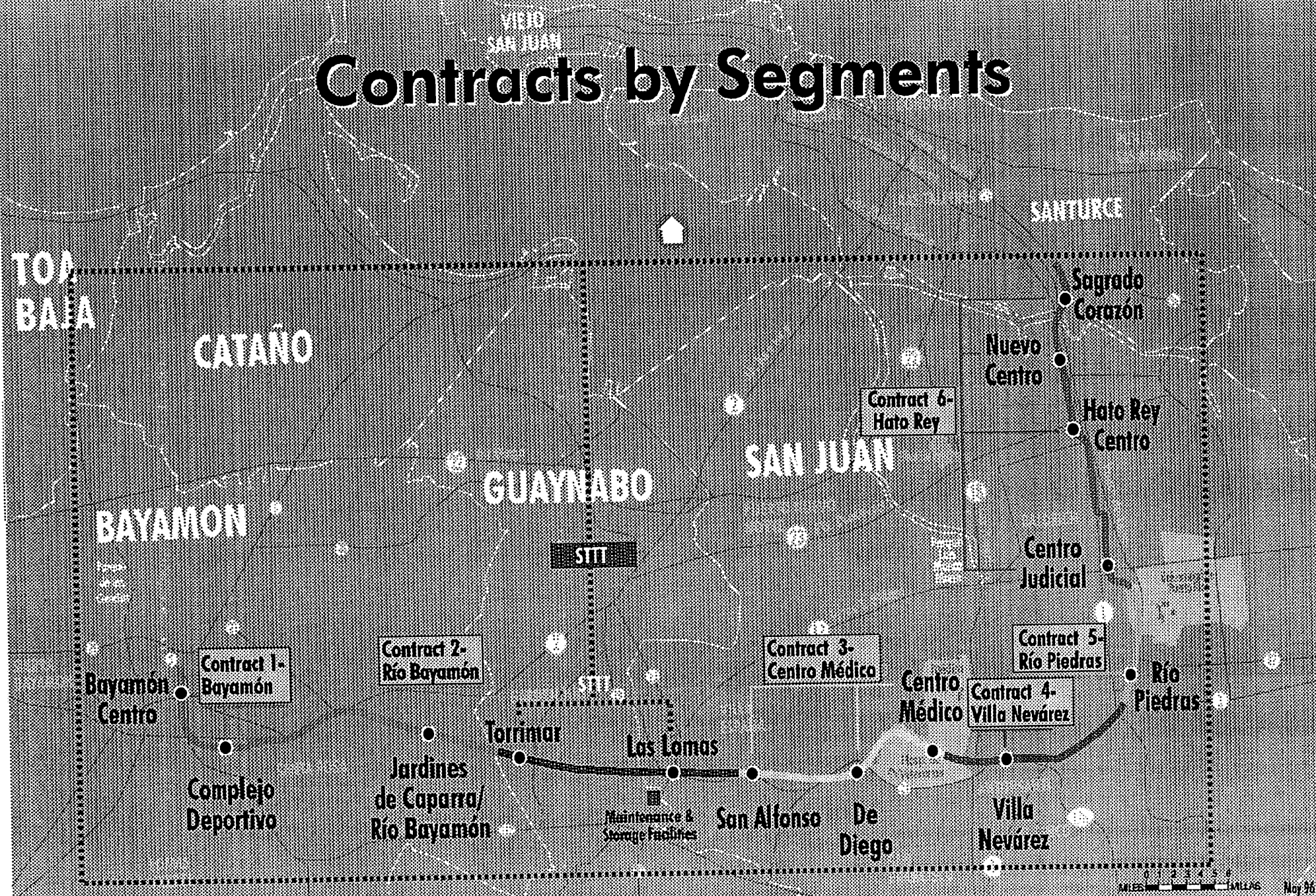
For the Tren Urbano Project

Interface Coordination is:

the coordination of the interfaces of **Systems Design & Installation with Facilities Design & Construction.**

To better understand Interface Coordination, we need to better understand the Tren Urbano design/build project.

Contracts by Segments



[illegible]

Distances

BAYAMON

17.2 KM

SANTURCE



TREN URBANO - SIEMENS TRANSIT TEAM Manta De Caballo (Marching Chart)



Alignment Sec. Contract	# 1	# 2	STTT	#3	# 4	#5	# 6
Distances	98+70 BAYAMON	123+10	143+80	170+00	195+63	216+70 231+19	268+34 SANTURCE
1996							
1997							
1998							
1999							
2000							
2001							



LEGEND

- ☐ Aerial/Direct Fixation
☐ At Grade & Rtn. Cut/ Ballasted Track
☐ Tunnel

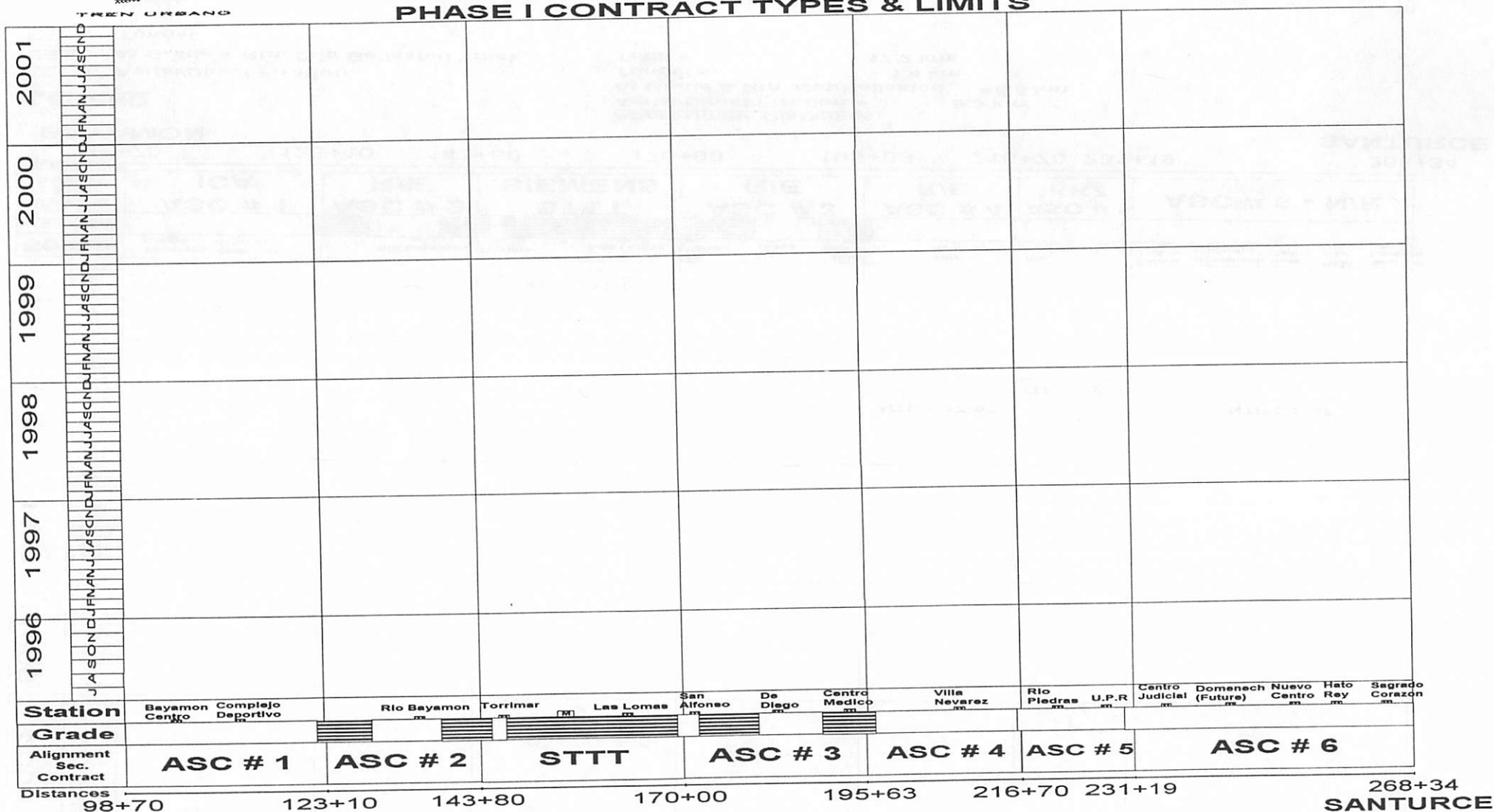
Approximate Distances:

Approximate Distances:

Aerial/Direct Fixation =	9.3 km
At Grade & Rtn. Cut/Ballasted =	6.5 km
Tunnel =	1.4 km
Total =	17.2 km



TREN URBANO - SIEMENS TRANSIT TEAM **Manta De Caballo (Marching Chart)** **PHASE I CONTRACT TYPES & LIMITS**



LEGEND

- Aerial/Direct Fixation
- At Grade & Rtn. Cut/ Ballasted Track
- Tunnel

Approximate Distances:

Aerial/Direct Fixation = 9.3 km
 At Grade & Rtn. Cut/Ballasted = 6.5 km
 Tunnel = 1.4 km
 Total = 17.2 km



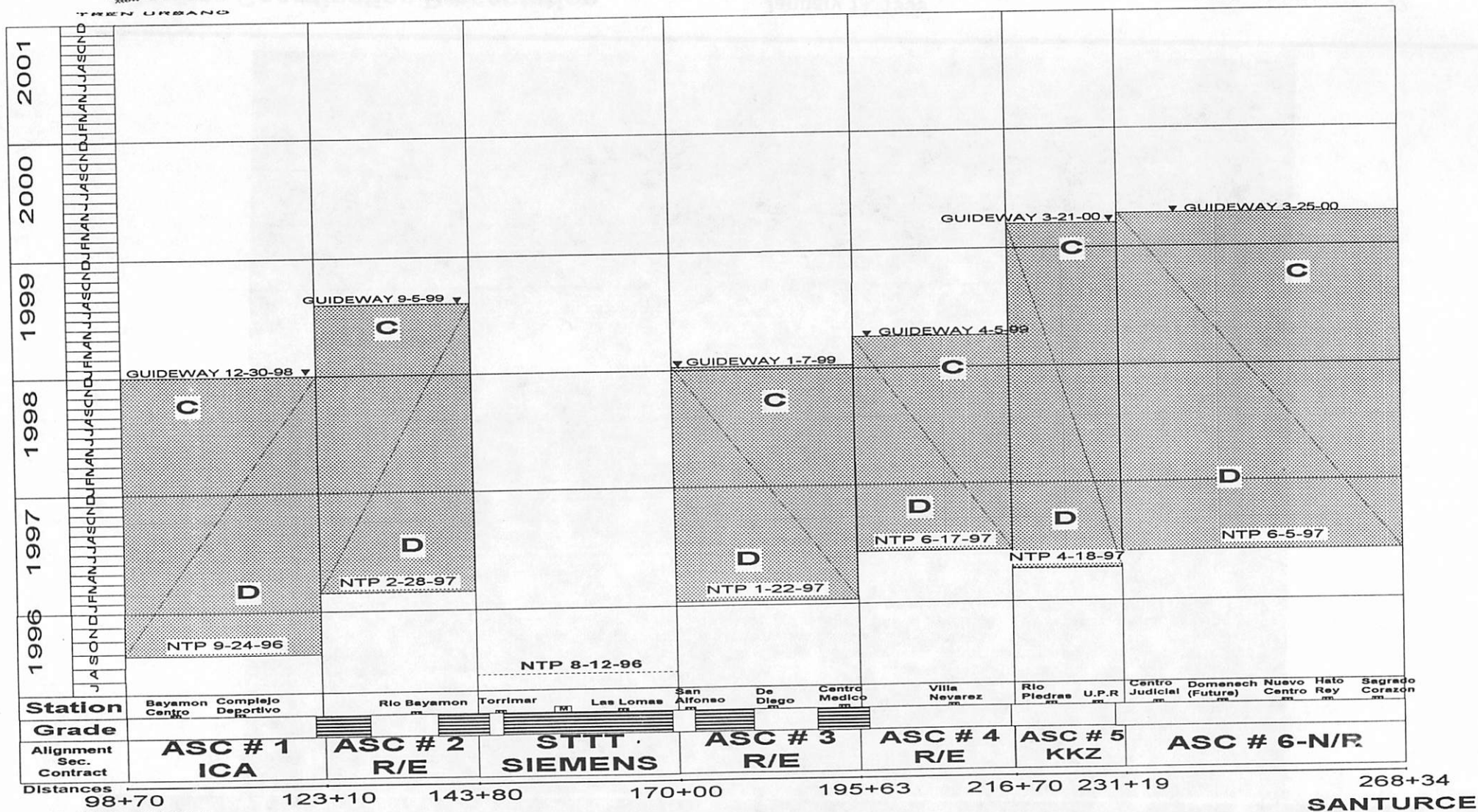
☐ Aerial/Direct Fixation
☒ At Grade & Rtn. Cut/ Ballasted Track
☐ Tunnel

Approximate Distances:

Aerial/Direct Fixation =	9.3 km
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Total =	17.2 km



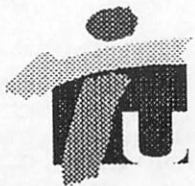
TREN URBANO - SIEMENS TRANSIT TEAM Manta De Caballo (Marching Chart)



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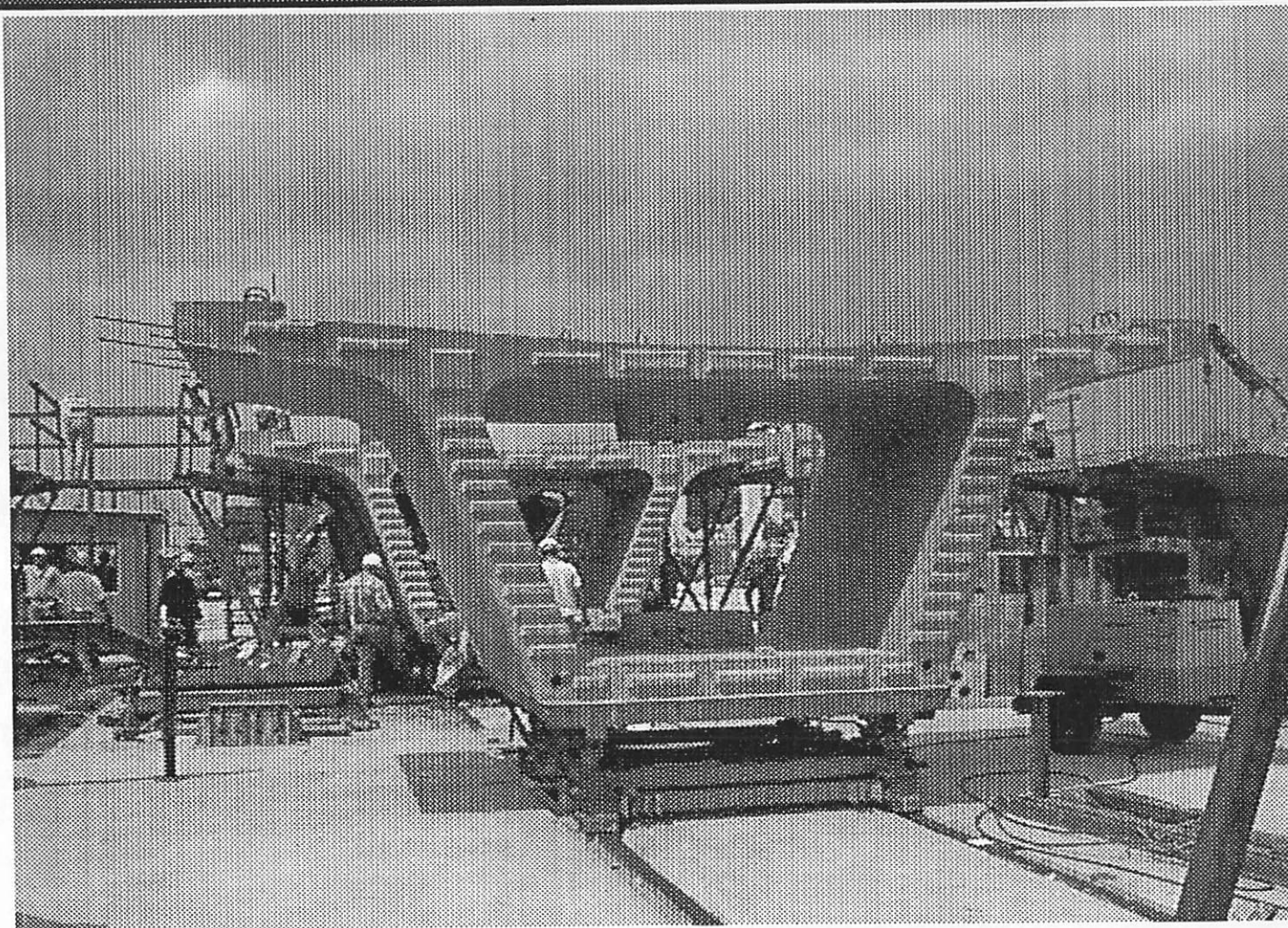
D=DESIGN
C= CONSTRUCTION

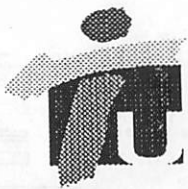


TREN URBANO

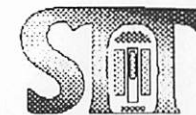


SIEMENS Transit Team

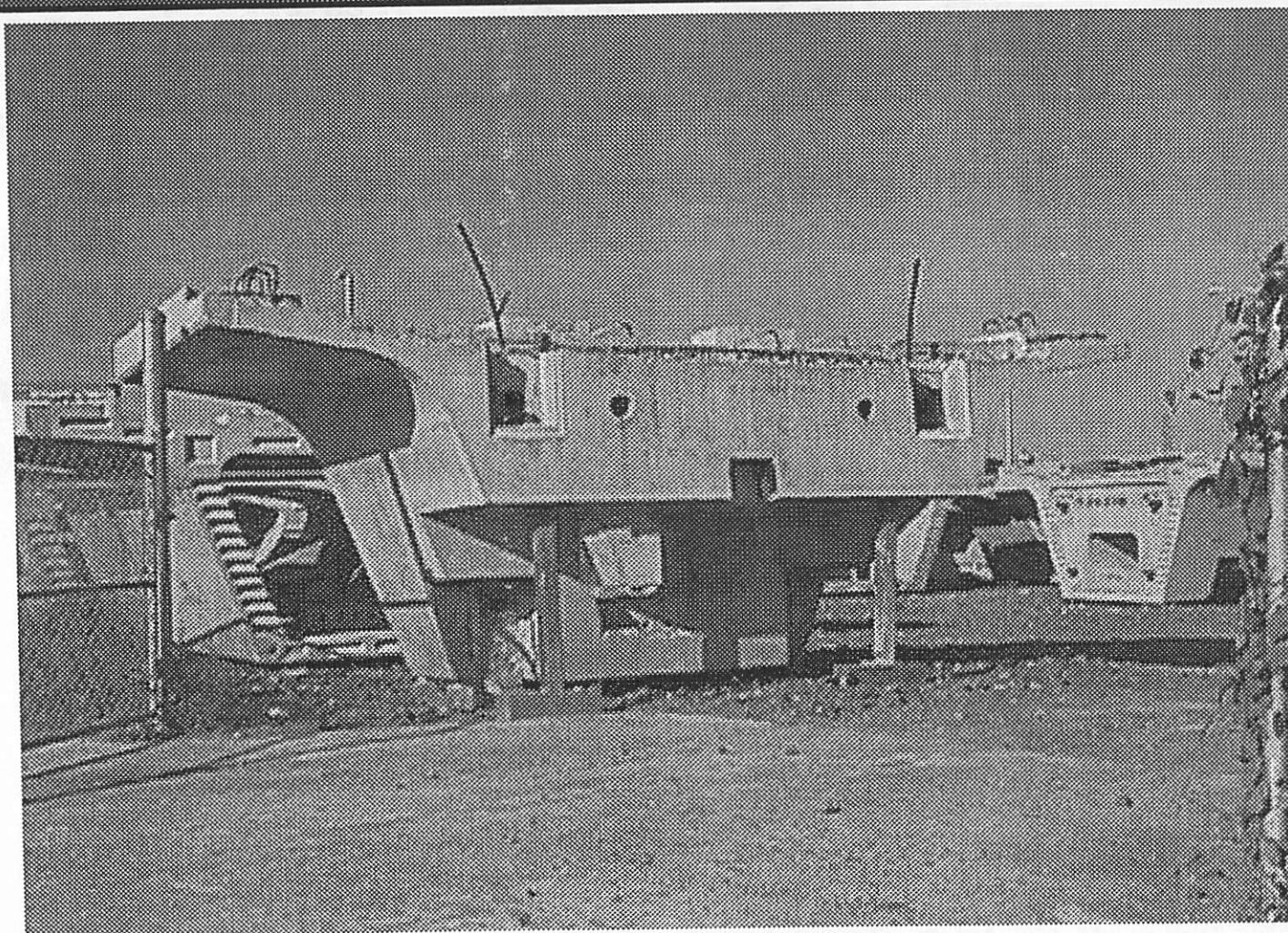




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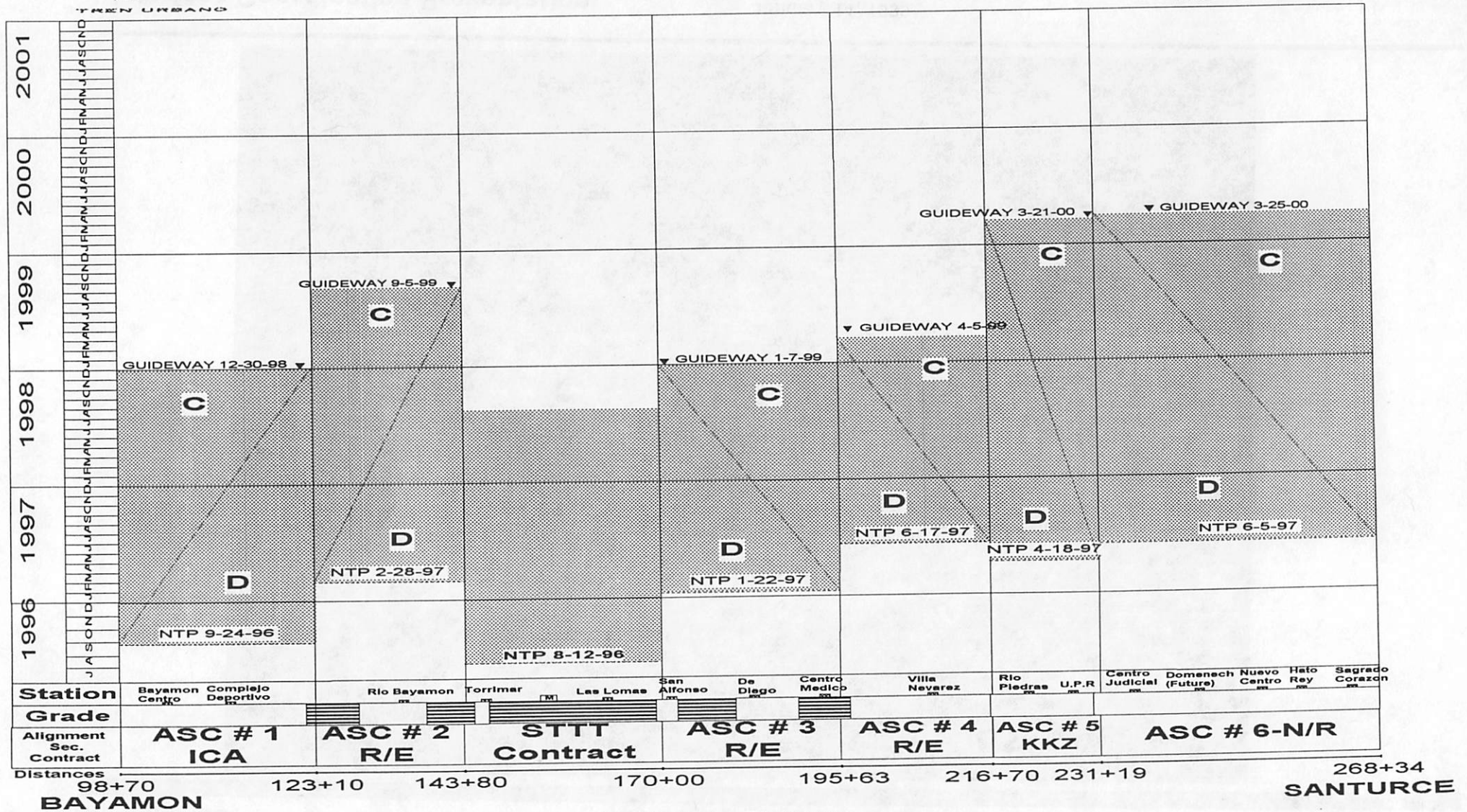


SIEMENS Transit Team





TREN URBANO - SIEMENS TRANSIT TEAM **Manta De Caballo (Marching Chart)**



LEGEND

- Aerial/Direct Fixation
- At Grade & Rtn. Cut/ Ballasted Track
- Tunnel
- Civil Work (ASC)
- Systemwide Installation

Approximate Distances:

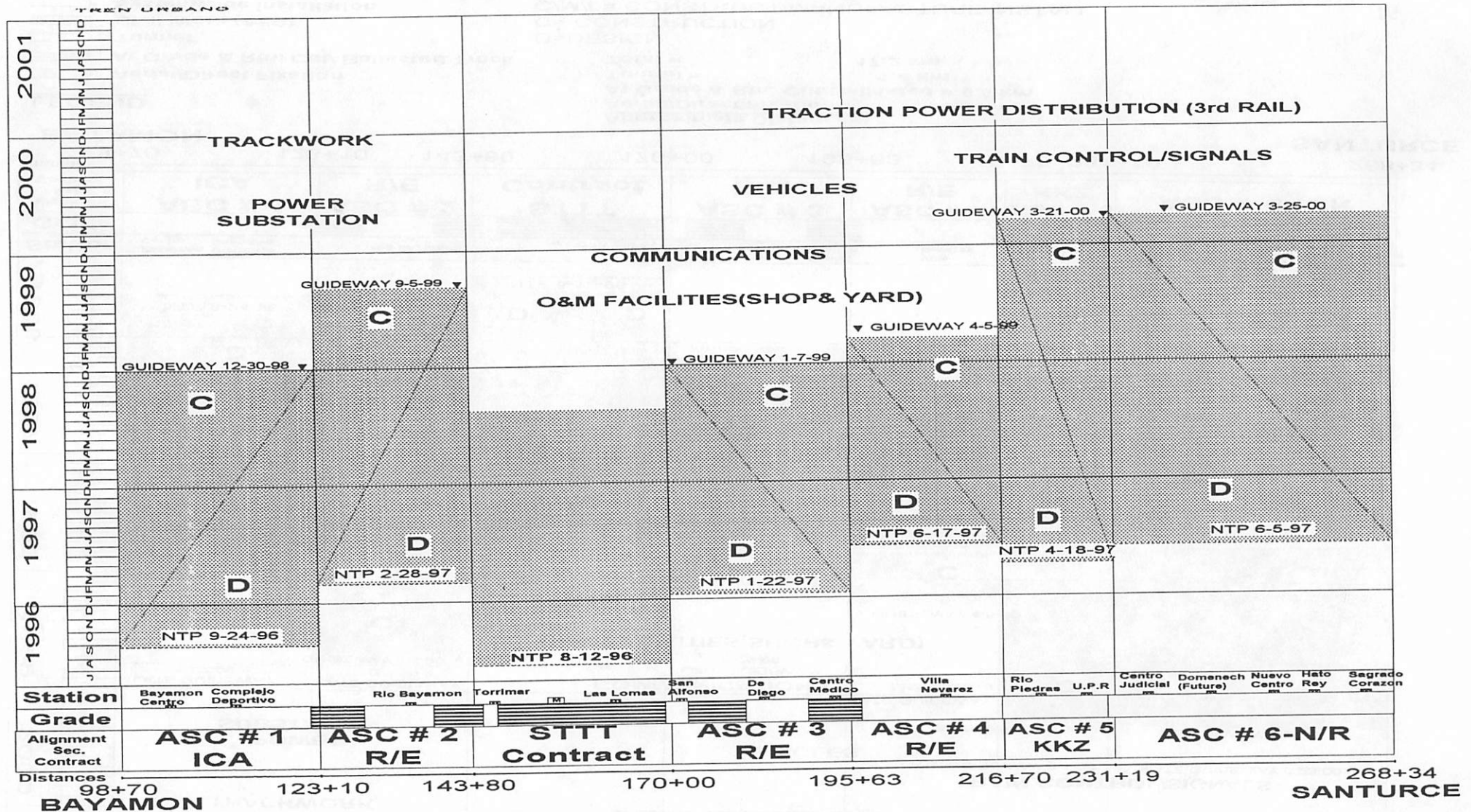
Aerial/Direct Fixation = 9.3 km
 At Grade & Rtn. Cut/Ballasted = 6.5 km
 Tunnel = 1.4 km
 Total = 17.2 km

D=DESIGN
 C= CONSTRUCTION



TREN URBANO - SIEMENS TRANSIT TEAM

Manta De Caballo (Marching Chart)



LEGEND

- Aerial/Direct Fixation
- At Grade & Rtn. Cut/ Ballasted Track
- Tunnel
- Civil Work (ASC)
- Systemwide Installation

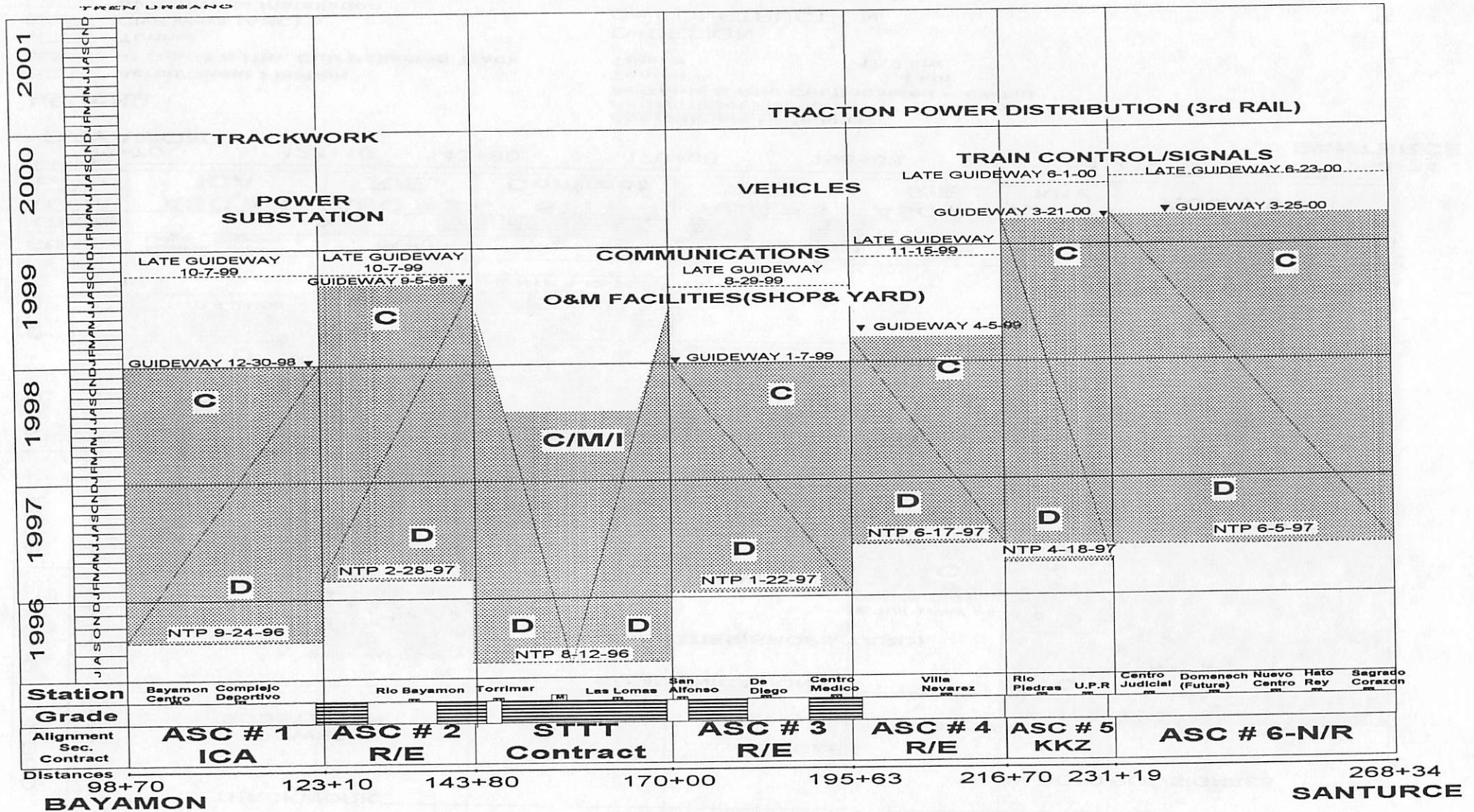
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Tunnel = 1.4 km
Total = 17.2 km

D=DESIGN
C= CONSTRUCTION



TREN URBANO - SIEMENS TRANSIT TEAM Manta De Caballo (Marching Chart)



LEGEND

- Aerial/Direct Fixation
- At Grade & Rtn. Cut/ Ballasted Track
- Tunnel
- Civil Work (ASC)
- Systemwide Installation

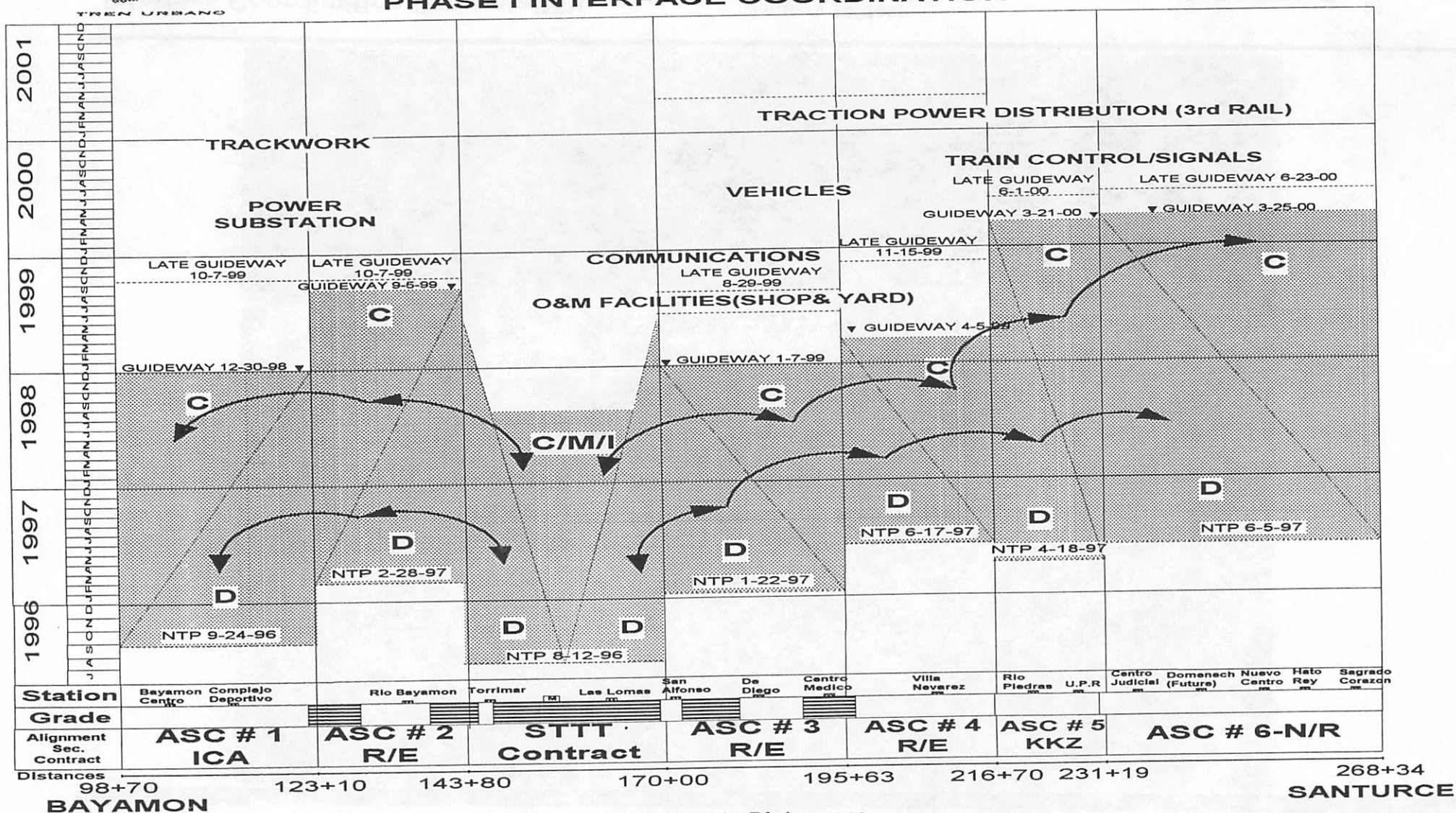
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 Tunnel = 1.4 km
 Total = 17.2 km

D=DESIGN
 C= CONSTRUCTION
 C/M/I = CONSTRUCT/MANUFACTURE/INSTALL



TREN URBANO - SIEMENS TRANSIT TEAM Manta De Caballo (Marching Chart) PHASE I INTERFACE COORDINATION



LEGEND

- Aerial/Direct Fixation
- At Grade & Rtn. Cut/ Ballasted Track
- Tunnel
- Civil Work (ASC)
- Systemwide Installation

Approximate Distances:

Aerial/Direct Fixation = 9.3 km
 At Grade & Rtn. Cut/Ballasted = 6.5 km
 Tunnel = 1.4 km
 Total = 17.2 km

D=DESIGN

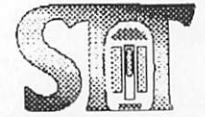
C= CONSTRUCTION

C/M/I = CONSTRUCT/MANUFACTURE/INSTALL

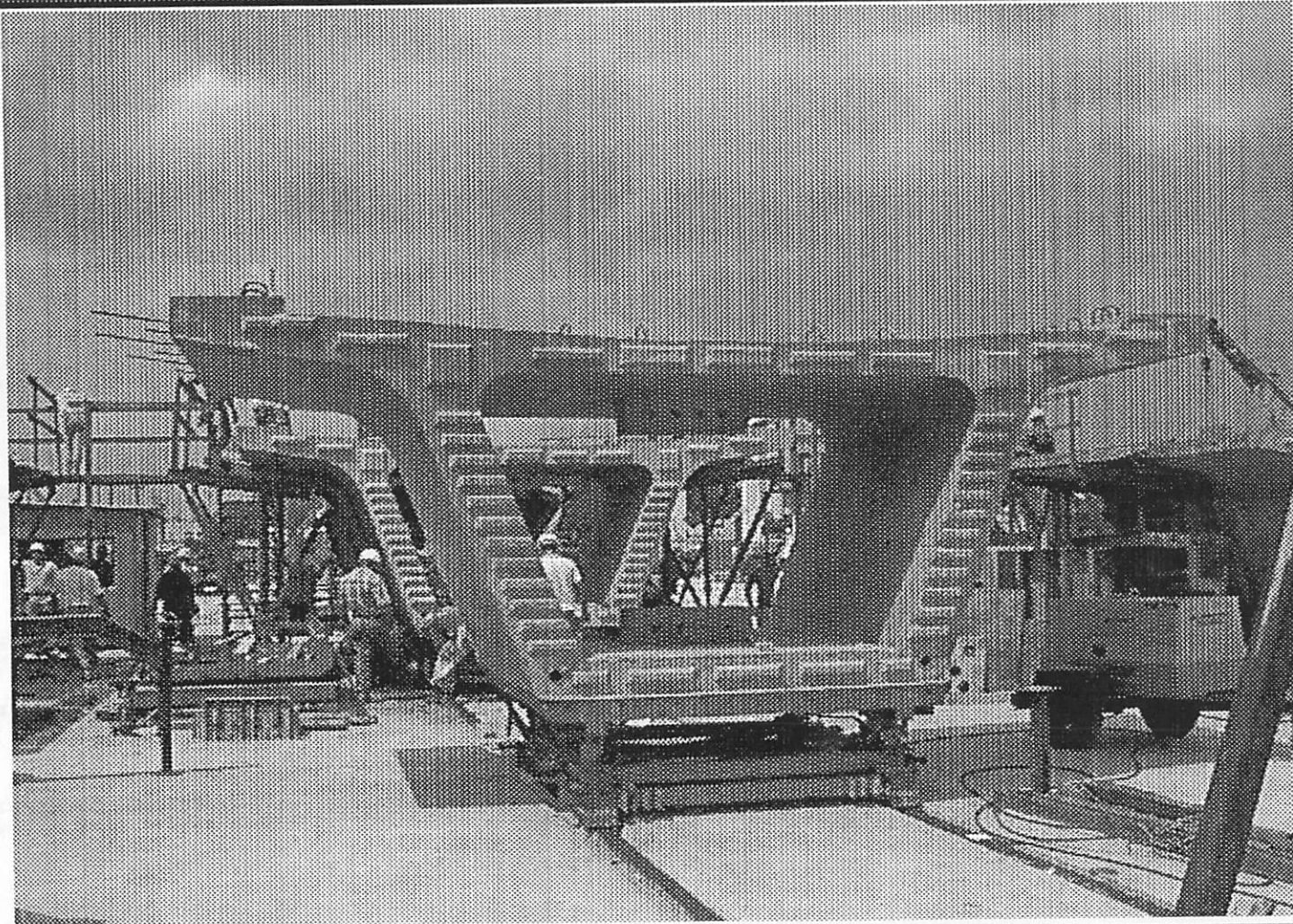
↔ = INTERFACE COORDINATION



TREN URBANO



SIEMENS TransIt Team

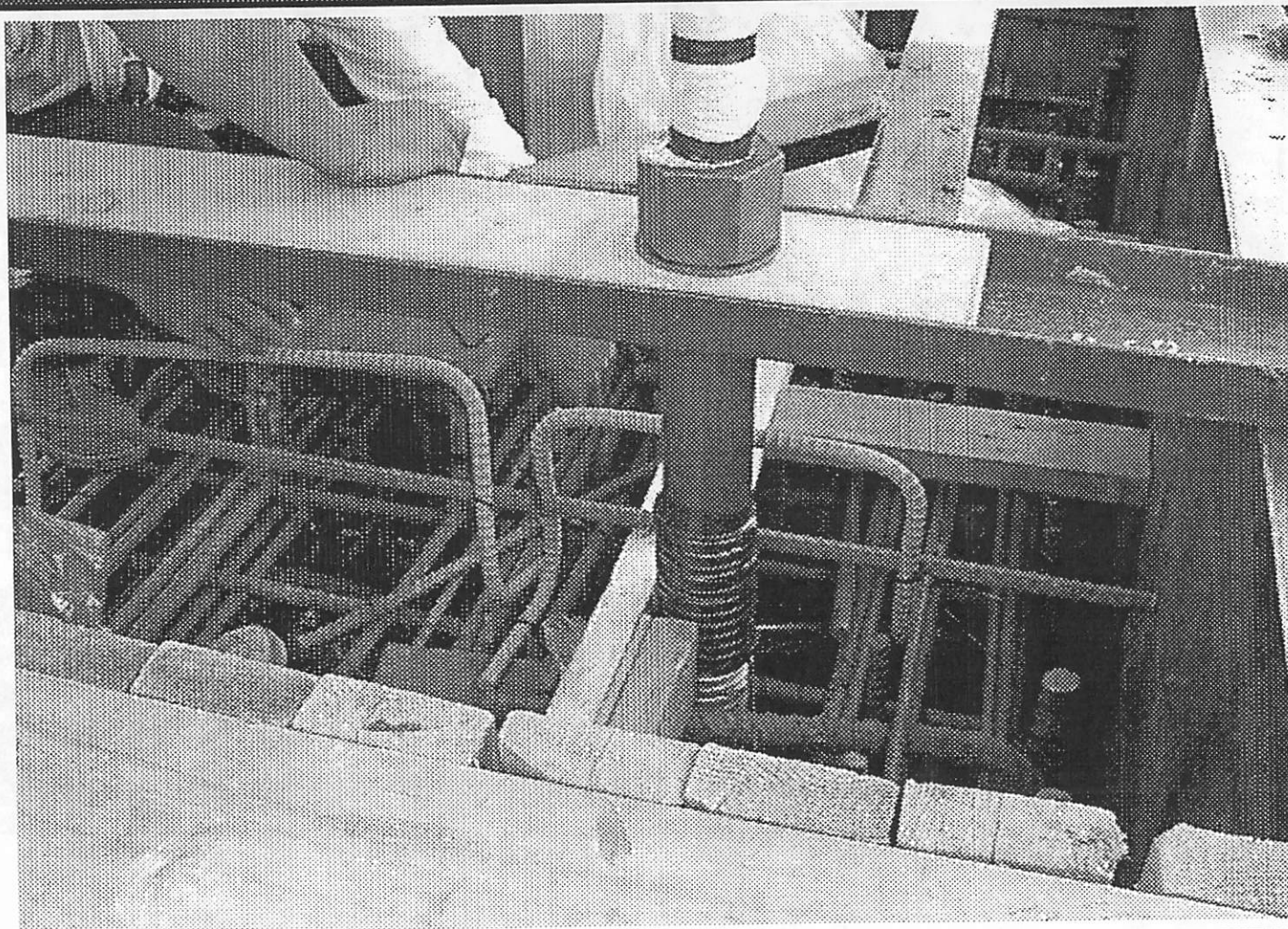




TREN URBANO



SIEMENS Transit Team





TREN URBANO

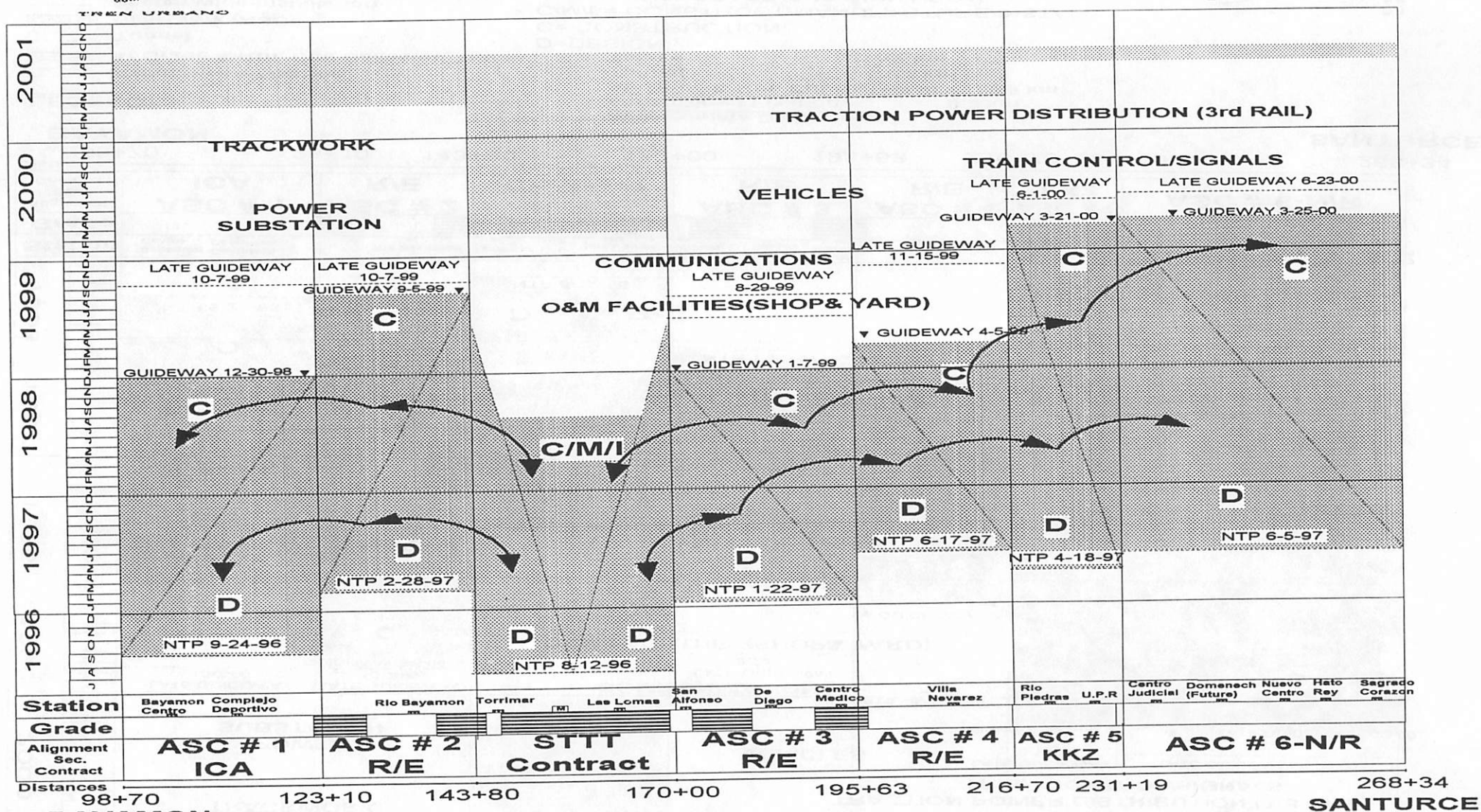


SIEMENS Transit Team





TREN URBANO - SIEMENS TRANSIT TEAM Manta De Caballo (Marching Chart)



LEGEND

- Aerial/Direct Fixation
- At Grade & Rtn. Cut/ Ballasted Track
- Tunnel
- Civil Work (ASC)
- Systemwide Installation
- Sectional integrated Testing (SIT)

Approximate Distances:

Aerial/Direct Fixation = 9.3 km
 At Grade & Rtn. Cut/Ballasted = 6.5 km
 Tunnel = 1.4 km
 Total = 17.2 km

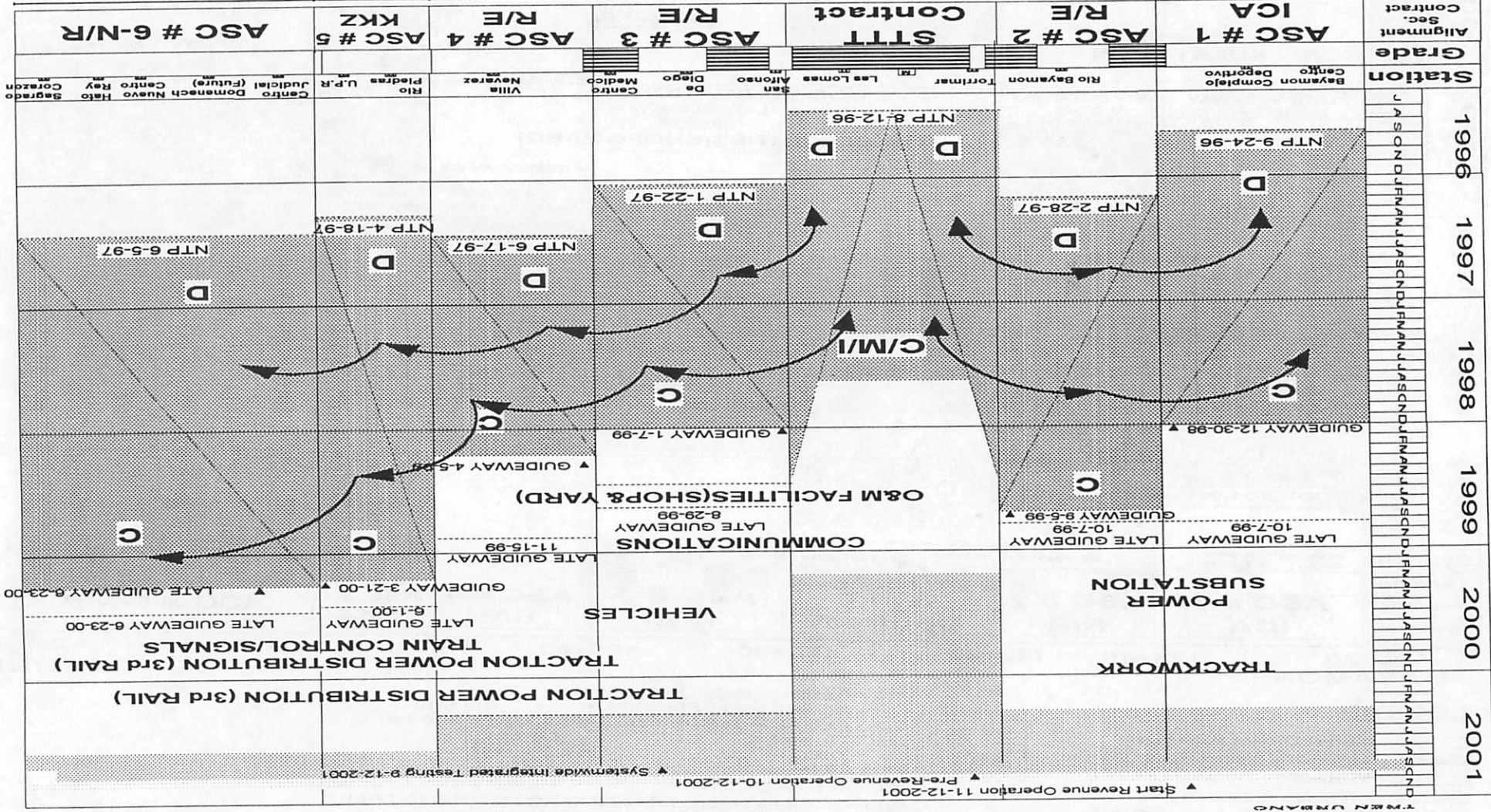
D=DESIGN

C= CONSTRUCTION

C/M/I = CONSTRUCT/MANUFACTURE/INSTALL

↔ = INTERFACE COORDINATION

TREN URBANO - SIEMENS TRANSIT TEAM
Manta De Caballo (Marching Chart)
PHASE I



SANTURCE
 268+34

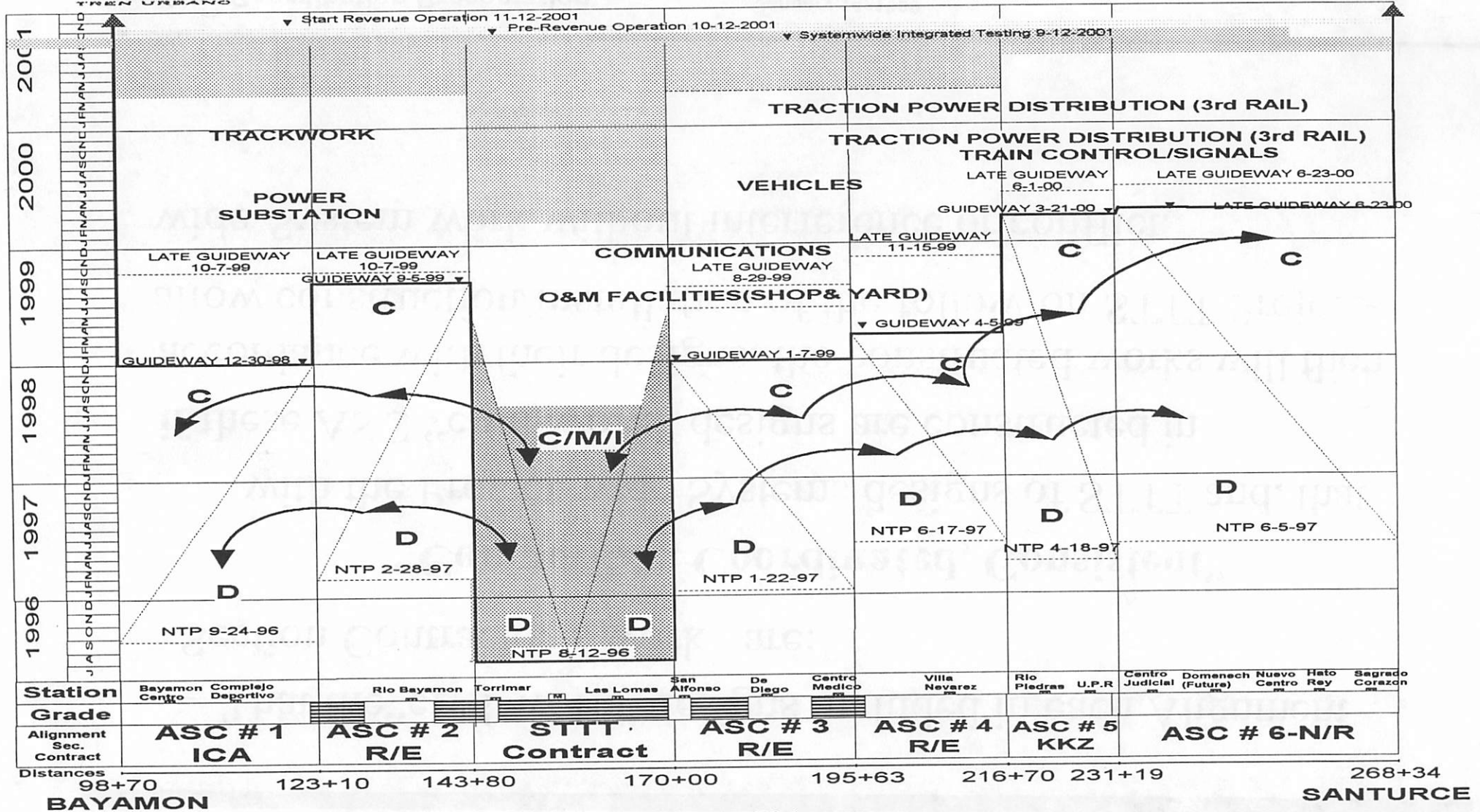
BAYAMON
 98+70

Distances
 123+10 143+80 170+00 195+63 216+70 231+19

Approximate Distances:
 Aerial/Direct Fixation = 9.3 km
 At Grade & Rtn. Cut/Ballasted = 6.5 km
 Tunnel = 1.4 km
 Total = 17.2 km
 D=DESIGN
 C=CONSTRUCTION
 C/M/I = CONSTRUCT/MANUFACTURE/INSTALL
 = INTERFACE COORDINATION



TREN URBANO - SIEMENS TRANSIT TEAM Manta De Caballo (Marching Chart) STTT CONTRACT



LEGEND

- Aerial/Direct Fixation
- At Grade & Rtn. Cut/ Ballasted Track
- Tunnel
- Civil Work (ASC)
- Systemwide Installation
- Sectional integrated Testing (SIT)

Approximate Distances:

Aerial/Direct Fixation = 9.3 km
At Grade & Rtn. Cut/Ballasted = 6.5 km
Tunnel = 1.4 km
Total = 17.2 km

D=DESIGN
C= CONSTRUCTION
C/M/I = CONSTRUCT/MANUFACTURE/INSTALL
↔ = INTERFACE COORDINATION

PURPOSE OF INTERFACE COORDINATION IN THE PROJECT

- That the “civil-work” designs included in each Alignment Section Contractor’s work are:

“Compatible, Coordinated, Consistent”

with the Project-wide Systems designs of STTT and, that if these ASC “civil-work” designs are constructed in accordance with their designs, the constructed works will then allow construction/installation of the follow-on STTT Project-wide System work without interference or conflict.



TREN URBANO



SIEMENS Transit Team

The Role of OPERATIONS & MAINTENANCE in the Tren Urbano Turnkey Project

On Track to Opening Day

Joe Ferretti
January, 1999

Operations & Maintenance

Page 1



TREN URBANO



SIEMENS Transit Team

OPERATIONS AND MAINTENANCE

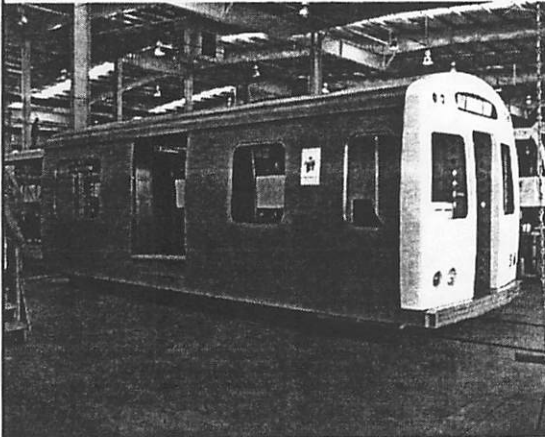
An Integral Part of the Project from Day 1



Operations & Maintenance

Page 2

A Vested Interest in:

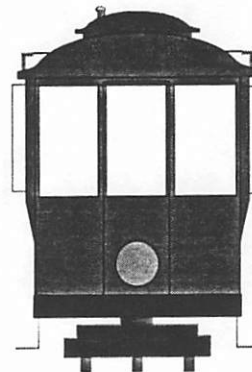


- Quality
- Functionality
- User Friendliness
- Maintainability
- Reliability
- Safety & Security
- Efficiency

PROJECT PHASES

O&M's WORK EVOLVES THROUGH THE FOLLOWING PHASES AS DESIGN - BUILD ACTIVITIES PROGRESS

- Design
- System Mobilization
- System and Integrated Testing
- Pre-Revenue Service
- Revenue Service





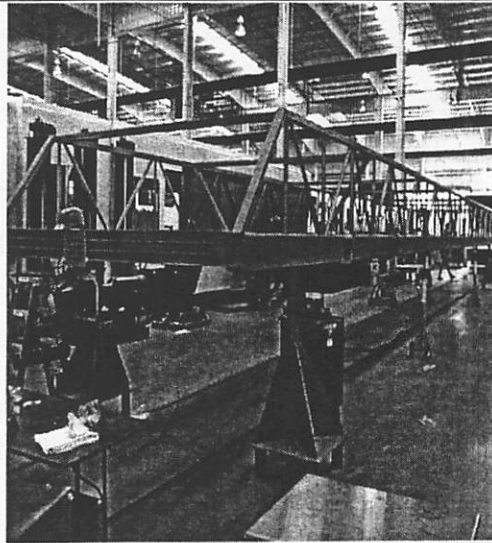
TREN URBANO

DESIGN ACTIVITIES



SIEMENS Transit Team

- Yard Reconfiguration
- System-Wide Elements
- Station Modifications
- Vehicle and Systems Optimization
- Shop & OCC Layouts
- Value Engineering Initiatives



Operations & Maintenance

Page 5

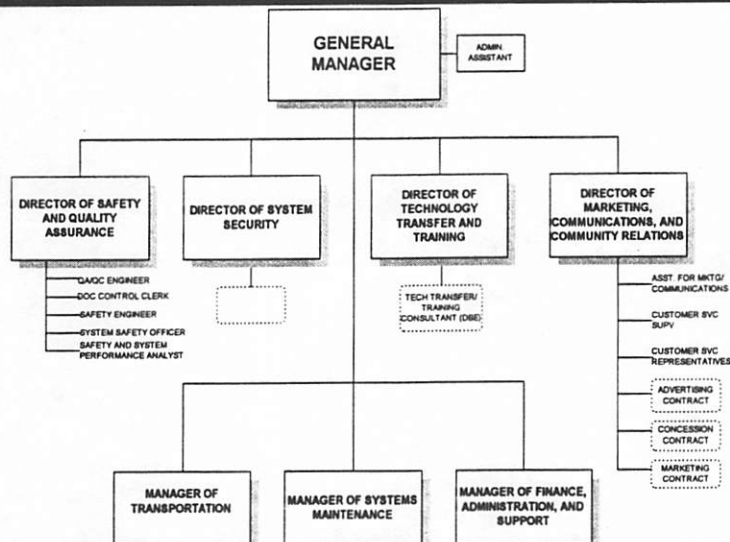


TREN URBANO

ORGANIZATION



SIEMENS Transit Team



Operations & Maintenance

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TREN URBANO

SYSTEM CHARACTERISTICS



SIEMENS Transit Team

•Trains

- 74 cars, 37 married pairs
- Probable 4 additional married pairs for phase IA
- Cars are:
 - Rail Gauge: 1,435 mm
 - Vehicle Length: 23 m
 - Vehicle Width: 3.1 m
 - Number Seats: 72 - seated, 182 total
- Trains will be 4 cars to begin, 6 cars maximum
- Possible 2 cars on weekends
- Hours of Operation 5:00 a.m. to 1:00 a.m
- Frequency 4 minutes, 8 minutes, 12 minutes



TREN URBANO

SYSTEM CHARACTERISTICS



SIEMENS Transit Team

• Stations

- 18 Stations - including phase IA
- Provisions for some parking and intermodal transfers

• Power

- Supply voltage: 750 VDC over-running 3rd rail
- No Non-bridgeable section gaps (A/C, braking, traction)
- Supplied by PREPA

• Automatic Train Control

- SACEM system - ATO
- Designed for operator in attendance
- Propulsion and braking suppressed axle



TREN URBANO

SYSTEM CHARACTERISTICS



SIEMENS Transit Team

• Communications/OCC

- Fiber optic based
- Single work station for line controller and power controller
- Redundancy in work stations
- Simulator for training part of actual OCC work station
- Trunked Radio System
- CBDS - for telephone radio, PA, VMS
- CCTV - Security
- Functional map board, windows based, interactive

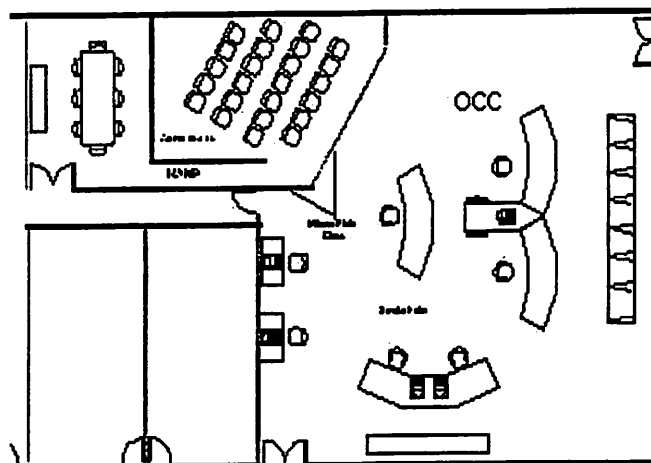


TREN URBANO

OPERATION CONTROL CENTER



SIEMENS Transit Team





TREN URBANO

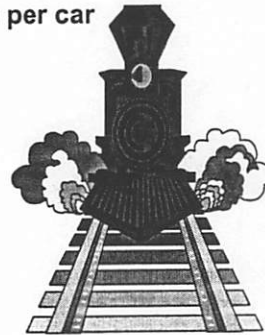
SYSTEM CHARACTERISTICS



SIEMENS Transit Team

• Vehicles

- Three passenger operated doors per side/Two end doors
- 2 independent, integrated, modular a/c systems per car
- Seating - extra wide, padded
- All surfaces vandal resistant
- Stainless Steel Carbody
- AC Propulsion, 1 motor per axle
- IGBT Technology
- Regenerative Braking
- Maximum Speed: 100 km/h
- Service Acceleration: 1.35 mpsps
- Deceleration: 1.35 mpsps (service) 1.55 mpsps (emergency)



Operations & Maintenance

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TREN URBANO

SYSTEM CHARACTERISTICS



SIEMENS Transit Team

• Shop

- Relative self reliance built in because we are an island with no other rail road for support

• Fare Collection

- Barrier
- Magnetic Stripe, Swipe
- SMART Card Capability
- Flat Fare with Structured Fare Capability



Operations & Maintenance

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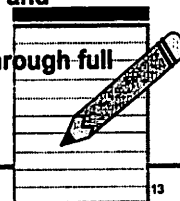
TREN URBANO

SCHEDULE



SIEMENS Transil Team

- **Test track - October 1999**
 - 1st married pair
- **System and Integrated testing through October 2001**
- **Pre-revenue service October/November 2001**
- **Revenue service November 2001**
- **Current consideration of “Phased Start-up”**
 - Requires coordination of alignment section contractors and systems installers.
 - Can be accomplished in degrees from demonstration through full revenue service.



Operations & Maintenance

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TREN URBANO

TESTING



SIEMENS Transil Team

- **Testing/commissioning plan and schedule now being developed.**
- **Begin test track section, Martínez Nadal-Torrimar.**
- **Technical testing of 1st married pair, track and section power**
 - will be accomplished with system supplier's personnel, Operations and Maintenance instructors and supervisors
- **Expanded testing of second married pair, and 4 car train**
- **Multiple Train Testing including ATC System Testing**
- **Operations Control Center testing**
- **Communications and Fare Collection testing will be phased throughout test period.**

Operations & Maintenance

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TREN URBANO

SECURITY



SIEMENS Transit Team

- **Security will evolve from construction site security through actual full revenue service security.**
- **Deployment details are design dependant and are being developed.**
- **General Principles**
 - **Customers must feel safe throughout their use of the system**
 - **security and perception of security**
 - **Security will be private, unarmed, uniformed and plainclothes**



TREN URBANO

SECURITY



SIEMENS Transit Team

- **Formal and direct contacts to police**
- **Only fully trained personnel (security /customer service)**
- **Security dispatcher on duty 24 hours at OCC**
- **Full station coverage by CCTV**
- **Precise protocols, rules, regulation to be in effect for normal and emergency conditions**



- **Coverage**

Stations	On board trains
Parking Areas	Intermodal locations
Yard Area	Shop and Administration building
	Other

- **Training**

- Fundamentals of Security
- Specific Transit Security
- Customer Service
- Other
 - Bus/Publico Dispatching (possible)
- All personnel with customer contact will be trained in security



- **Trainers and Supervisory personnel** to be hired early in testing period.
- **Technicians** to be selected from installation and testing personnel.
 - Testing activities will be conducted using the same personnel that will run revenue service
- **Technology Transfer Philosophy**
 - Some program participants in design/construction phase will move into O&M positions
 - Off-island experts will be brought in for a transition period during which local staff will be trained and become proficient
 - Local staff may be sent to other operating properties for training
- **Steady-State operations** will be accomplished using a full local staff.



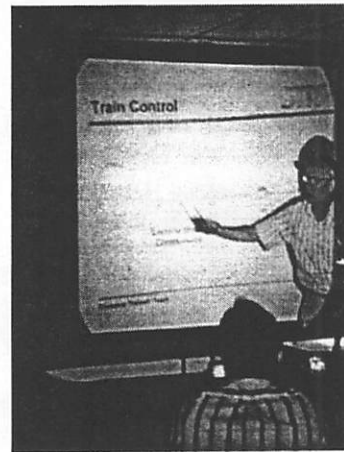
TECHNOLOGY TRANSFER

Building the Human Infrastructure



- **Local Experts Now Being Developed In Many Areas**

- Train Control
- Vehicle
- Operations Control Center
- Marketing
- Intermodal Logistics
- Fare Collection



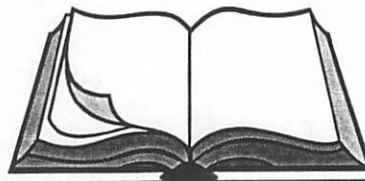
TRAINING



- Training will be modular, including modules for:
 - Organizational responsibilities
 - Train operations
 - Passenger relations
 - Dispatching
 - Supervision
 - Accident investigation
 - Emergency response
 - Maintenance and technical areasto be developed by individual system suppliers.
- A matrix of employee classifications and training modules will be developed e.g., Transportation supervisors, station attendants, operators, and security personnel will be trained in passenger relations.



- Initial training schedule and associated hiring schedule is coordinated with system testing schedule.
- Periodic refresher training and remedial training will be ongoing.
- Comprehensive employee training database will be kept.
- Continuously updated training manuals will be used for each module.



- Prior to Pre-revenue operations, after the train is functional and safe we (TU/STT) may decide to:
 - Run VIP trips
 - Run local community demonstration trips
 - Conduct focus group demonstrations
 - Have various promotional, demonstration, practice activities.
 - Free weekend service (close to pre-revenue service period)
 - Organized student Commutation Day
 - Others to be planned
- **Pre-revenue operations** should incorporate larger scale participation of the public
- **Phased opening** would require a geographically focused introduction to the public



MARKETING FOR EARLY AND SUSTAINED SUCCESS



SIEMENS Transit Team

Objectives

- **Make Tren Urbano**
 - Known
 - Accepted
 - Understood
 - Desired
- **Build Ridership by**
 - Convincing potential customers of Tren Urbano's usefulness and desirability
 - validation to customer's decision to use the train
- **Instill an understanding of Tren Urbano's value**
 - High service quality at moderate cost
- **Build an awareness of how Tren Urbano improves the quality of life**
 - congestion relief
 - clean air
 - fast, comfortable transportation
 - local economic development
 - a more livable San Juan Metropolitan Area



MARKETING FOR EARLY AND SUSTAINED SUCCESS



SIEMENS Transit Team

Objectives

- **Educate potential riders concerning Tren Urbano's benefits**
 - low cost
 - convenience
 - safety, efficiency
- **Create a TREN URBANO CULTURE**
 - this is OUR train
 - no crime
 - no vandalism
 - no littering
 - Tren Urbano is the pride of our city



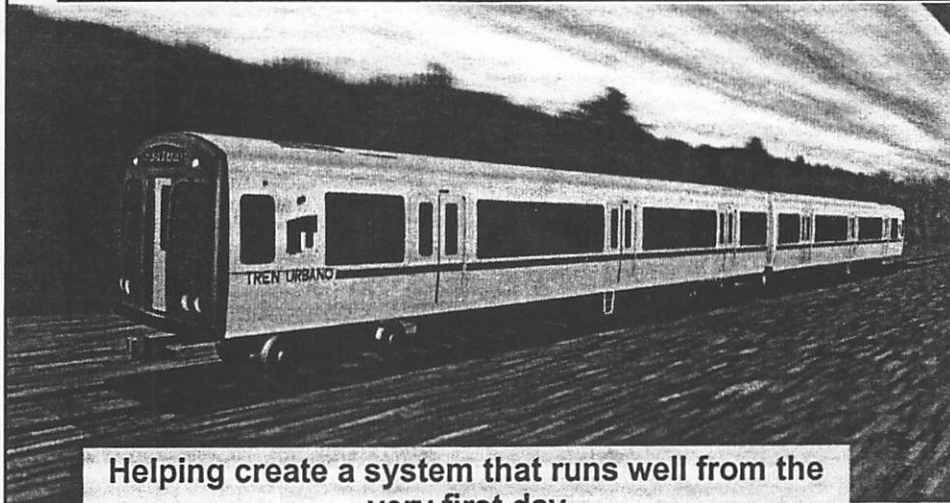


TREN URBANO

OPERATIONS & MAINTENANCE



SIEMENS Transit Team



Helping create a system that runs well from the very first day

Operations & Maintenance

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TREN URBANO



SIEMENS

A Better Way to Move Puerto Rico

Puerto Rico's largest-ever infrastructure project — a 17.2 kilometer urban rapid transit system known as Tren Urbano (Urban Train) — is North America's first comprehensive turnkey transit project. The rail line will serve the most densely populated corridor of the island, linking the central business district to residential and employment areas in San Juan and neighboring communities. Siemens is leading the team that is building the vehicles and systems, the trackwork, the maintenance facility and two stations.

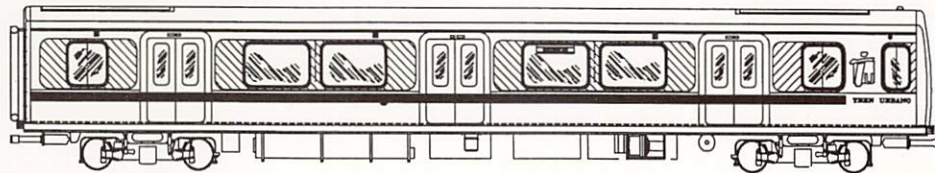
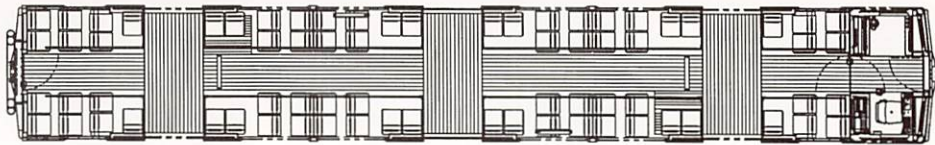
The sleek new vehicles designed by Siemens for the Puerto Rico Highways and Transportation Authority are constructed of stainless steel and configured in married pairs. Multiple coupling of up to three married pairs allows for maximum flexibility in meeting varying passenger flow. The customized air conditioning system is designed to accommodate the local climate and the IGBT AC three-phase propulsion provides superior traction and electrical braking. The ATC system (Automatic Train Control) provides the highest level of passenger safety. Six wide double-leaf pocket doors allow for rapid and easy boarding, and two wheelchair parking areas are provided in each car.

A total of 74 vehicles will be assembled and shipped from the Siemens mass transit facility in Sacramento, California. The Tren Urbano system begins operation in November 2001.

Siemens Transportation Systems, Inc.
7464 French Road, Sacramento, CA 95828 • (916) 688-5014

Siemens Transportation Systems.
A better way to move America.

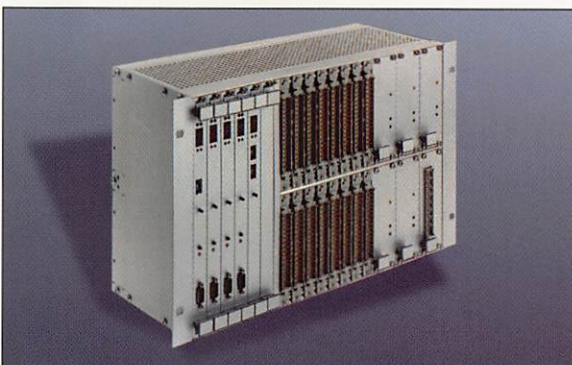




The Tren Urbano consists of specially designed stainless-steel vehicles configured in married pairs.

TECHNICAL CHARACTERISTICS

SUPPLY VOLTAGE:	750 VDC
BOARDING:	Three high level doors per side/Two end doors
CAR BODY MATERIAL:	Stainless steel
SUSPENSION SYSTEM:	Primary - Rubber chevron springs Secondary - Air springs
FRICTION BRAKE SYSTEM:	Electro-pneumatic with spring applied parking brake
PROPULSION SYSTEM:	AC-IGBT, four motors per car
TRACTION MOTOR RATING:	125 kW (167 HP) continuous



The SIBAS® 32 microcomputer centrally controls the main functions of the train.

PERFORMANCE AND CAPACITY

MAXIMUM SPEED:	100 km/h (63 mph)
SERVICE ACCELERATION:	1.35 m/s ² (3.0 mphps)
SERVICE DECELERATION:	1.35 m/s ² (3.0 mphps)
MAXIMUM EMERGENCY BRAKING RATE:	1.55 m/s ² (3.5 mphps)
NUMBER SEATS:	72
TOTAL PASSENGERS PER CAR:	240

DIMENSIONS AND WEIGHTS

	METRIC	IMPERIAL
VEHICLE LENGTH:	23.0 m	75'-5"
VEHICLE WIDTH:	3204 mm	10'-6"
HEIGHT RAIL TO ROOF:	3810 mm	12'-5"
FLOOR HEIGHT ABOVE RAIL:	1100 mm	43.3"
DOORWAY WIDTH (SIDE):	1420 mm	55.9"
DOORWAY HEIGHT (SIDE):	1980 mm	78"
WHEEL DIAMETER (NEW):	710 mm	28"
TRUCK WHEEL BASE:	2400 mm	95"
TRUCK CENTER DISTANCE:	15900 mm	52'-2"
RAIL GAUGE:	1435 mm	4'-8.5"



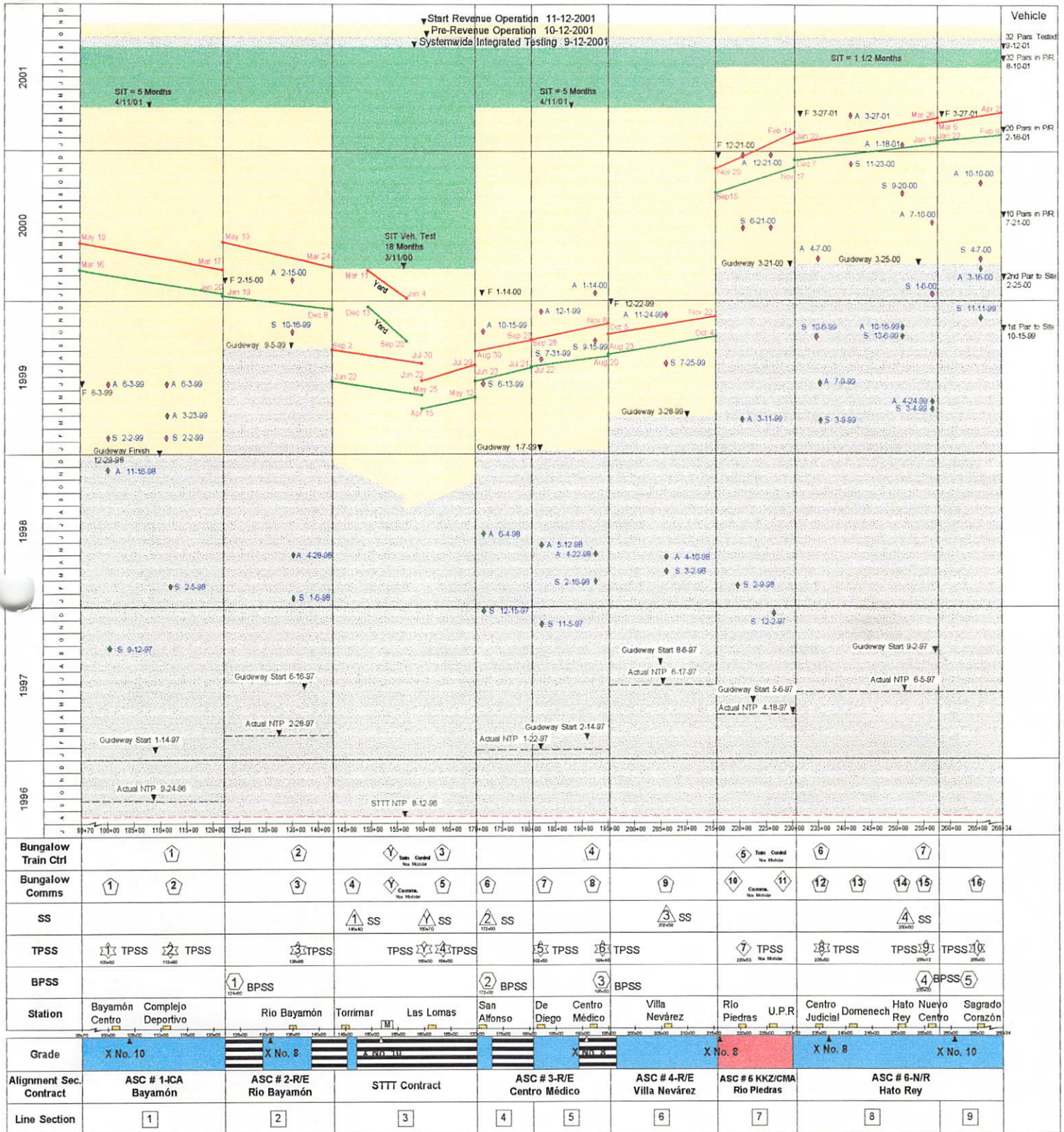
The ride stays pleasant thanks to powerful air conditioning, passenger information systems and extra-wide cantilevered seats.

TREN URBANO - SIEMENS TRANSIT TEAM

Manta De Caballo (Marching Chart)

Running Rail & 3rd Rail Installation

Revision 14a, September 3, 1998



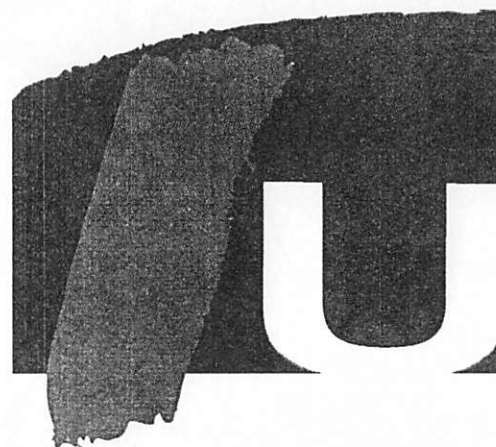
LEGEND

Final Completion (Civil)
 Structural Begin Finish
 Architectural Begin Finish
 P/R = Puerto Rico
 SS = Sub Station
 TPSS = Traction Power Sub Station
 BPSS = Bulk Power Sub Station
 = Running Rail
 = 3rd Rail

X Double Crossover
 [M] Maintenance/Storage Facility
 [A] Aerial/Direct Fixation
 [B] At Grade & Rtn. Cut/ Ballasted Track
 [T] Tunnel
 [S] Sectional Integrated Testing (SIT)
 [I] Systemwide Installation
 [C] Civil Work
 [N] Non-Modular Equipment

Approximate Distances:
 Aerial/Direct Fixation = 9.3 km
 At Grade & Rtn. Cut/Ballasted = 6.5 km
 Tunnel = 1.4 km
 Total = 17.2 km

PRELIMINARY



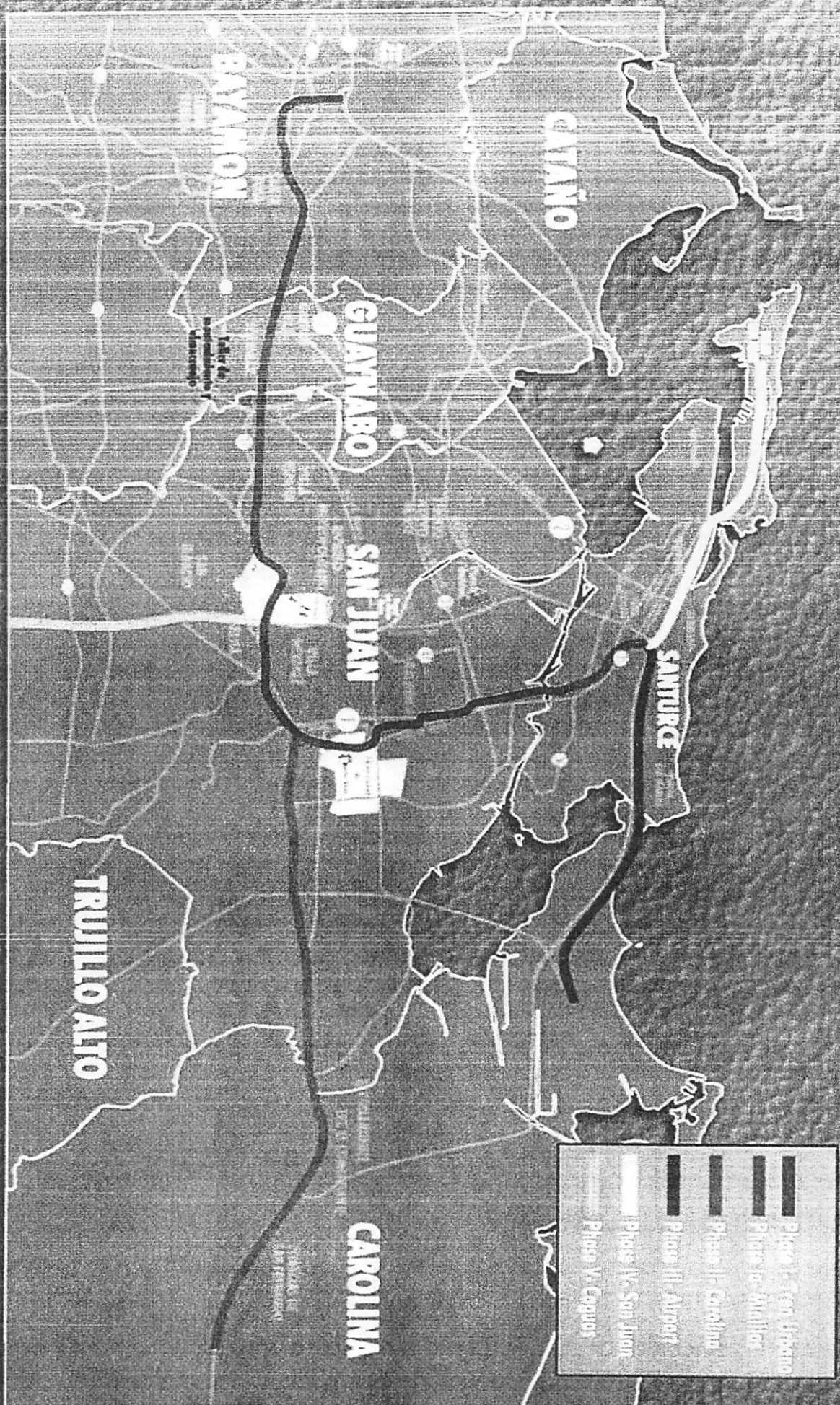
TREN URBANO

MINILLAS EXTENSION

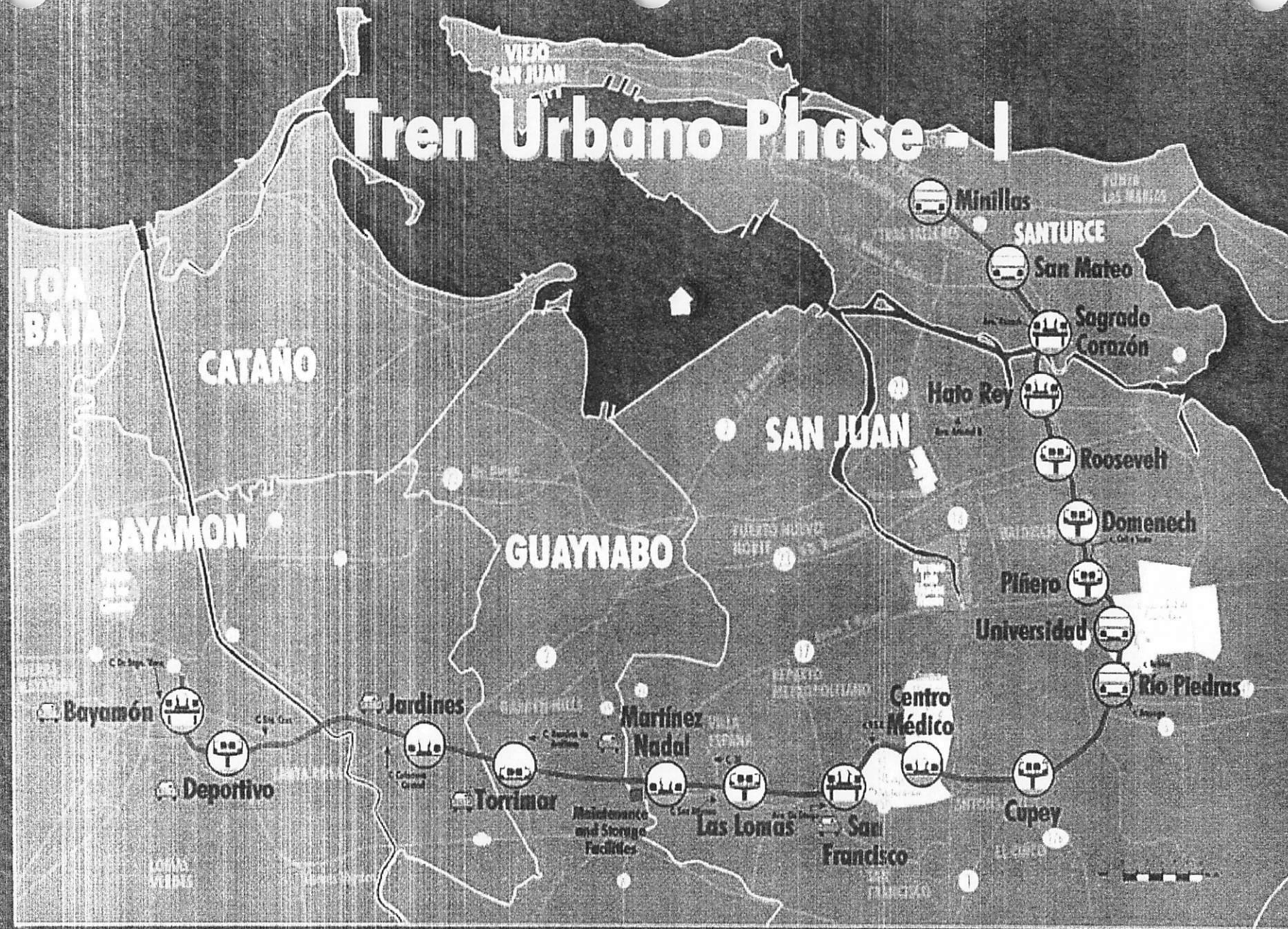
PHASE IA

January 1999

Tren Urbano Master Plan



Tren Urbano Phase - I



Elevated Center Platform



Elevated Side Platform



Retained Cut Side Platform



Retained Cut Side Center Platform



Underground Center Platform with Mezzanine



Park & Ride

Minillas Extension - Phase IA



Underground Center Platform with Mezzanine



Elevated Side Platform

Phase I
Phase IA

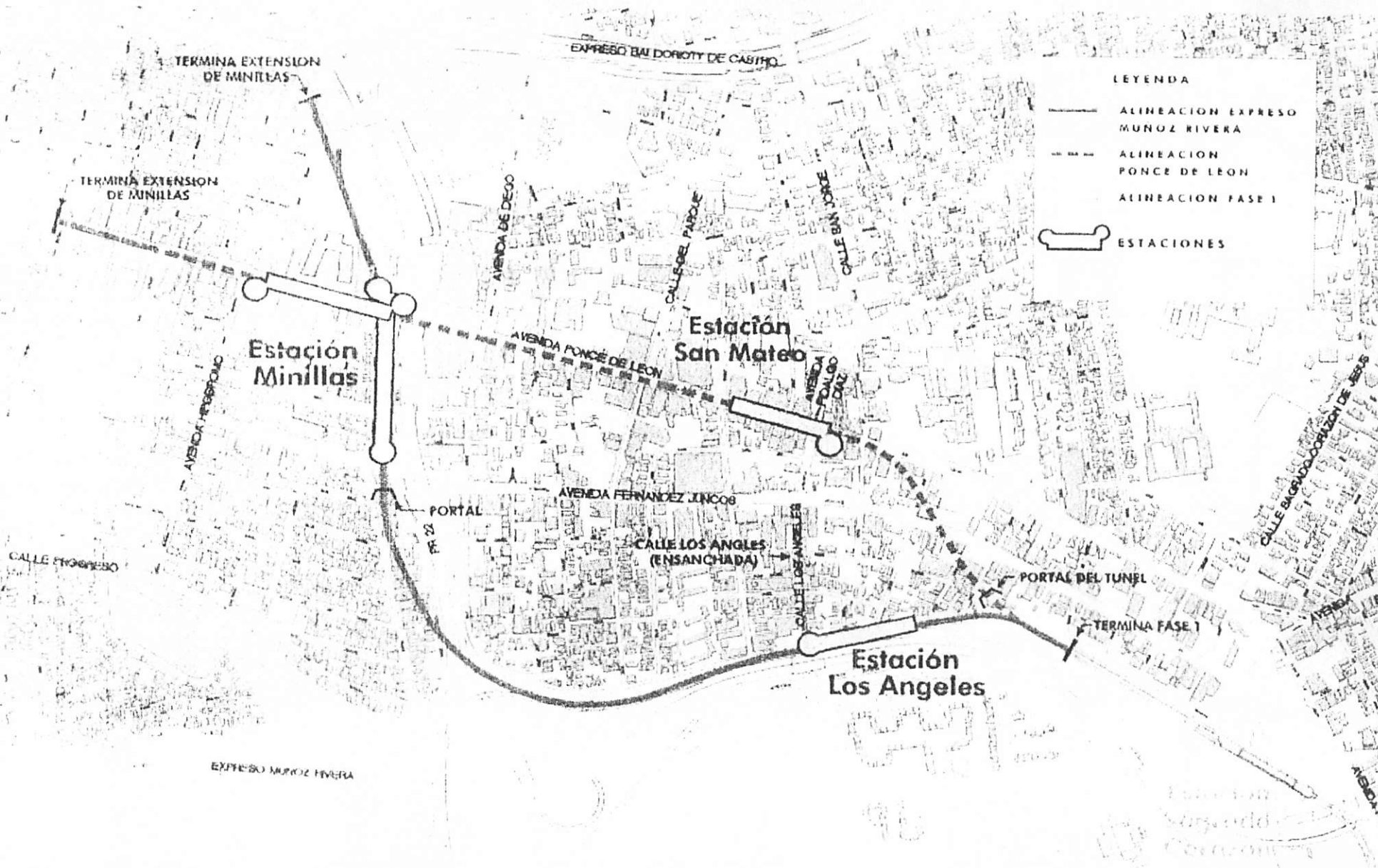


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Phase 1A Alignment



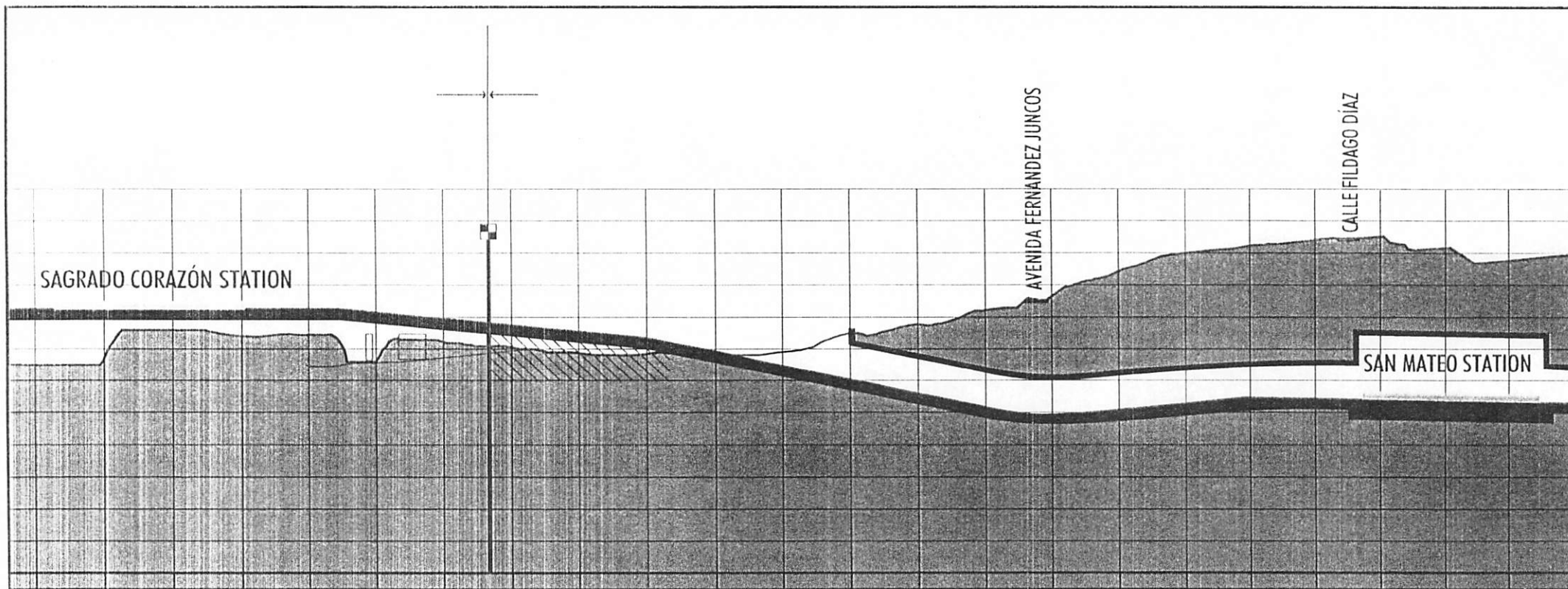
TREN URBANO



LONGITUDINAL SECTION 1



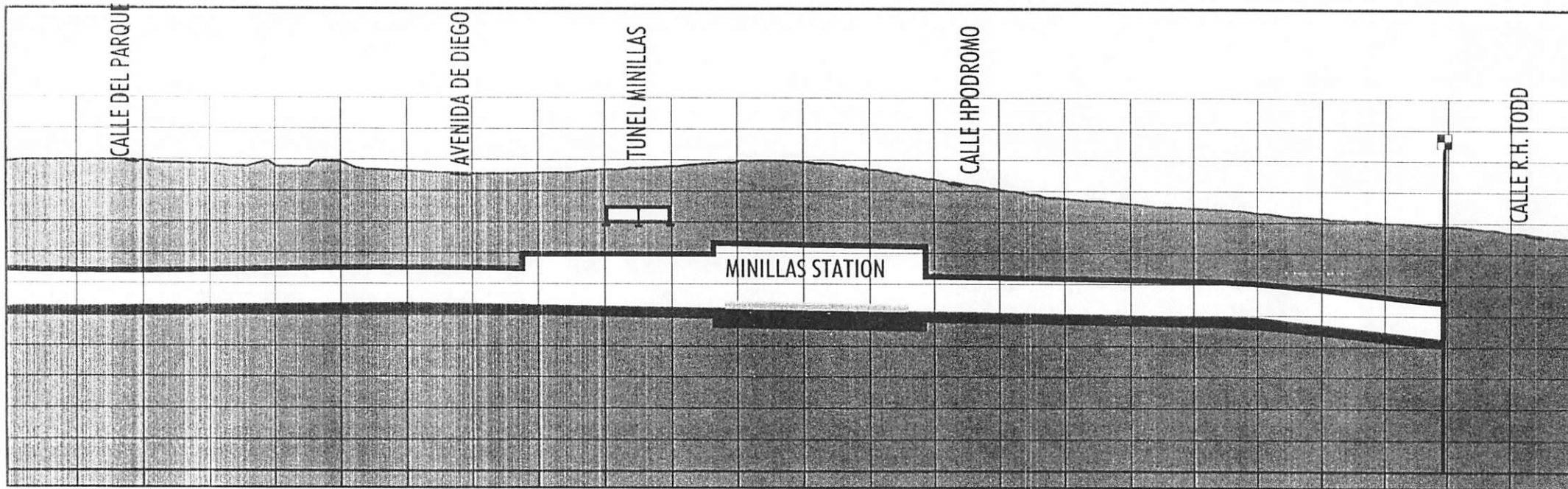
TREN URBANO



LONGITUDINAL SECTION 2



TREN URBANO

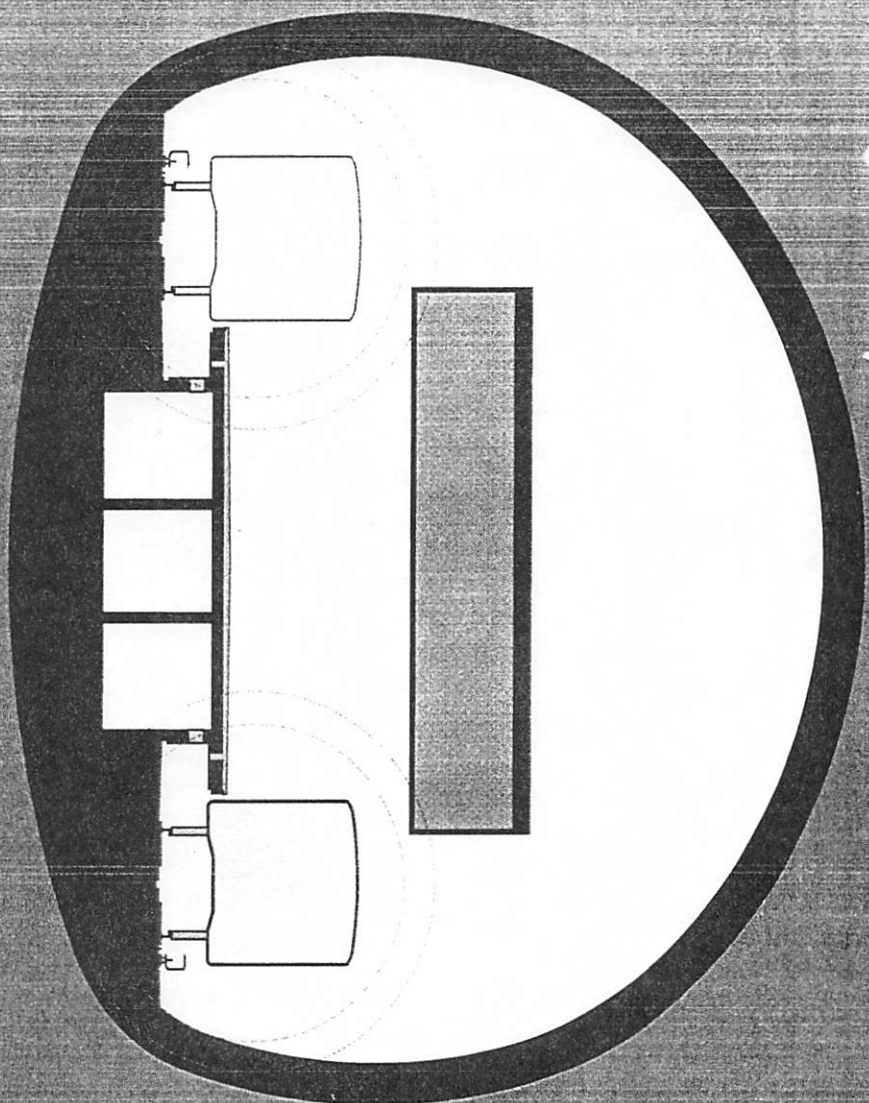


TYPICAL MINED SECTION



TREN URBANO

- Conceptual construction methodology - NATM
(New Austrian Tunneling Method)

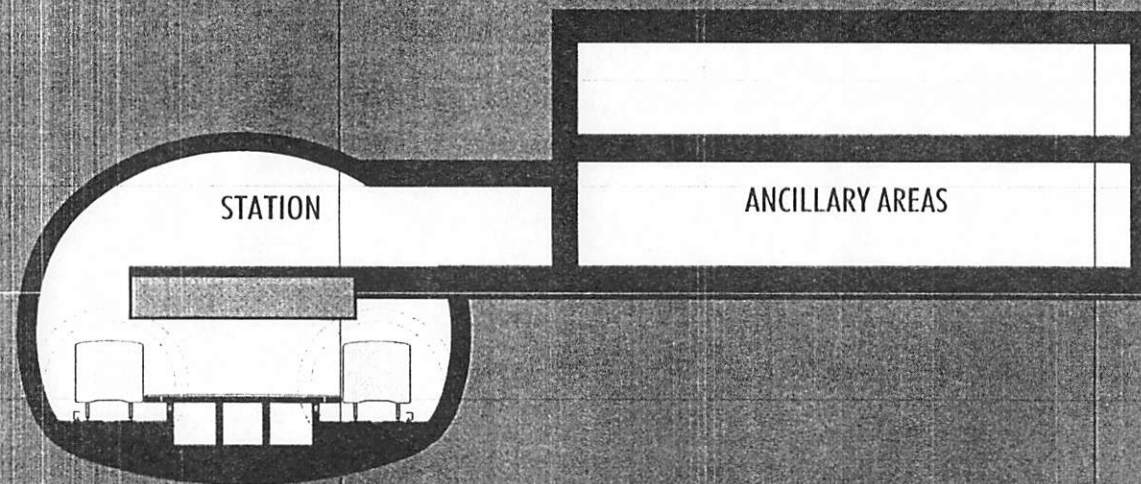


TYPICAL CROSS SECTION (Ancillary Areas)



TREN URBANO

Ave. Ponce de León

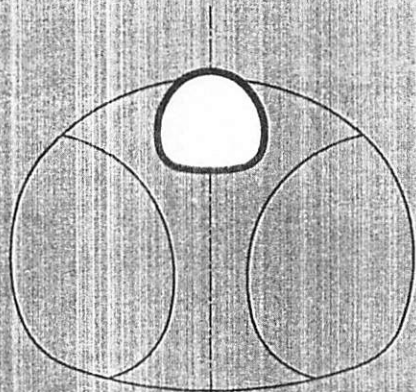


- Station - NATM (New Austrian Tunneling Method) construction methodology
- Ancillary areas (cut and cover)

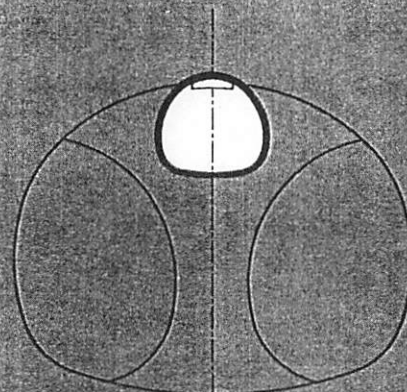
EXCAVATION SEQUENCE



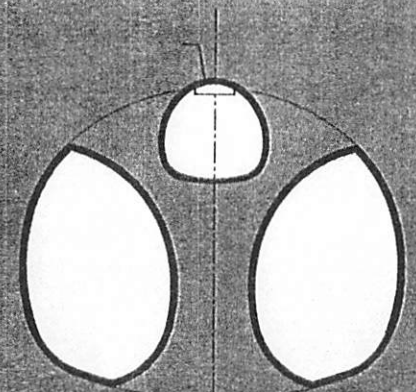
TREN URBANO



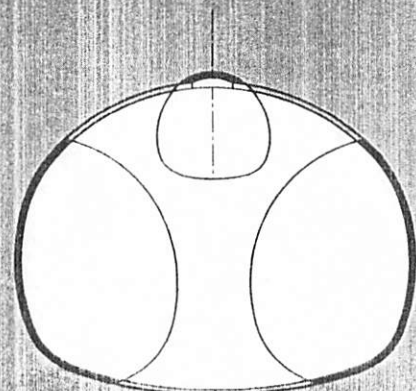
Phase 1



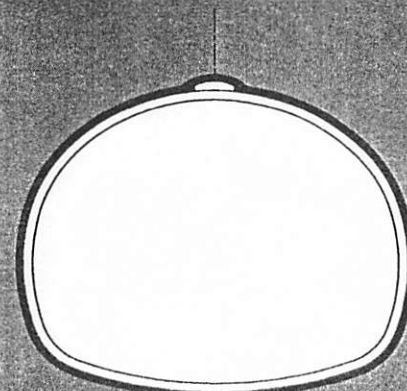
Phase 2



Phase 3



Phase 4

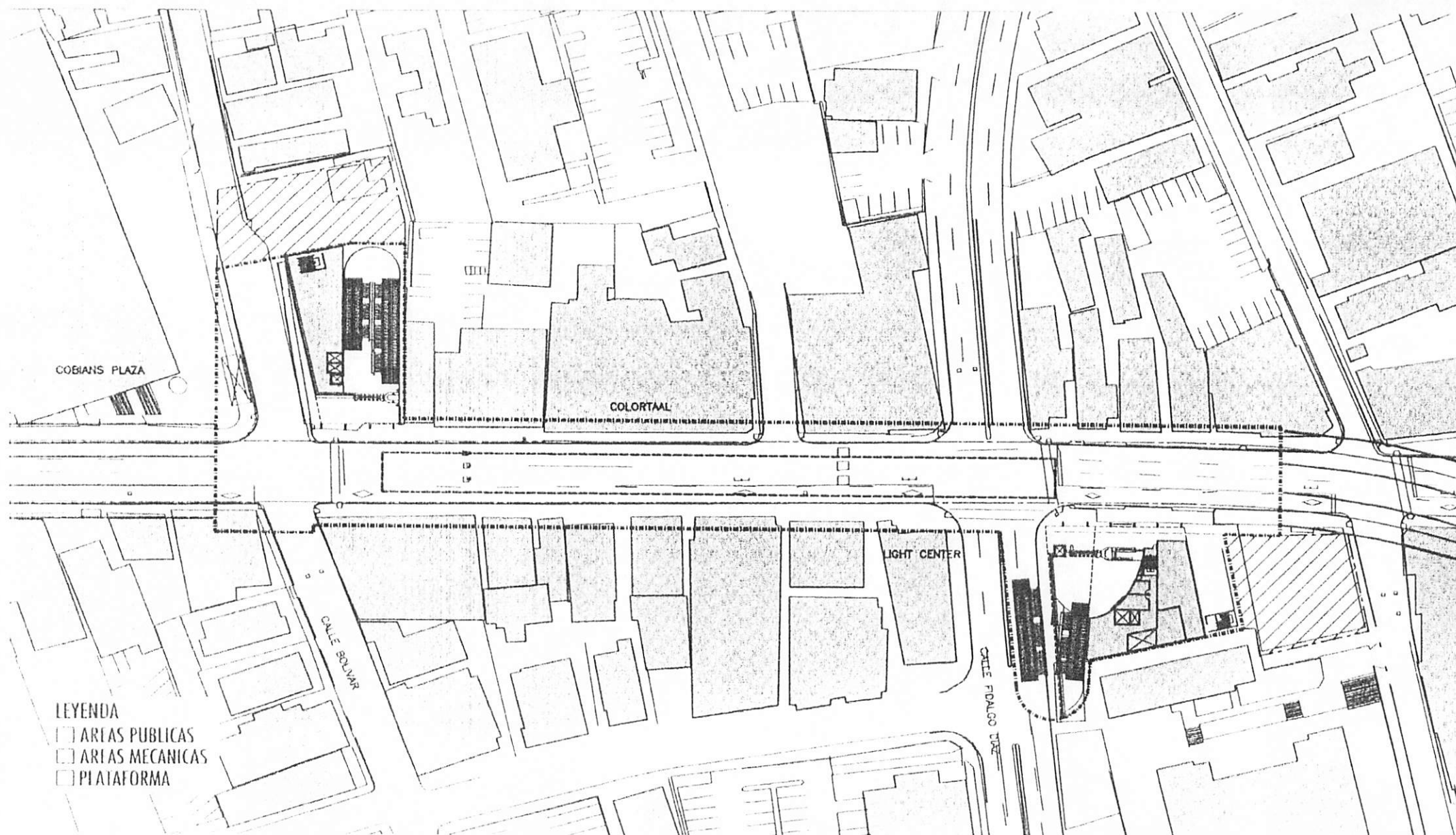


Phase 5

San Mateo - Street level plan



TREN URBANO



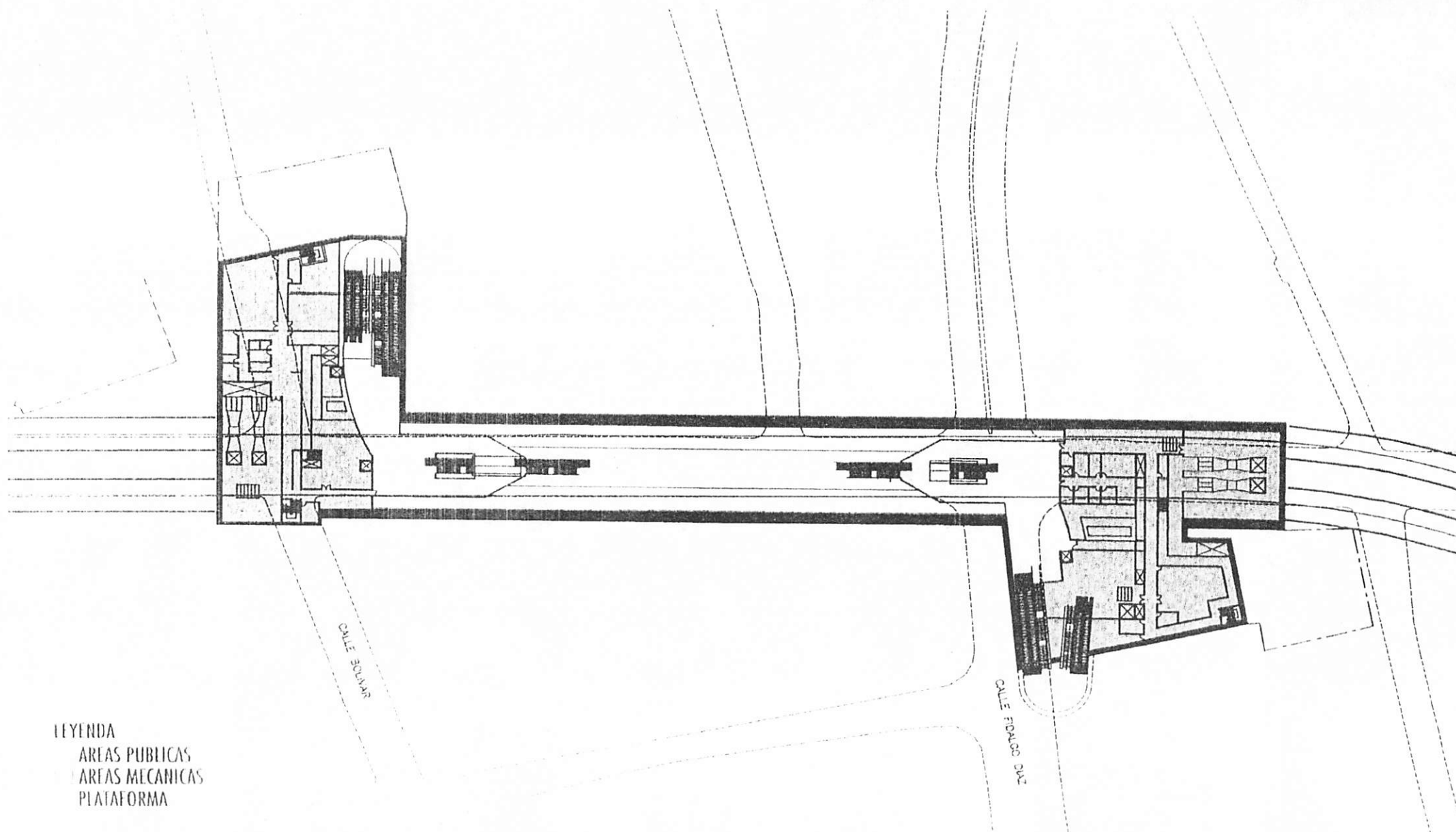
LEYENDA

- ARIAS PUBLICAS
- ARIAS MECANICAS
- PLATAFORMA

San Mateo - Mezzanine level plan



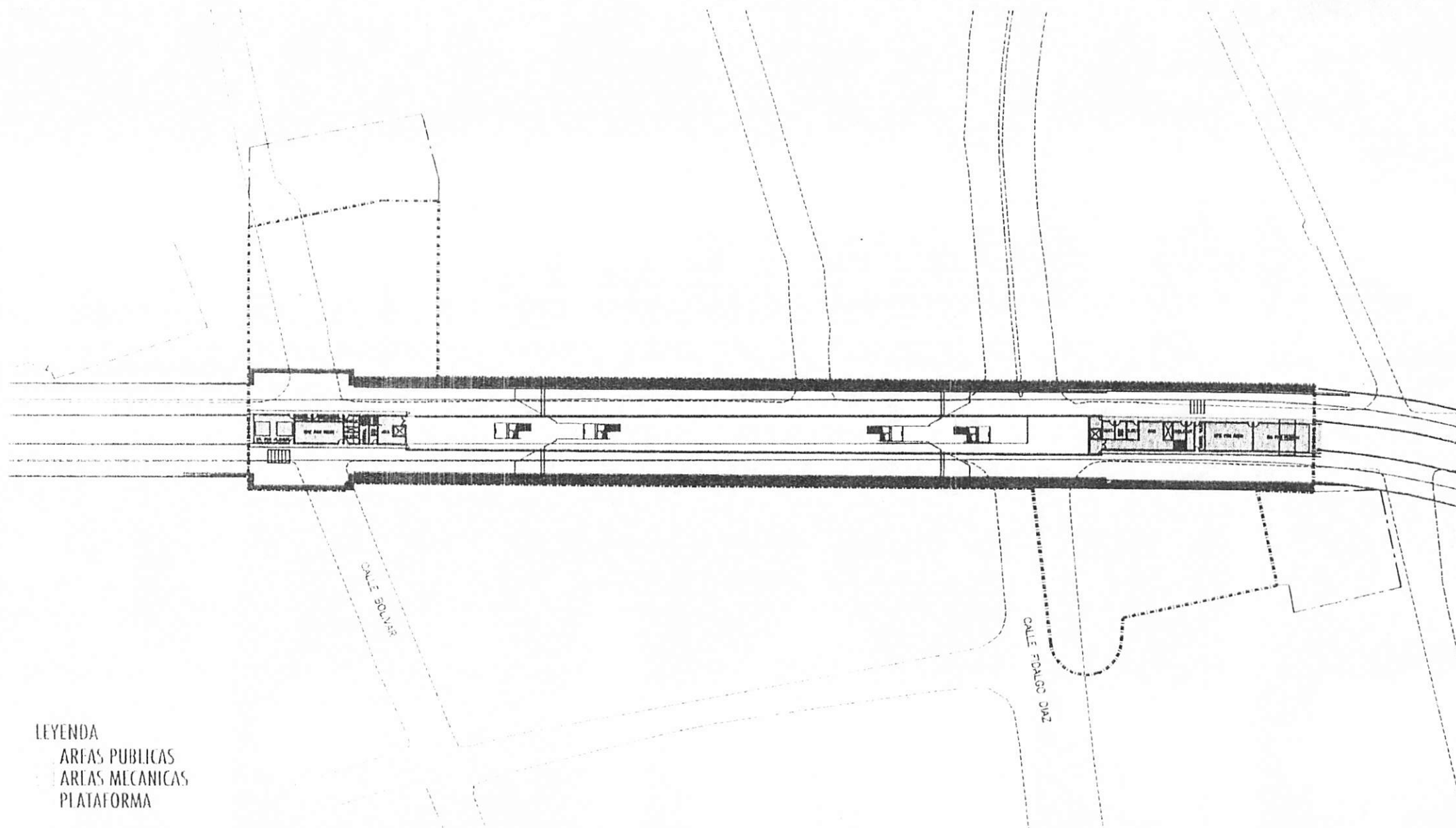
TREN URBANO



San Mateo - Platform level plan



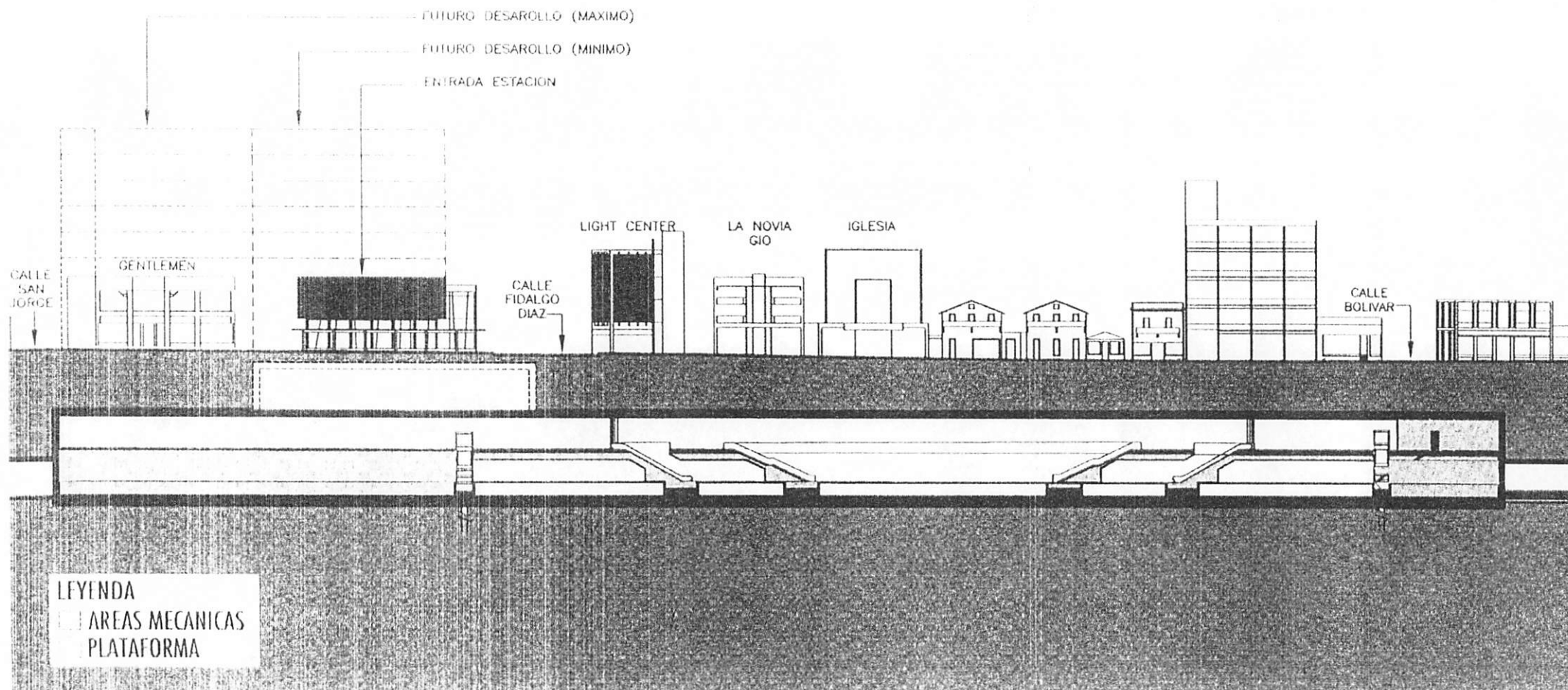
TREN URBANO



San Mateo - East entrance facade



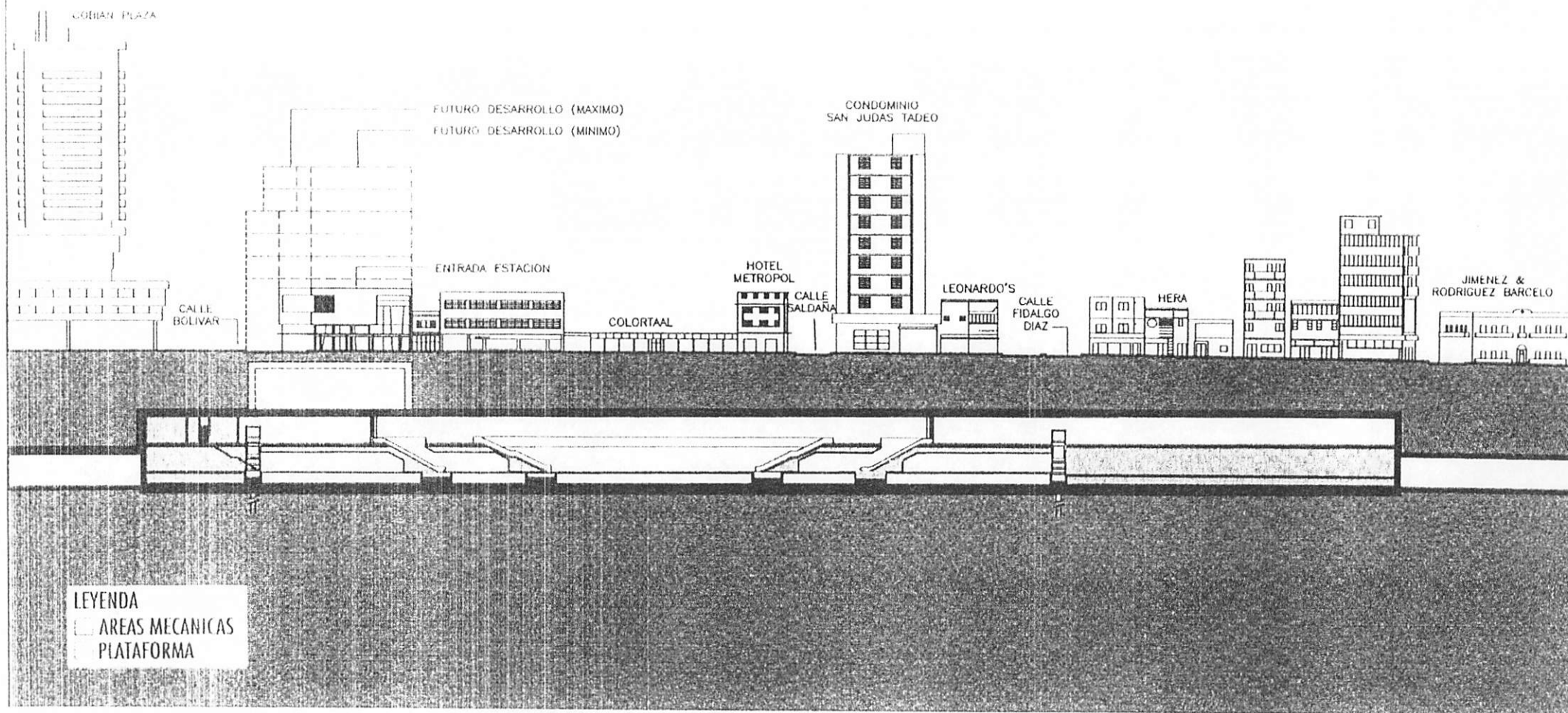
TREN URBANO



San Mateo - West entrance facade



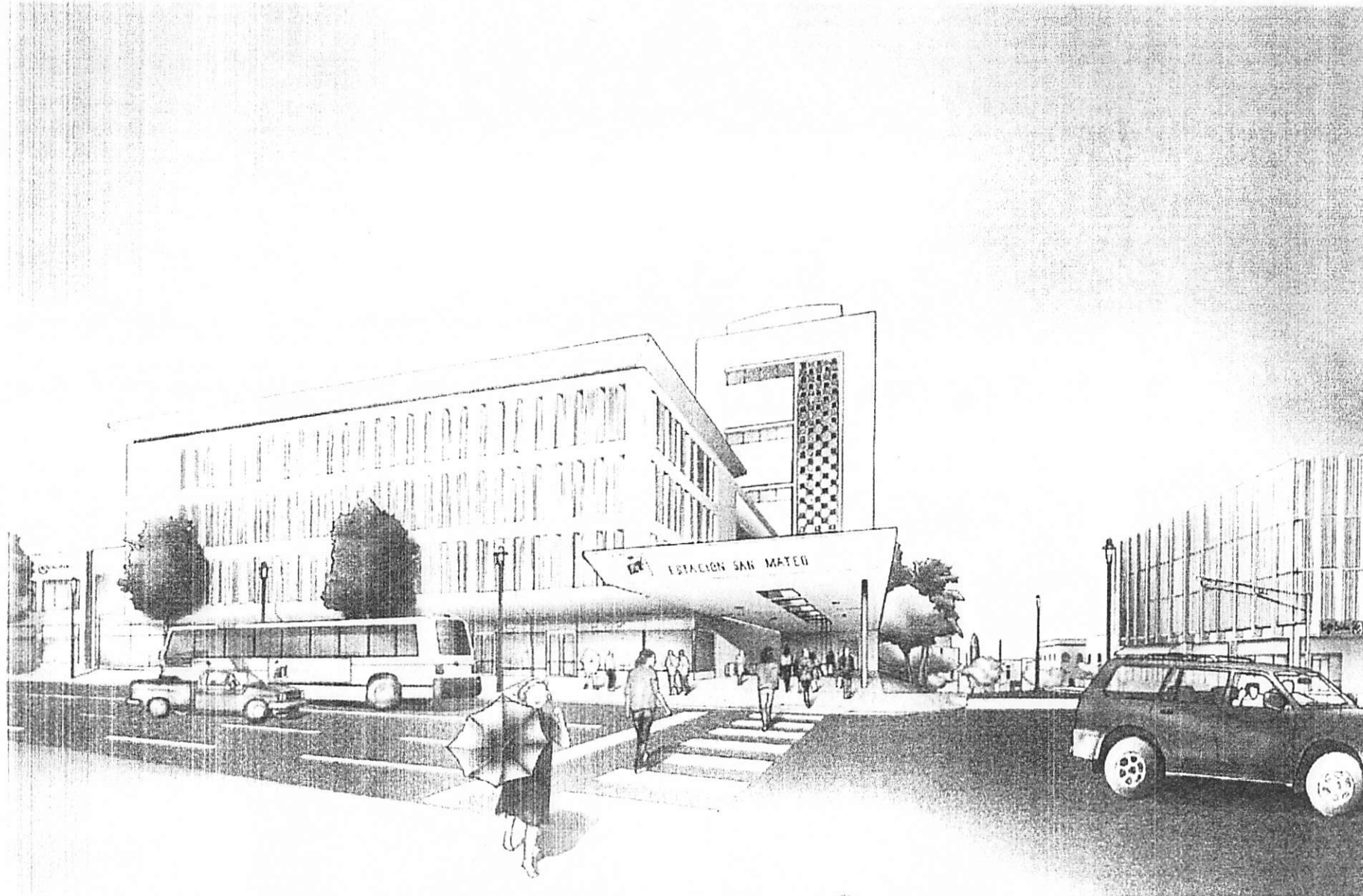
TREN URBANO



San Mateo



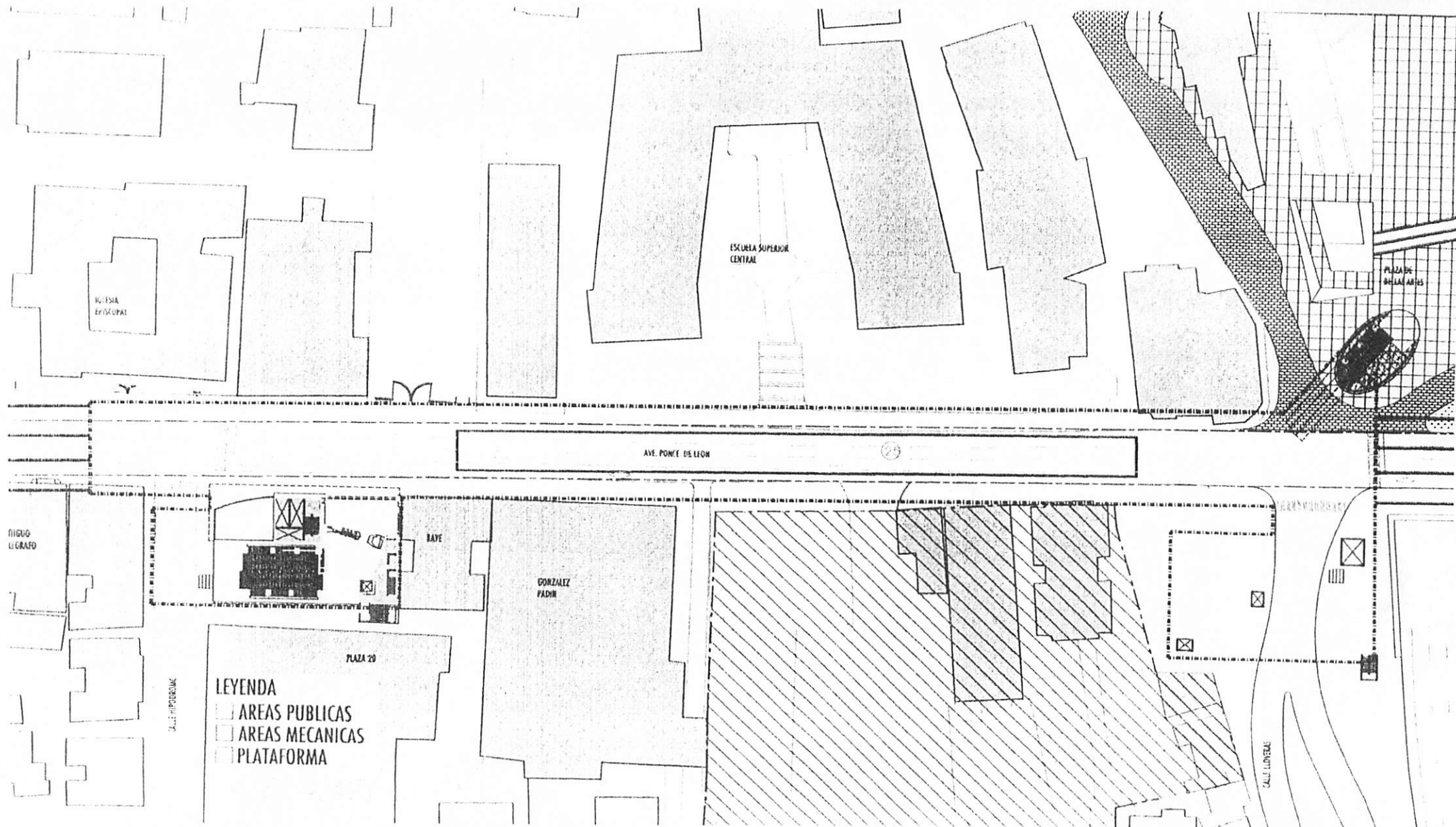
TREN URBANO



Minillas - Street level plan



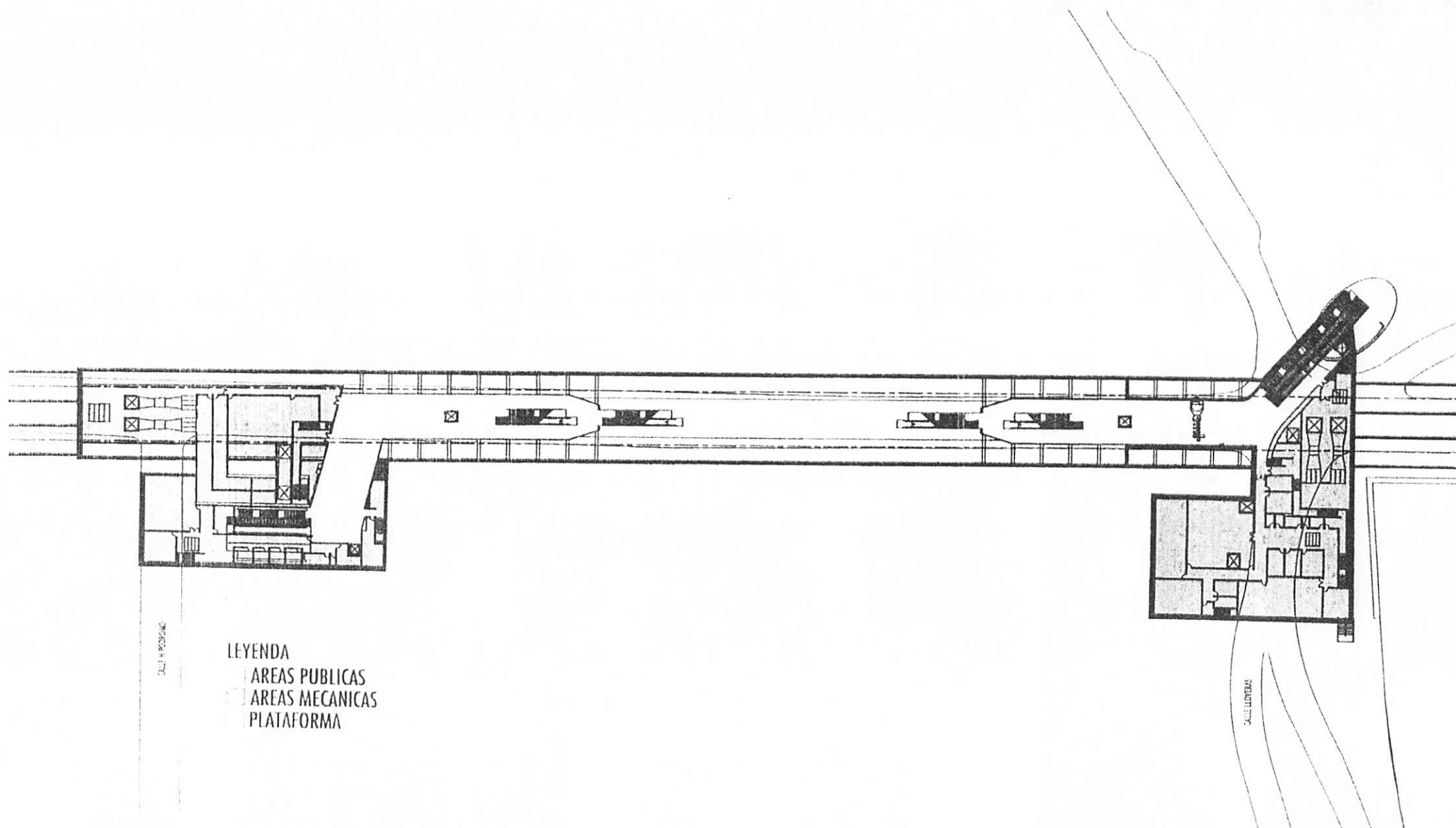
TREN URBANO



Minillas - Mezzanine level plan



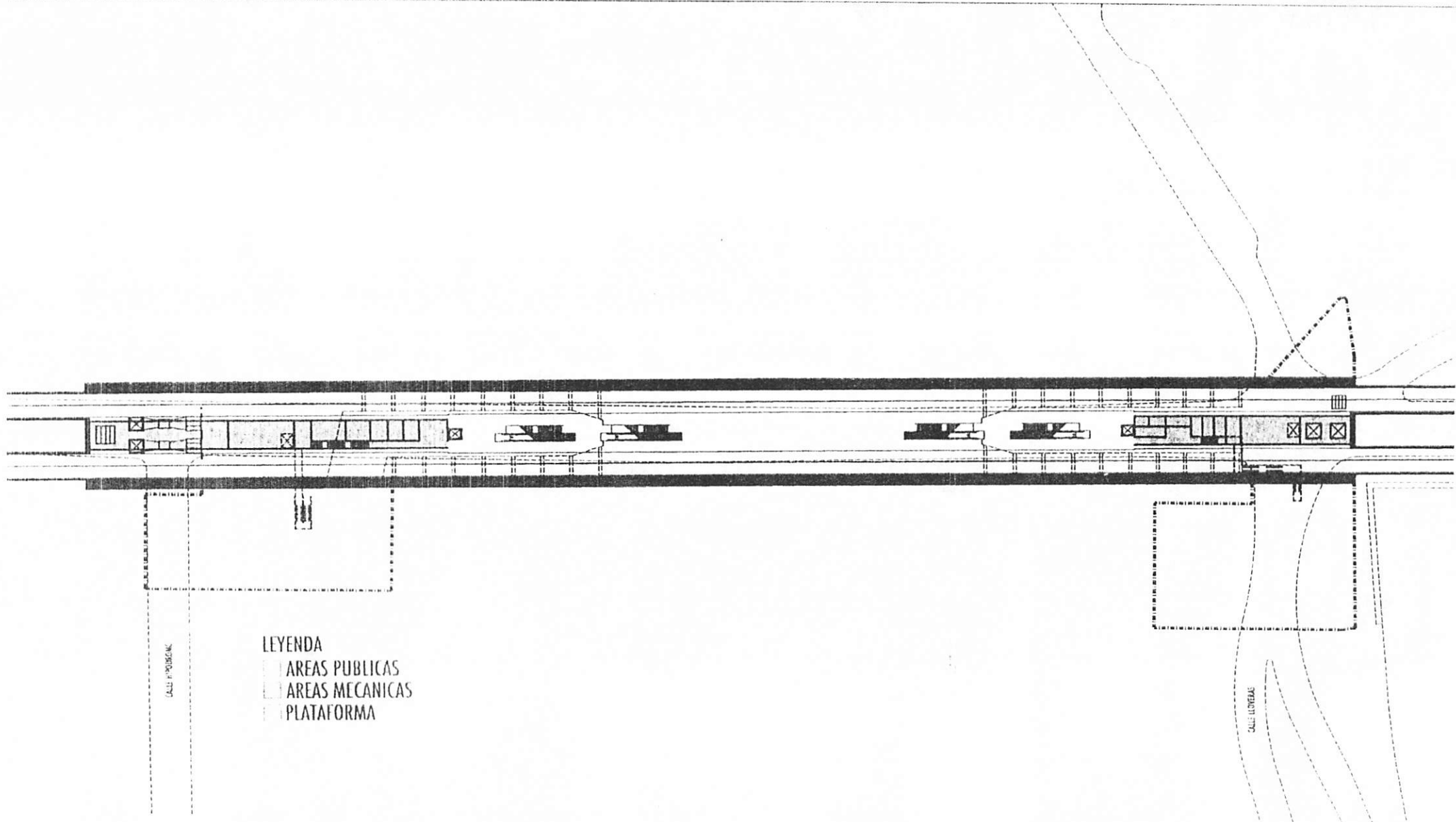
TREN URBANO



Minillas - Platform level plan



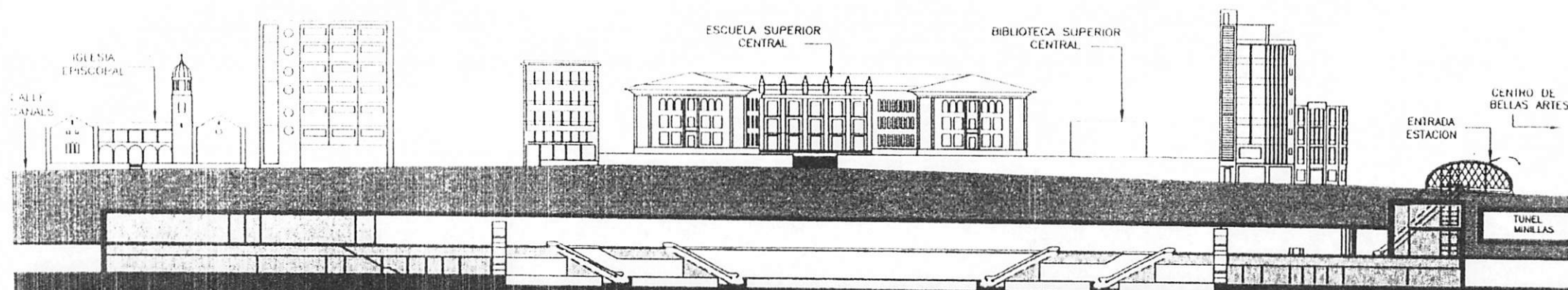
TREN URBANO



Minillas - West entrance facade



TREN URBANO



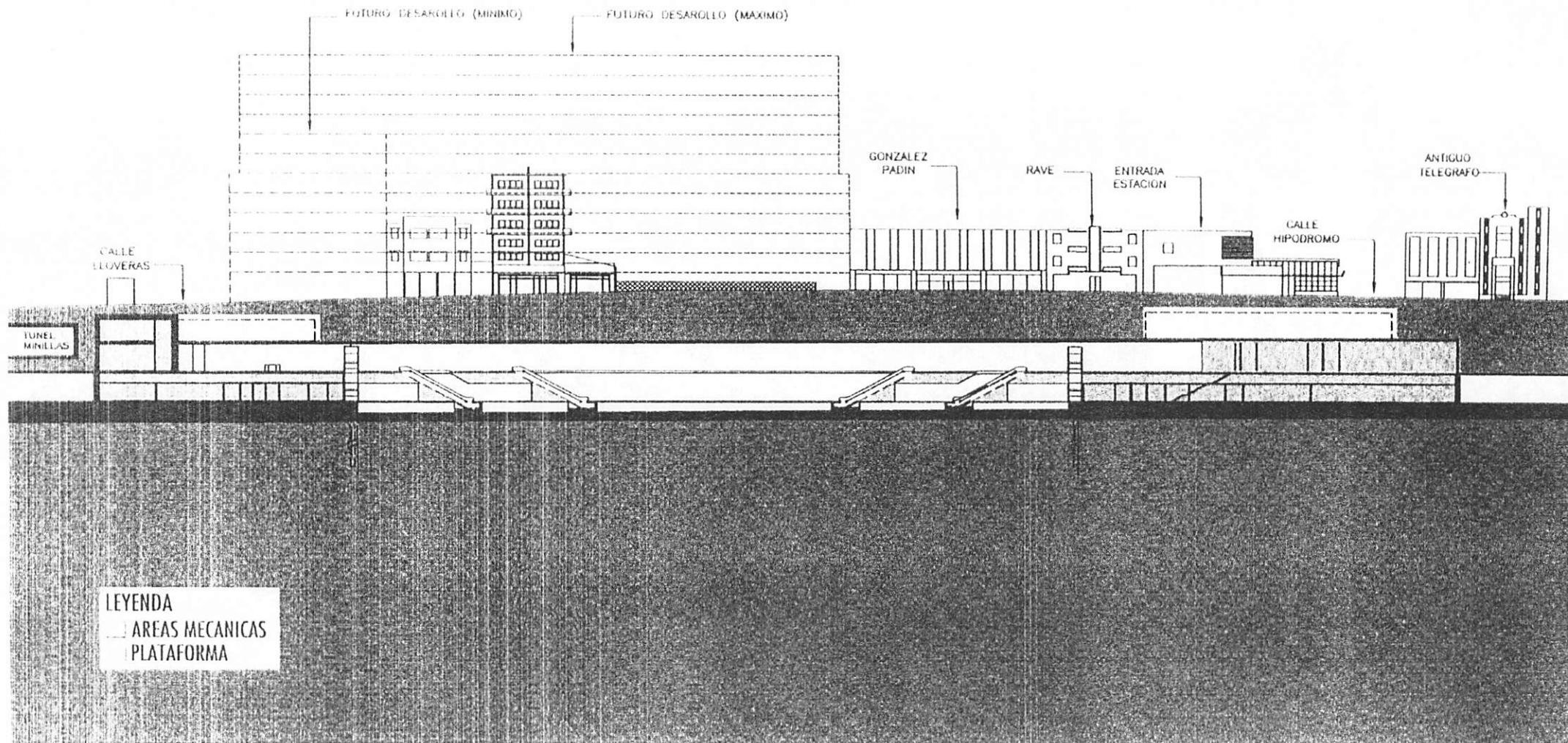
LEYENDA

AREAS MECANICAS
PLATAFORMA

Minillas - East entrance facade



TREN URBANO



Minillas



TREN URBANO





Facts About the Minillas Extension Alternatives



TREN URBANO

	Ponce de León Alternative
Property Acquisition:	31 properties 69 residential units 19 commercial establishments
Noise / Vibration:	No noise barrier needed Special trackwork to mitigate vibration impacts
Traffic:	Slight improvement
Historic / Archaeological:	Potential visual impacts to 2 structures
Consistency with Plans:	Consistent with Plan Vial
Construction:	Maintenance of Traffic; Noise / Vibration Mitigation Needed
Parklands: Ecosystem: Water Resources: Wildlife / Vegetation: Hazardous Waste:	No significant impact

Facts About the Minillas Extension Alternatives



TREN URBANO

	Ponce de León Alternative
Capital Cost:	\$468 millions
New Riders (Daily):	14,400
Total Length:	1.8km
Cut and Cover:	1%
Bored Tunnel:	54%
Above Grade:	12%
Mined Sections (NATM):	33%