Appendix C–3 Accident Analysis

Table C–3–1 Accident Analysis

Location	Type of Accident		Type of Violation		Comment
C11 45 – Cr. 33	Side Swipe collision	31% (5)	Not Enough Head-Way	25% (4)	o Rear-End collision: high-frequency, at Cr. 32 approach on C11 45.
	Rear-End collision	31% (5)	Improper Turning	19% (3)	o Side Swipe collision: -do-, at approaches on C11 45.
(16)	Multiple collision	19% (3)	Careless Driving	19% (3)	o Collision with bus: -do- (about 50%)
	Others	19% (3)	Others	37% (6)	o Left-turning vehicles at both approaches on C11 45: many exist.
					o Cycle length of signal: very short (about 50 sec.).
					o Caused by failure to allow sufficient headways.
C11 35 – Cr. 27	Side Swipe collision	54% (7)	No stop at stop sign	54% (7)	o Side Swipe collision, Right angle collision: high frequency.
	Right Angle collision	38% (5)	Others	46% (7)	o Infinite classification of major/minor street.
(14)	Others	8% (2)			o Collision with bus: about 21%.
					o Caused by no stop at stop sign.
					o Caused by indefinite classification of major/minor street.
C11 34 – Cr. 43	Side Swipe collision	30% (4)	Disregarded Traffic		o Side Swipe collision: high frequency, unless traffic signaled st.
	Rear-End collision	14% (2)	Signal	30% (4)	o Accidents with personal injury: about 14%.
(14)	Right Angle collision	14% (2)	Improper Pedestrian		o Collision with bus: high frequency (about 50%)
	Turning collision	14% (2)	Crossing.	21% (3)	o Caused by traffic confliction due to traffic congestion.
	Personal Injury	14% (2)	No Preventive Care	21% (3)	o Caused by disregarded traffic signals.
	Others	23% (3)	Improper Overtaking	14% (2)	o Caused by indiscriminate crossing of pedestrians.
			Others	14% (2)	
C11 30 – Cr. 11	Rear-End collision	31% (4)	Not Enough Head-Way	31% (4)	o Turning collision/Right angle collision: high frequency at
	Turning collision	23% (3)	Improper Passing	23% (3)	CIRCUNVALAR approach on C11 30.
(13)	Right Angle collision	15% (2)	Break Failure	15% (2)	o Rear-end collision: high frequency, at Cr 13 approach on C11 30.
	Personal Injury	8% (1)	Improper Pedestrian		o Accident with personal injury: about 8%.
	Others	23% (3)	Crossing.	8% (1)	o Collision with bus: about 30%
			Others	23% (1)	o Left-Turning vehicle at approach on C11 30: many exist.
					o Rear-end collisions caused by many left-turning vehicles.
					o No-signalized intersection.

Table C–3–1 (Cont'd)

Location	Type of Accident		Type of Violation		Comment
C11 84 – Cr. 46	Multiple collision	30% (3)	Not Enough Head-Way	30% (3)	o Multiple collision: high frequency, at C11 85 approach on Cr. 46.
	Side Swipe collision	21% (2)	Improper Overtaking	30% (3)	o Most of multiple collisions consists of rear-end/side swipe collisions.
(10)	Turning collision	20% (2)	No Preventive Care	20% (2)	o Collision with bus: about 40%.
	Others	30% (3)	Others	20% (2)	o Caused by improper overtaking/disregarded traffic signal.
					o Cycle length of signal: very short (about 40 sec).
C11 72 – Cr. 25B	Side Swipe collision	56% (5)	No stop at stop sign	34% (3)	o Side swipe collision: high frequency, at central of intersection.
	Rear-End collision	11% (1)	Break Failure	22% (2)	o Collision with bus: about 22%.
(9)	Right Angle collision	11% (1)	No Preventive Care	22% (2)	o Caused by no stop at stop sign.
	Out of Control	11% (1)	Others	22% (2)	o Caused by indefinite classification of major/minor streets.
	Others	11% (1)			
C11 72 – Cr. 46	Rear-End collision	29% (2)	Break Failure	44% (3)	o Rear-end collision: relatively high frequency, at Cr. 45 approach C11 72.
	Side Swipe collision	29% (2)	Not enough Head-Way	14% (1)	o Collision with bus: about 29%.
(7)	Others	42% (3)	Disregarded Traffic Signal.	14% (1)	o Left-turning vehicles at Cr. 45 approach on C11 72.: many exist
			Others	28% (2)	o Caused by traffic congestion.
C11 76 – Cr. 46	Side Swipe collision	42% (3)	Break Failure	57% (4)	o Side swipe/multiple collision: high frequency, unless traffic signals exist.
	Multiple collision	29% (2)	No stop at stop sign	14% (1)	o Collision with bus: about 43%.
(7)	Others	29% (2)	Others	29% (2)	o Caused traffic congestion/disregarded traffic signal.
C 11 72 – Cr. 53	Rear-End collision	29% (2)	No Preventive Care	30% (2)	o Right angle/side swipe/rear-end collision: high frequency, at C11 74 approach on Cr. 53, at Cr. 52 approach on C11 72.
	Right Angle collision	29% (2)	Disregarded Traffic Signal.	14% (1)	o Collision with bus: about 43%.
(7)	Side Swipe collision	29% (2)	Not Enough Head-Way	14% (1)	o Unless traffic signals exist, those accidents show high frequency, which is caused by traffic congestion/disregarded traffic signal.
	Others	13% (1)	Improper Backing	14% (1)	
			No stop at stop sign	14% (1)	
			Improper in Coming out of parking	14% (1)	

Table C–3–1 (Cont'd)

Location	Type of Accident		Type of Violation		Comment
C11 45 – Cr. 38	Side-Swipe collision	36% (4)	Break Failure	27% (3)	o Side-swipe collision: high frequency, at Cr. 35 approach C11 45.
	Rear-End collision	27% (3)	Disregarded Traffic	18% (2)	o Rear-end collision: -do-, at both approaches on C11 45.
(11)	Personal Injury	10% (1)	Not Enough Head-Way	10% (1)	o Accident with personal injury: about 10%.
	Others	27% (3)	Improper Change of Lane.	10% (1)	o Collision with bus: about 36%.
					o Caused by traffic congestion with jams.
			Improper Pedestrian Crossing.	10% (1)	o Left-turning vehicles at Cr. 35 approach on C11 45: many exist.
					o Caused by disregarded traffic signal/improper overtaking.
			Others.	28% (3)	
C11 45 – Cr. 44	Side-Swipe collision	50% (5)	Over Speed	20% (2)	o Side-Swipe collision: high frequency, unless traffic signal exist.
	Rear-End collision	30% (3)	Disregarded Traffic Signal.	20% (2)	o Side-Swipe/right angle collision: high frequency, at C11 46 approach on Cr. 44.
(10)	Others	20% (2)	No Preventive Care	20% (2)	o Collision with bus: about 30%.
			Others	40% (4)	o Caused by traffic congestion/disregarded traffic signal.
					o Caused by congestion of buses near bus stop.
C11 47 – Cr. 21	Side-Swipe collision	50% (5)	Break Failure	20% (2)	o Side-Swipe/rear-end/bultiple collision: high frequency, at C11 45 approach on C11 47.
	Rear-End collision	20% (2)	No Forward Attention	20% (2)	o Collision with bus: about 40%.
(10)	Turning collision	20% (2)	No stop at stop sign	20% (2)	o Caused by obstruction of smooth: traffic flow due to poor condition of pavement maintenance.
	Others	10% (1)	Others	40% (4)	o Caused by disregarded traffic signal/traffic congestion.

Appendix D–1 OD Pattern by Purpose

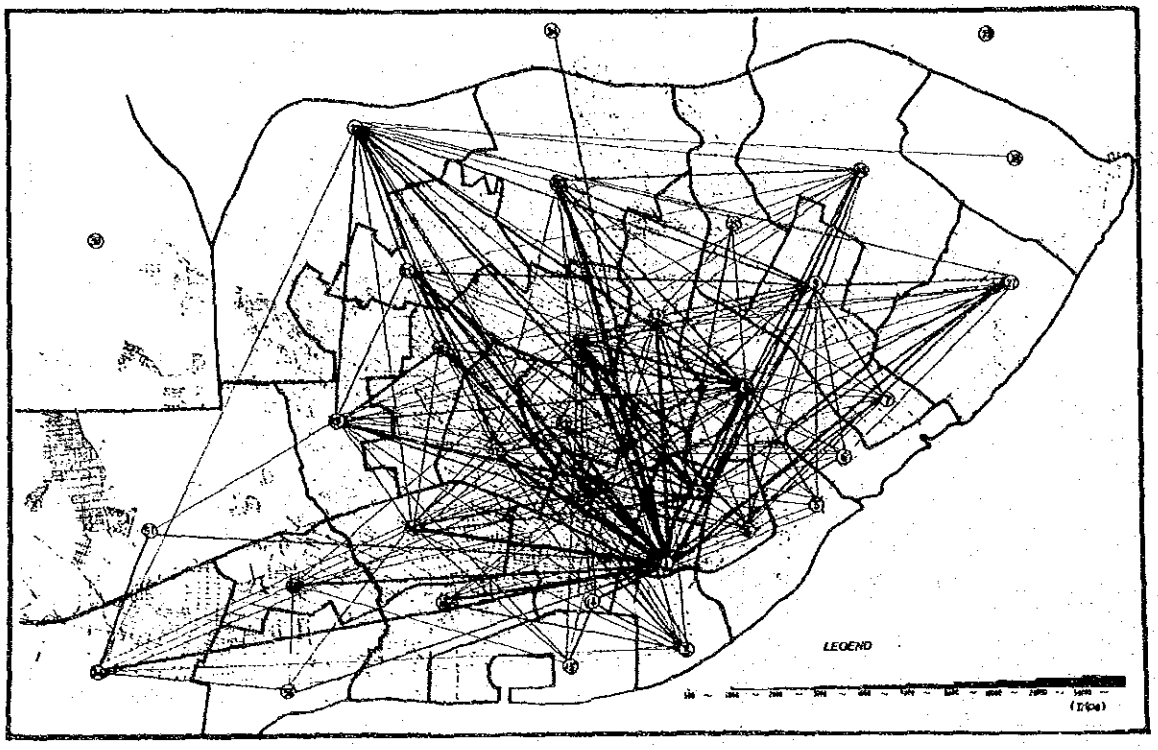

Fig. D–1–1 OD Pattern in 1983 (Work)

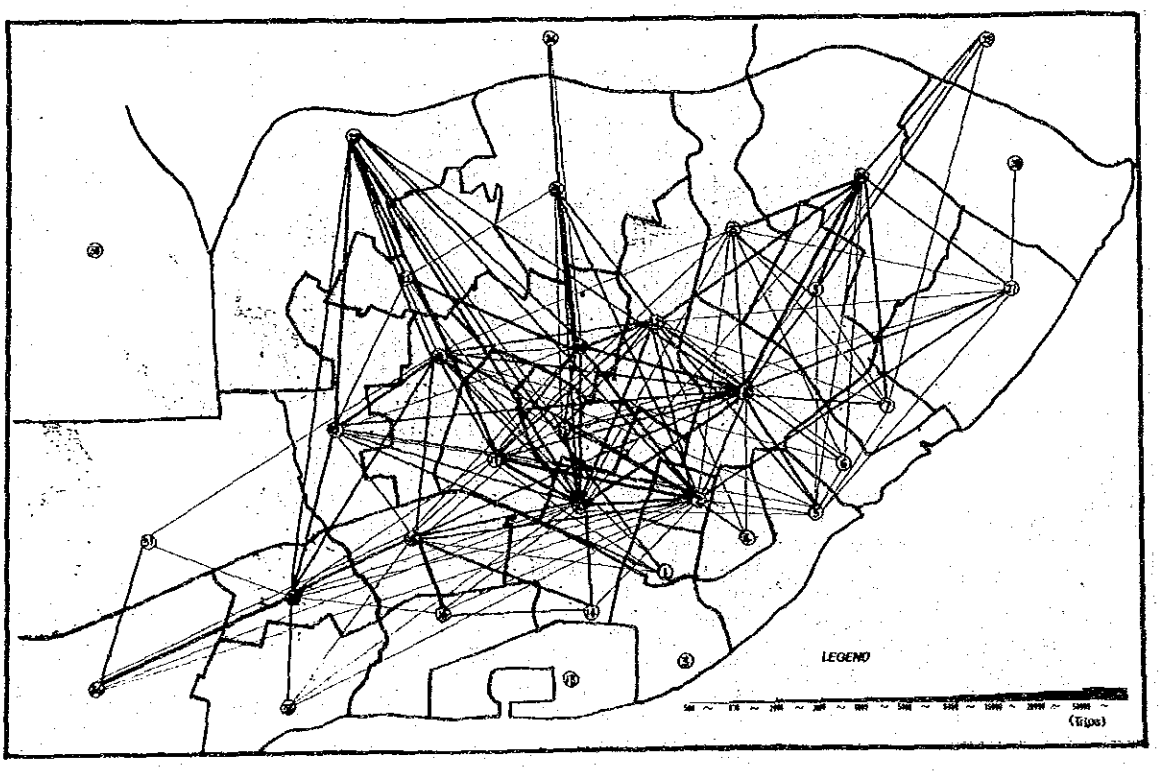

Fig. D–1–2 OD Pattern in 1983 (School)

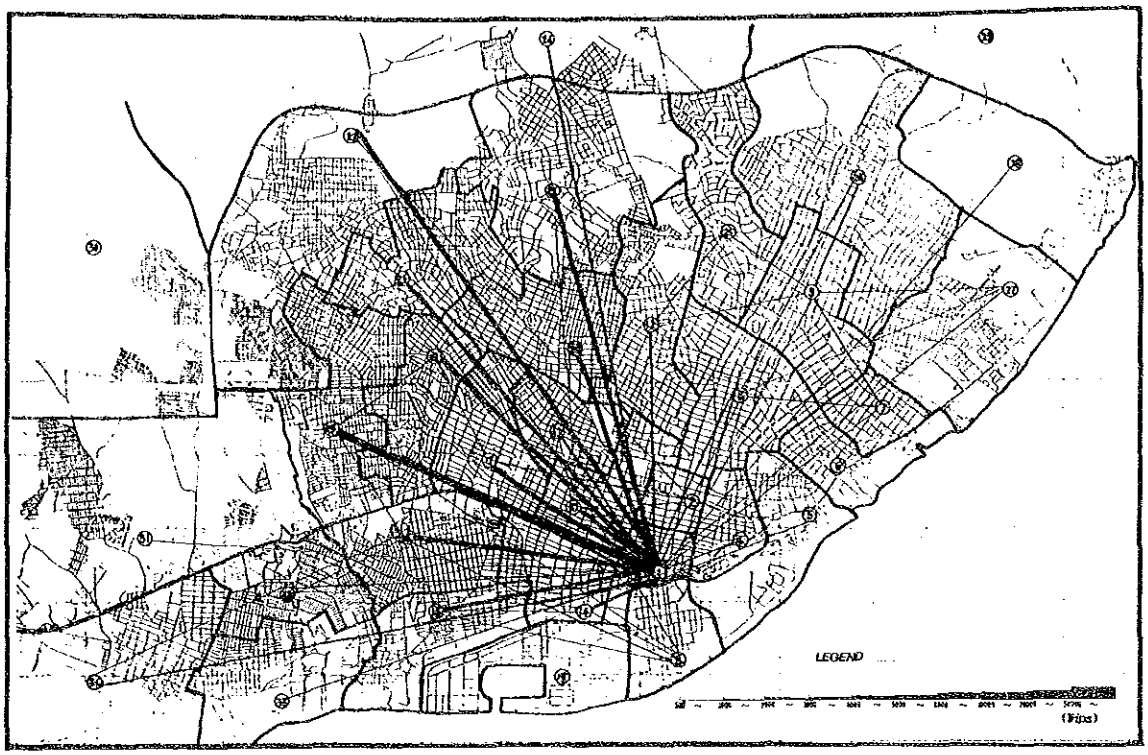

Fig. D–1–3 OD Pattern in 1983 (Shopping)

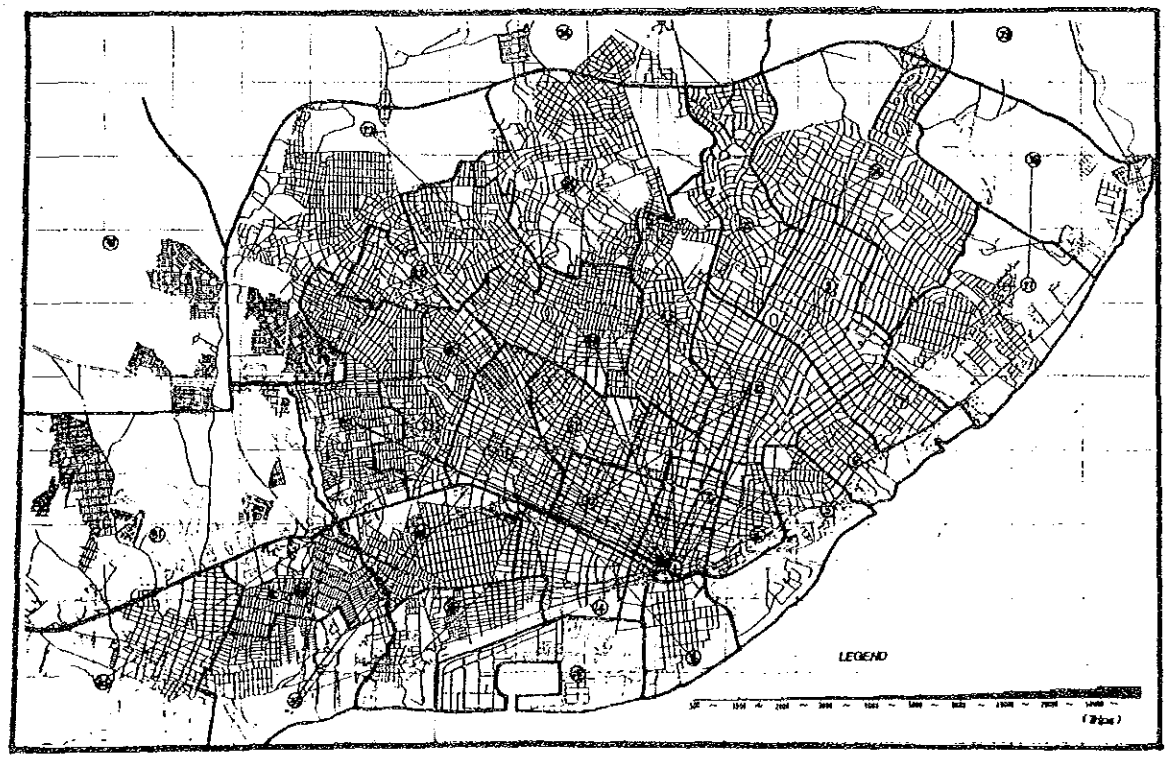

Fig. D–1–4 OD Pattern in 1983 (Business)

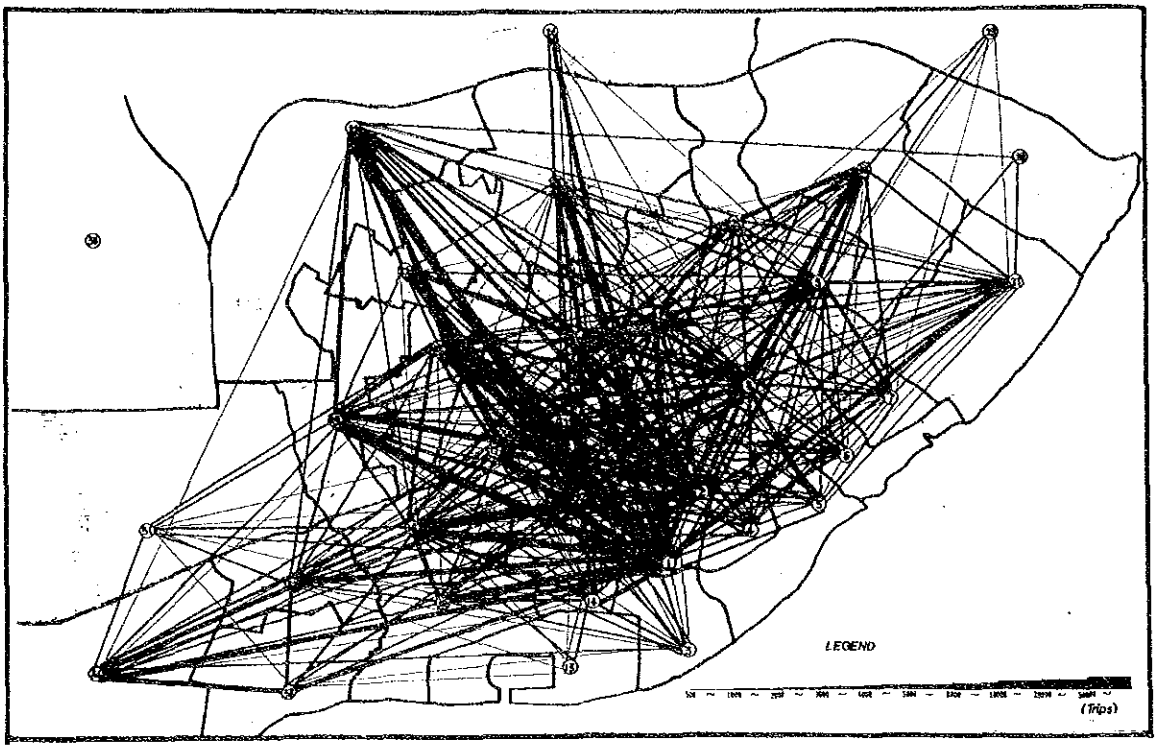

Fig. D–1–5 OD Pattern in 1983 (Home)

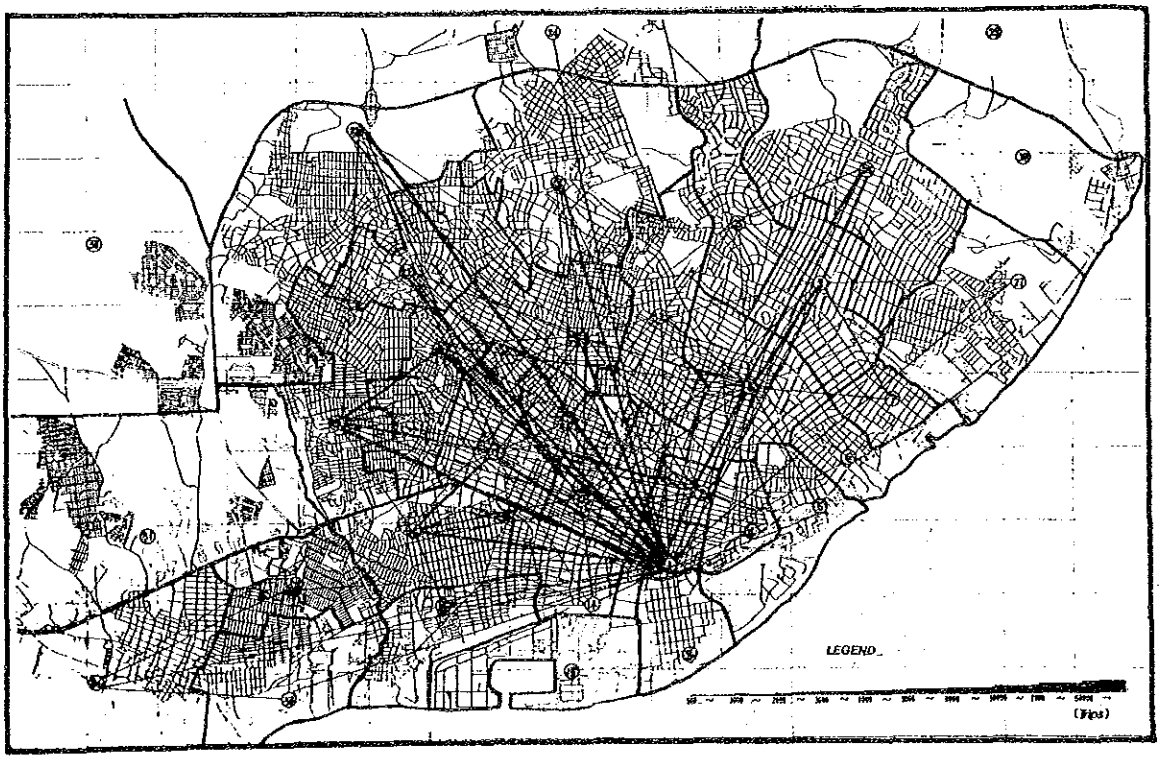

Fig. D–1–6 OD Pattern in 1983 (Private)

Appendix E–1 Present Bus Routes

Table E–1–1 List of Urban Bus Routes

Code No.	Company	Route (Service Area)	Route Length (km)
01	Flota Roja Ltda.	Boston Calle 76	14.3
02	Cootransnorte	Prado Boston	12.5
03	Flota Roja Ltda.	Boston Calle 72	15.2
04	Sobusa S.A.	Paraíso Cra. 50	18.0
05	Sobusa S.A.	Vivero Paraíso	18.0
06	Transdiaz S.A.	Ruto No.3 Andalucía	17.8
07	Flota Angulo Ltda.	Porvenir Prado	17.0
08	Transp. Lolaya Ltda.	Prado Porvenir	17.6
17	Cootransnorte	Prado Lujo	16.3
18	Sobusa S.A.	Cra. 54 Uninorte	26.0
21A	Transp. Coolitoral	Vía 40–Calle 72–Silencio	20.0
	Transp. Trasalfa	Vía 40–Calle 72–Silencio	20.0
21B	Transp. Coolitoral	Silencio–Vía 40	20.0
	Transp. Trasalfa	Silencio–Vía 40	20.0
22	Transdiaz	Porvenir Paraíso Cra. 38	21.0
23	Transdiaz	Porvenir Paraíso Vía 40	21.0
24	Coolitoral	Florida Terminal Cra. 38	22.0
25	Coolitoral	Florida Terminal Cra. 43	22.0
26	Flota Angulo	Expreso Porvenir	18.0
31	Cootrantico	Lucero San Felipe	14.0
32	Cootrantico	Estudiantes Los Andes	14.0
33	Transp. Lolaya	Murillo Delicias	15.0
	Transp. Trasalfa	Murillo Delicias	15.0
34	Embusa, Transp. Monterrey	Delicias Olaya	15.0
35	Transp. Lolaya y Trasalfa	Valle–Silencio	18.0
			18.0
36	Embusa y Monterrey	Silencio–Valle	18.0
37	Transp. Sodetrans	Loma Fresca–La Paz	19.0
38A	Cootrantico	La Manga–Nva. Colombia	17.0
38B	Cootrantico	La Manga–El Pueblo	22.0
39	Sodetrans	Loma Fresca–Hospital Sourdis	17.8
41	Sotrausque	El Bosque–Cra. 18	15.2
42	Transp. Monterrey	Bosque Aduanilla	18.0
47	Sobusa	Caldas Recreo	34.0
48	Sobusa	Las Flores Cevillar	33.0
49	Transurbar	Maria Modelo	44.0
51	Sotrausque	Santuario Cra. 9	15.5
52	Coochofal	Ciudadela–Conidec	22.0
53	Transp. Atlántico	Cra. 14–Ciudadela Conidec	21.5
54	Coochofal	Cra. 19–Realengo	20.7
55	Coochofal	San Luis–Santa María	24.0
56	Coochofal	Cra. 14	24.0
57	Coochofal	Cra. 20	26.6
61	Transp. Atlantico	Palmas Cra. 11	18.0
62	Transp. "	Palmas Cra. 17	18.0
63A	Trasalianco	Galan	21.0
63B	Coochofal	La Victoria	24.0
64	Transurbar	Maria Modelo–El Parque	21.0
65	Cootrasol	Arboleda–El Parque	25.0
71	Cootratlantico	Cra. 15–Las Nieves	7.0
72	Cootratlantico	Ferry–Mercado	11.0
73	Transalianco	Simon Bolivar–Calle 17	10.5
74	Trasalianco	Pasadena–Los Trupillos	12.0
75	Trasalianco	Simon Bolivar–Cra. 12	15.0
76	Cootratlantico	Vista Hermosa	13.0
81	Transp. Soledad	Hipodromo–INEM–Salamanca	17.0
82	Cootrasol	Hipodromo–Inem–Soledad	27.8
83	Transp. Soledad	Calle 30 American Bar	20.7
84	Transmecar	San Antonio	25.0
85	Cootrasol	Aeropuerto–Calle 30–Hipodromo	18.6
87	Trasalianco	Aeropuerto–Calle 30–Concord	32.0
87B	Trasalianco	Manuela Beltran Soledad 2000	17.6
96	Transmecar	Salamanca Soledad	22.2
97	Transmecar	Ferry–Calle 17	17.9
98	Transmecar	Calle 17–Soledad	19.5

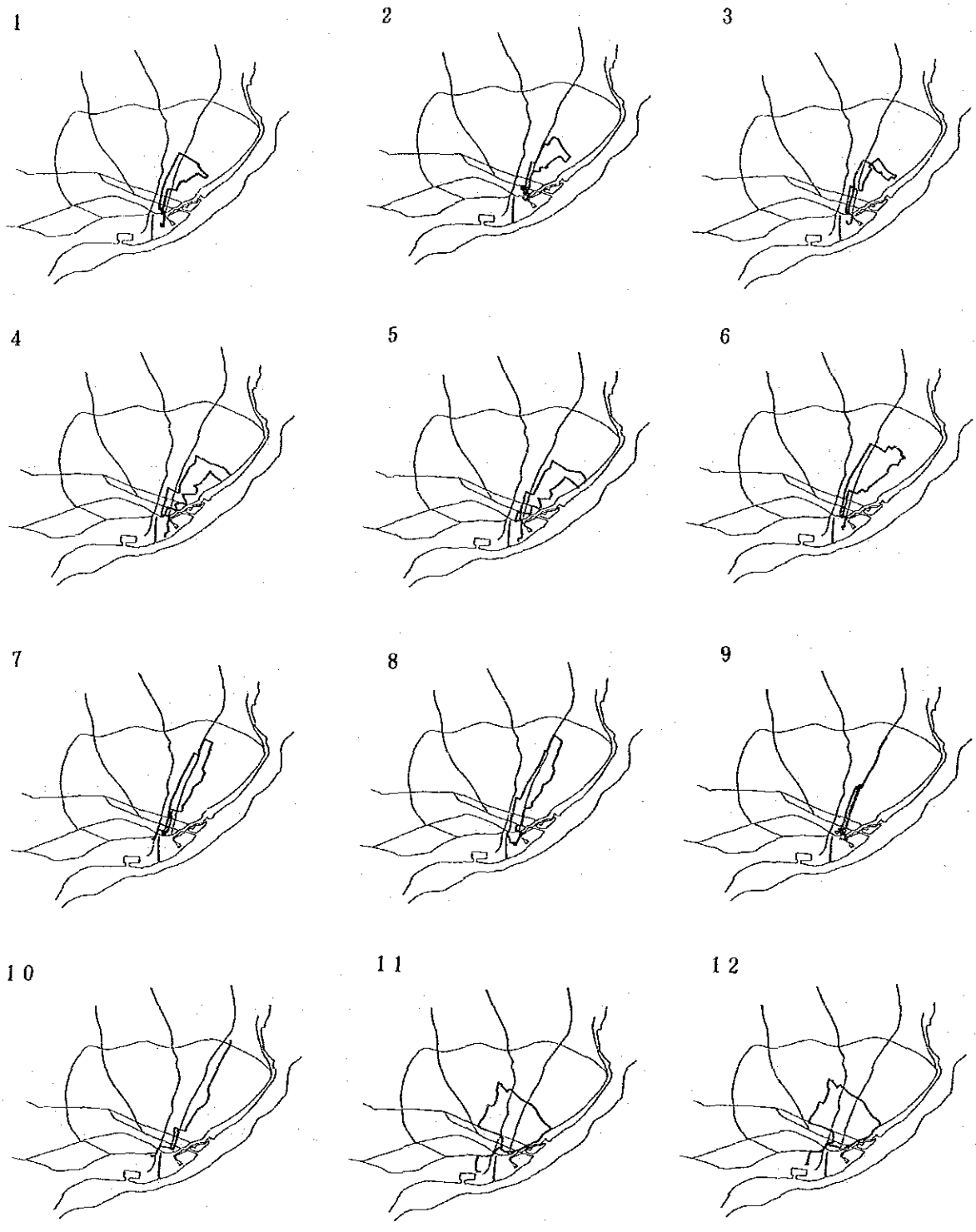

Fig. E–1–1 Existing Bus Routes

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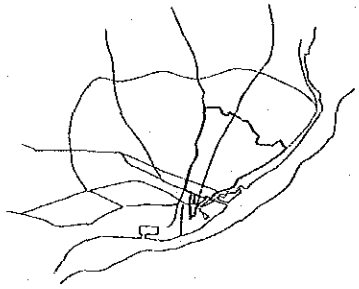

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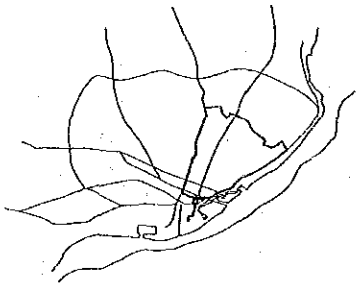

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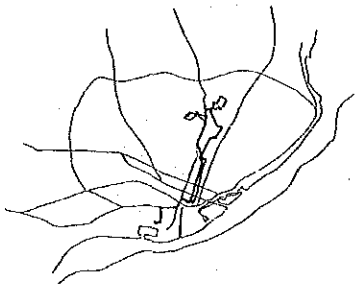

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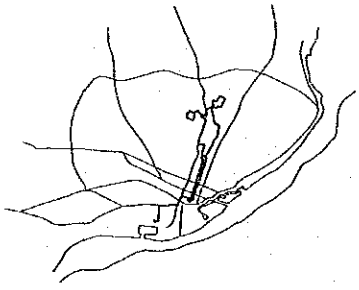

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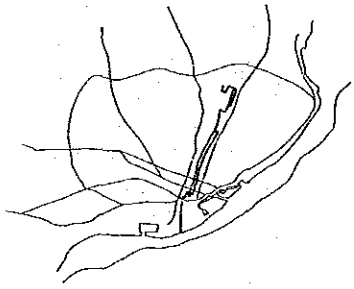

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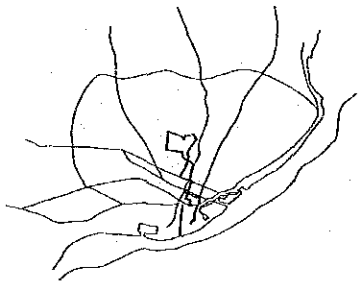

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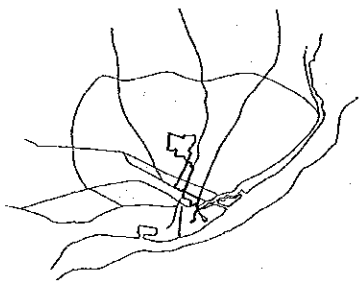

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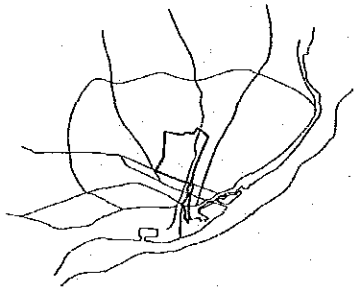

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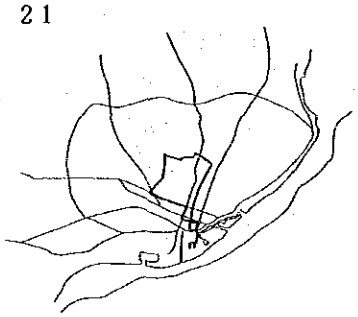

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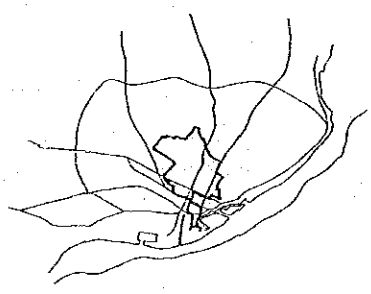

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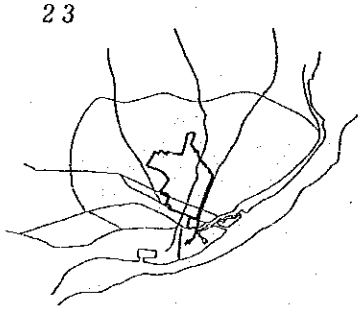

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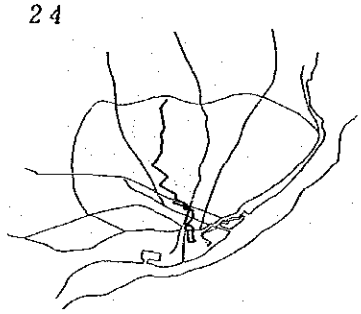

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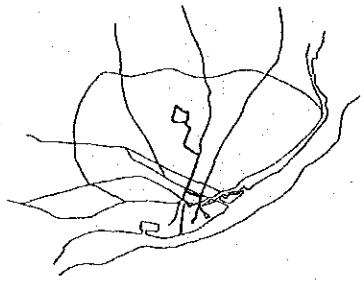

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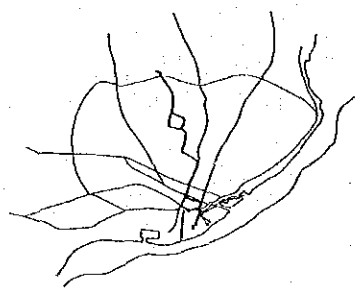

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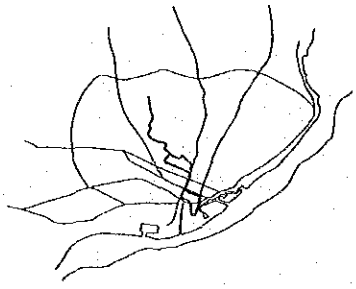

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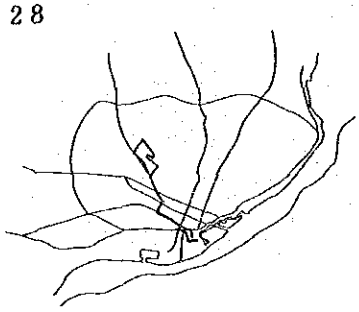

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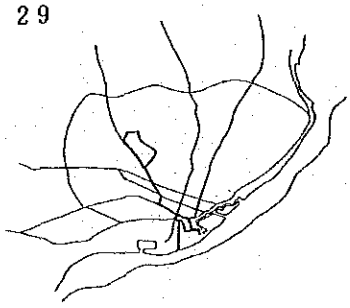

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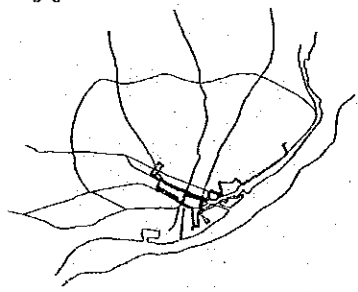

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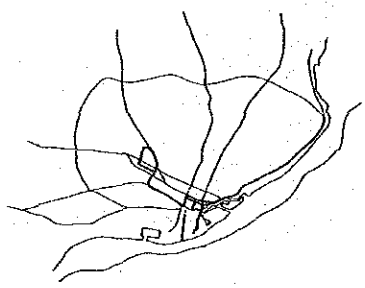

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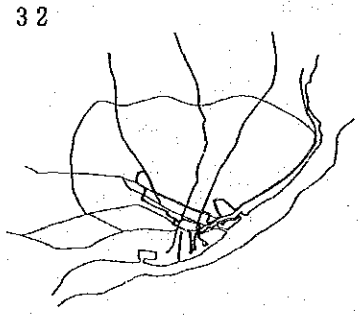

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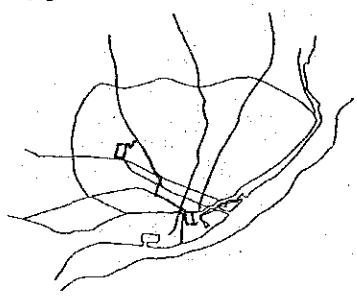

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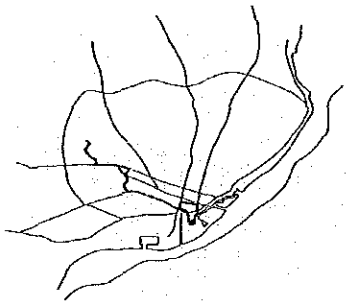

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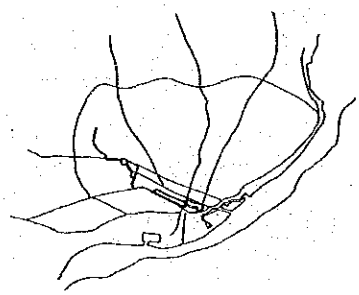

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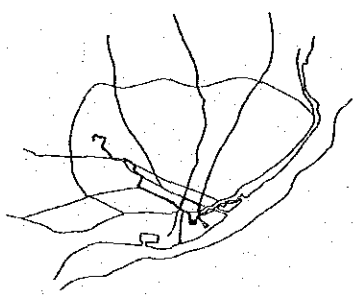

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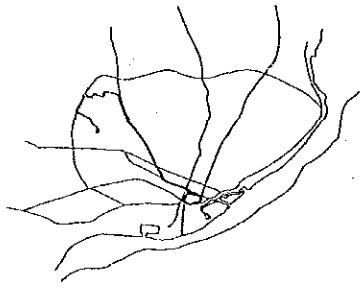

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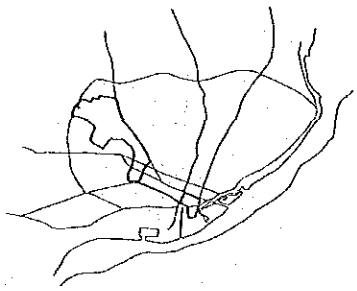

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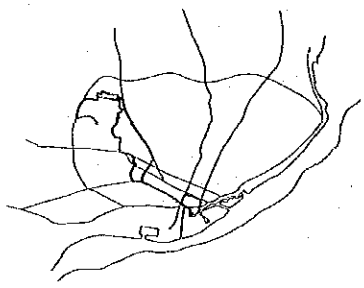

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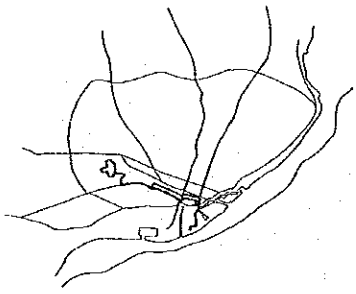

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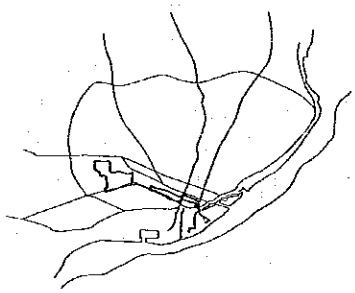

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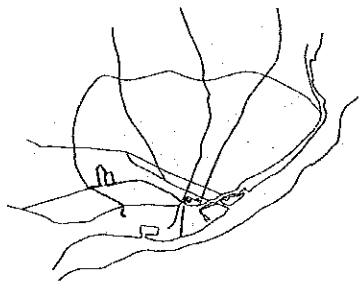

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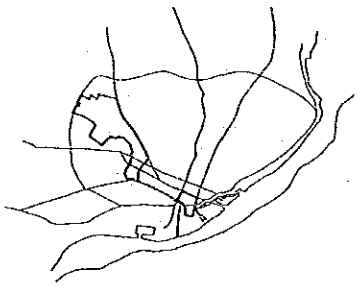

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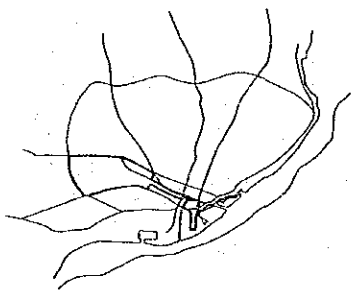

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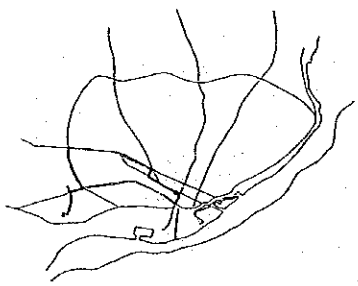

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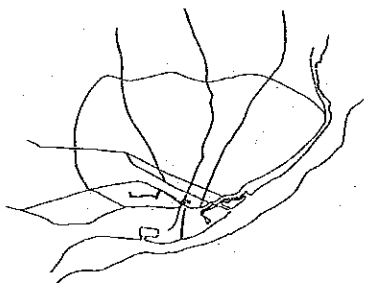

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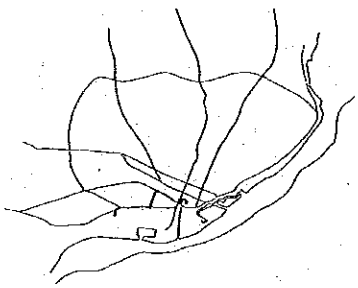

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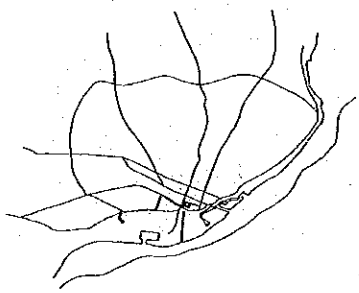

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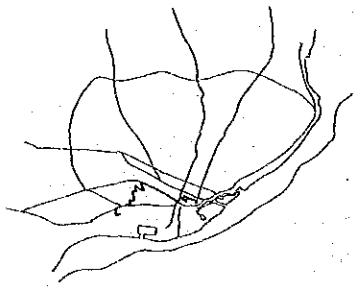

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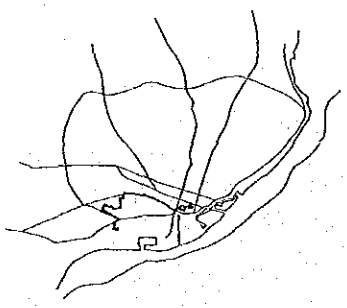

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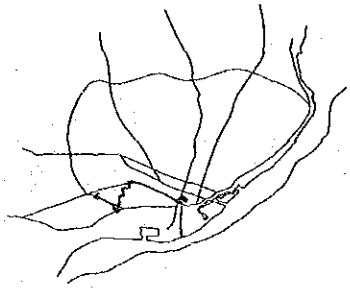

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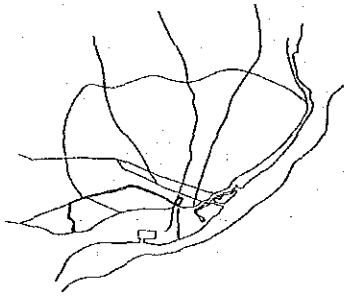

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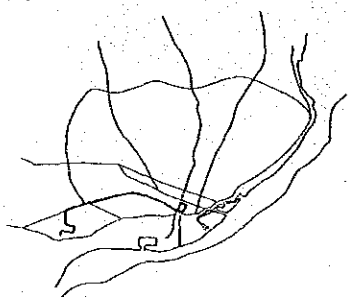

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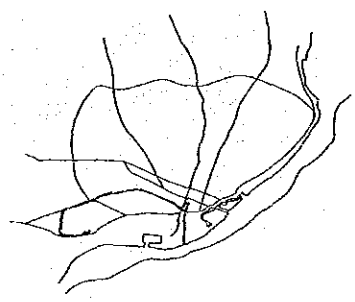

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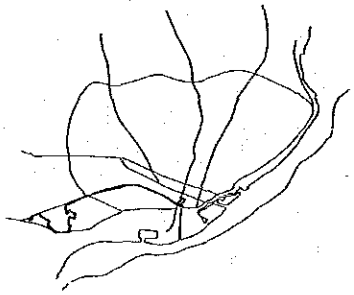

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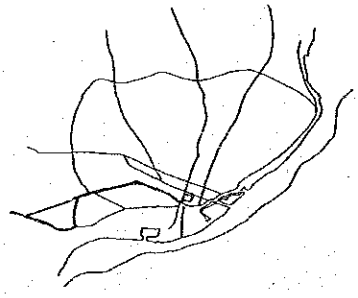

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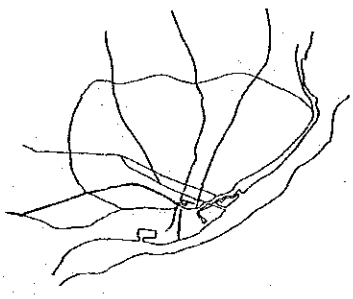

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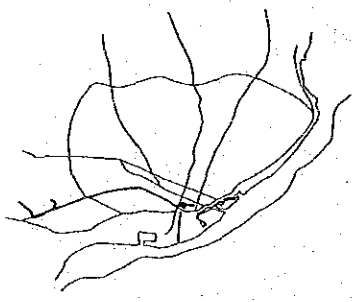

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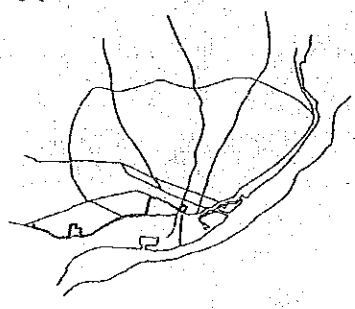

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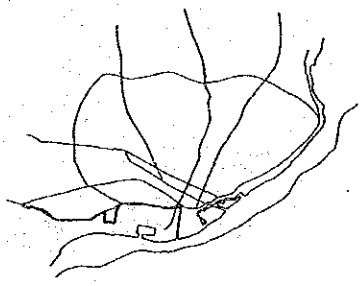

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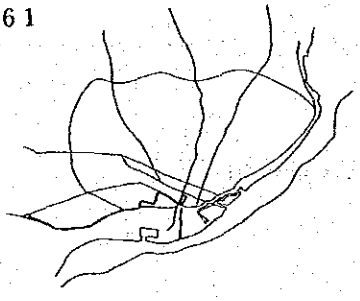


Appendix E–2 Desire Line of Bus Passengers in 1983

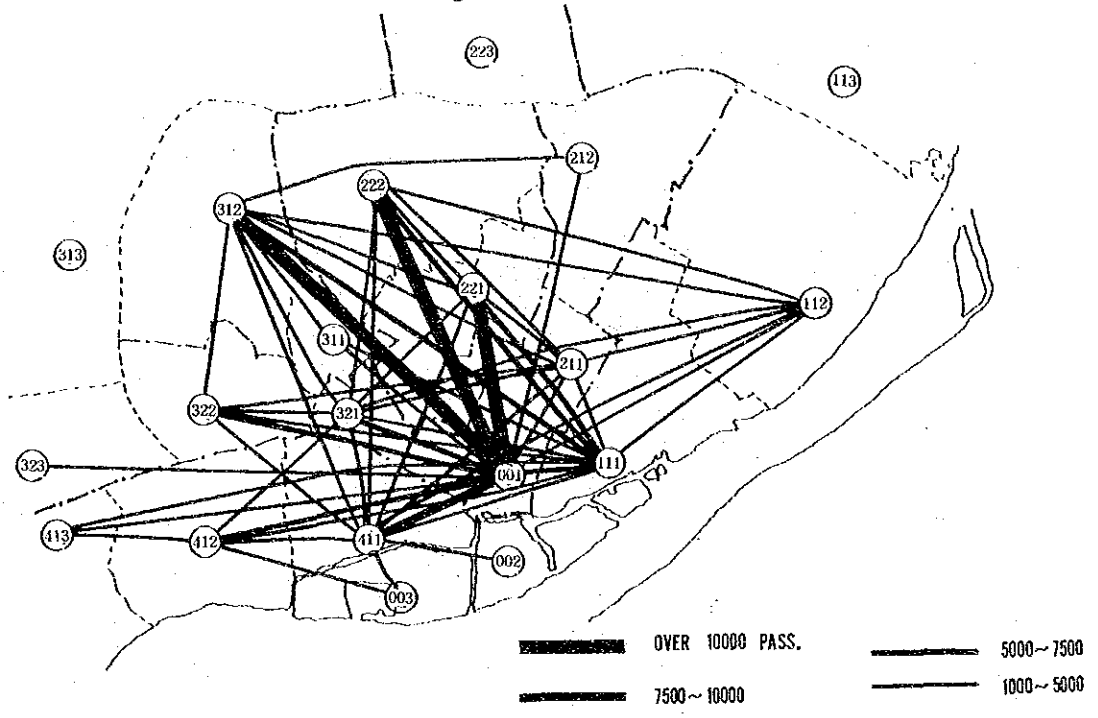


Fig. E–2–1 Desire Line of Bus Passengers in 1983 (Work)

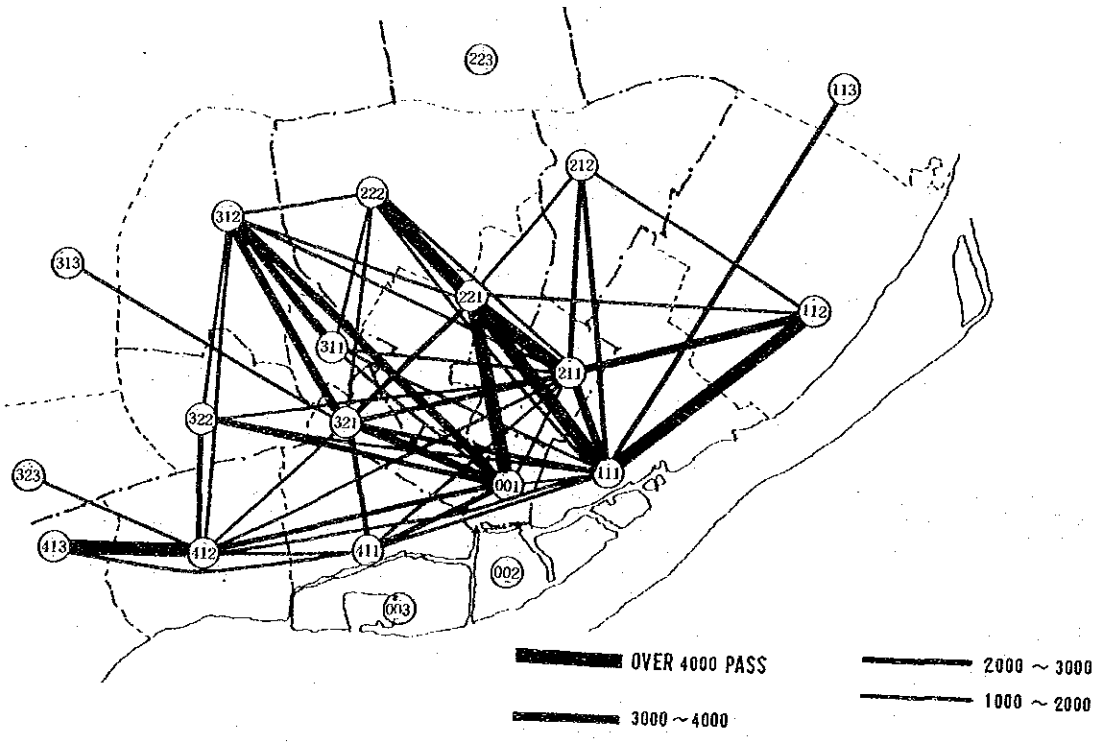


Fig. E–2–2 Desire Line of Bus Passengers in 1983 (School)

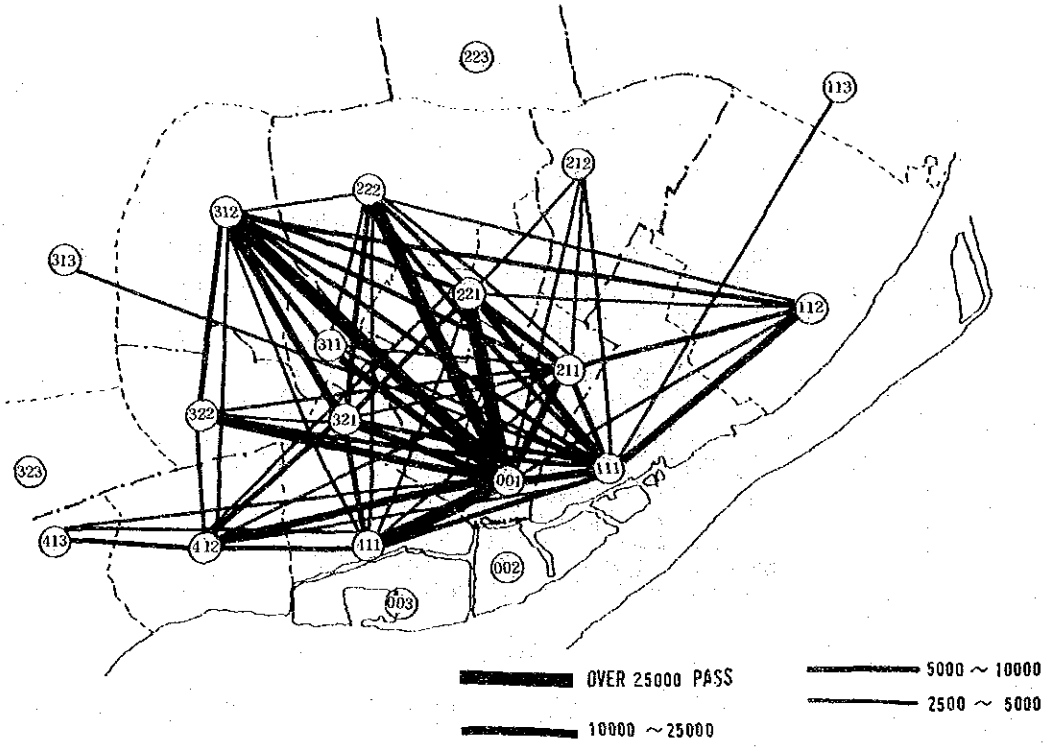


Fig. E–2–3 Desire Line of Bus Passengers in 1983 (Home)

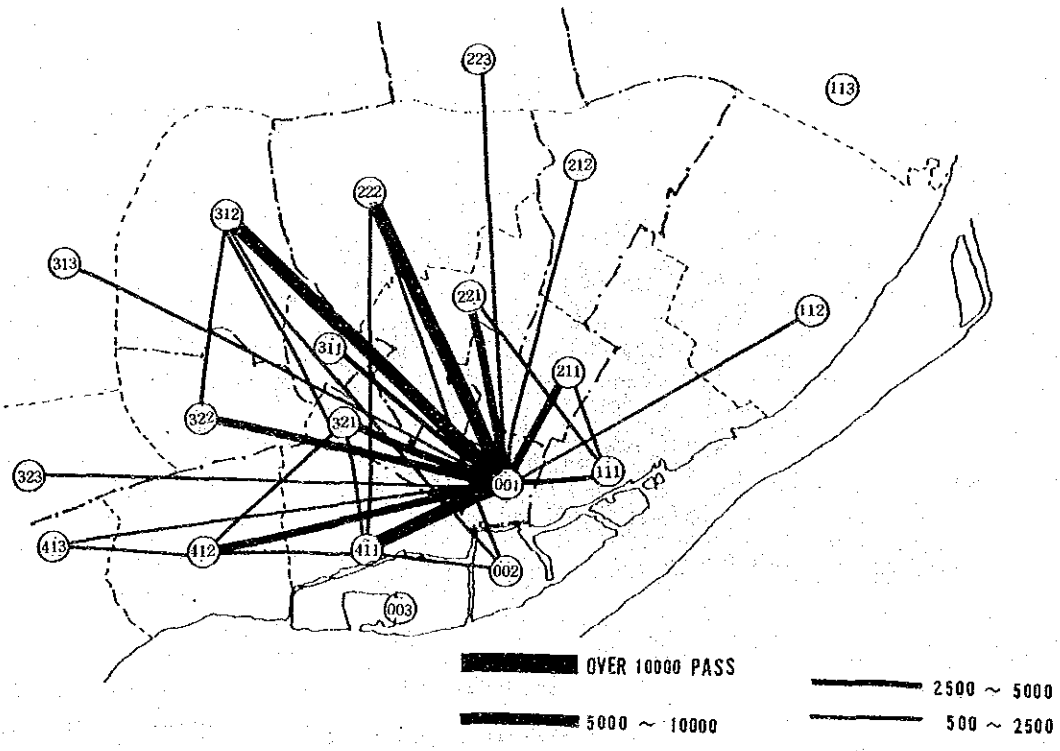


Fig. E–2–4 Desire Line of Bus Passengers in 1983 (Shopping)

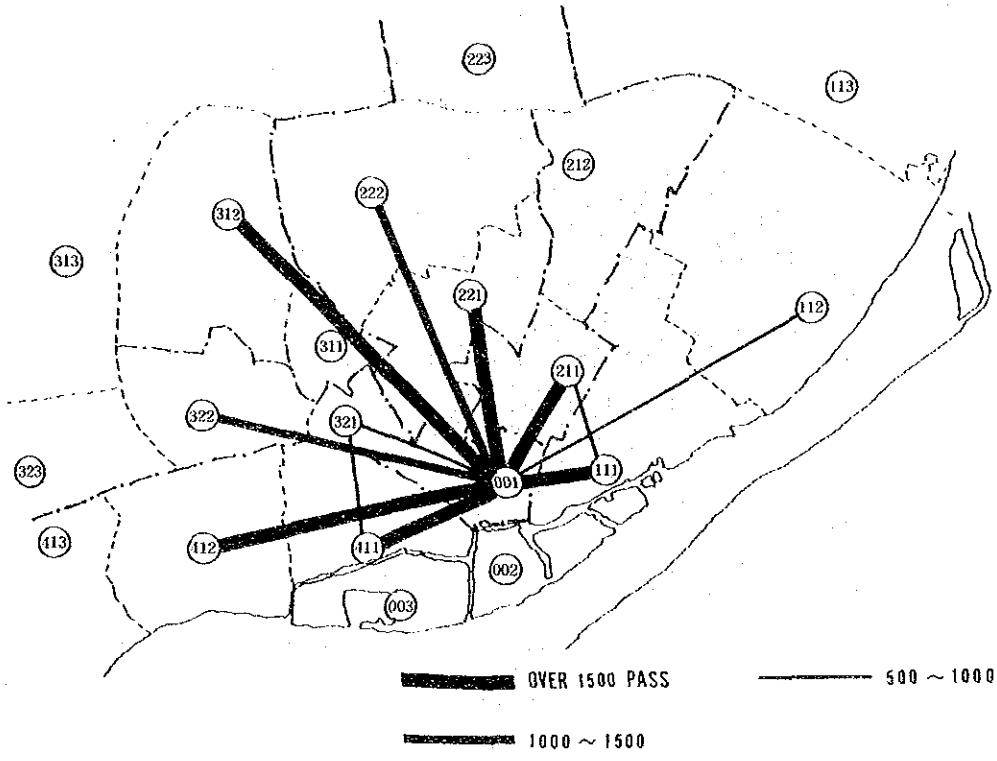


Fig. E–2–5 Desire Line of Bus Passengers in 1983 (Business)

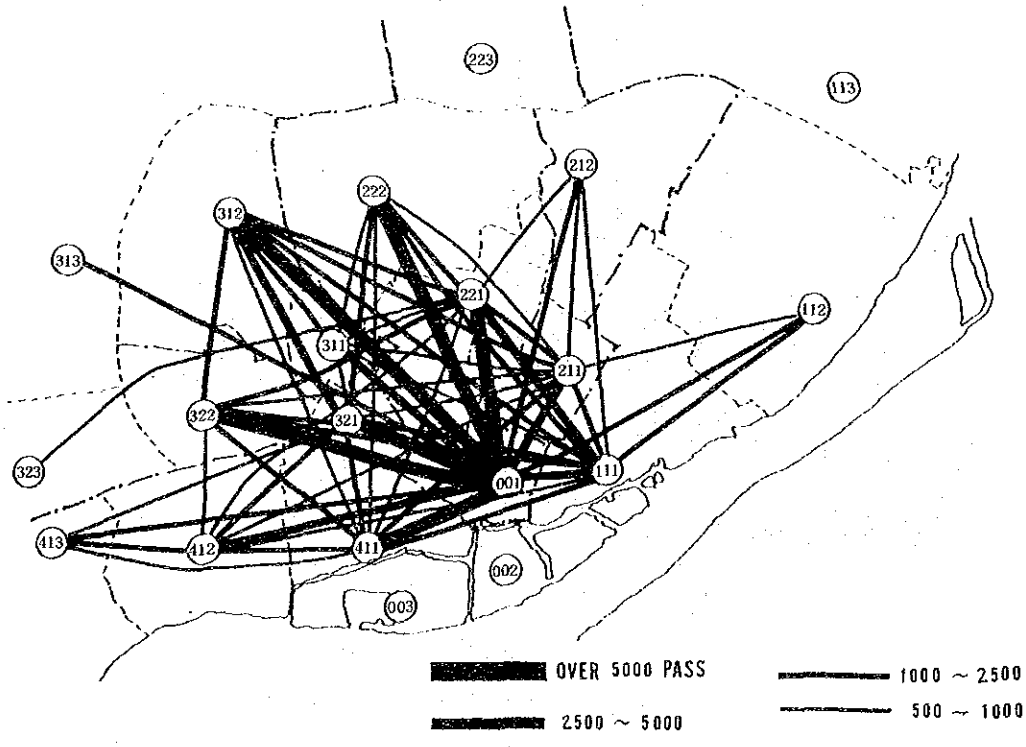
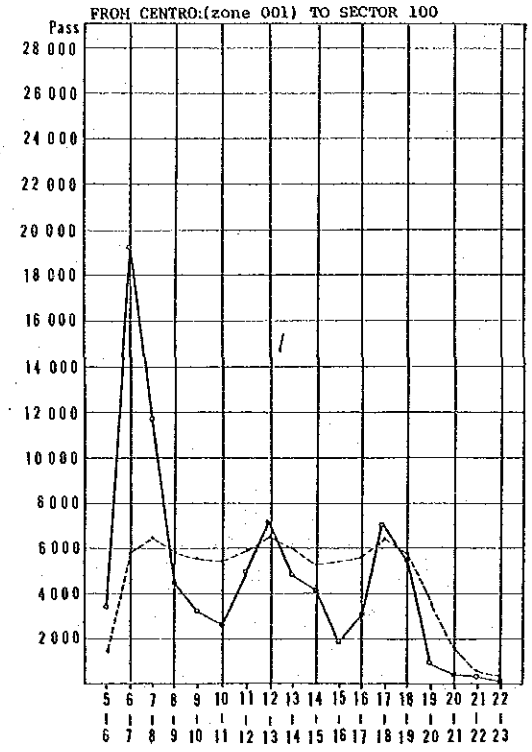
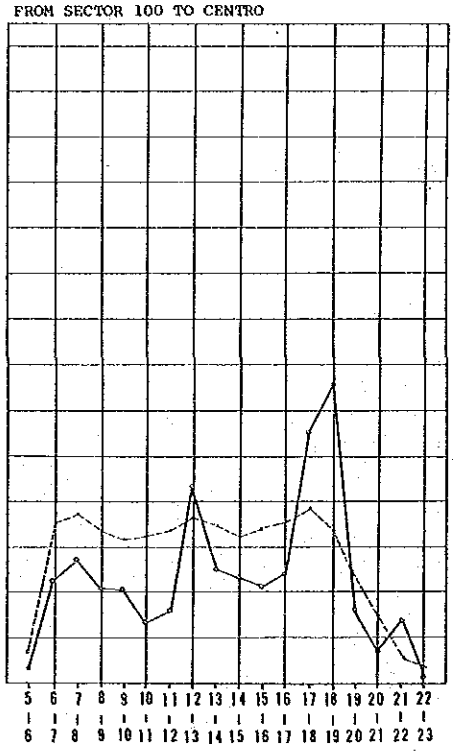
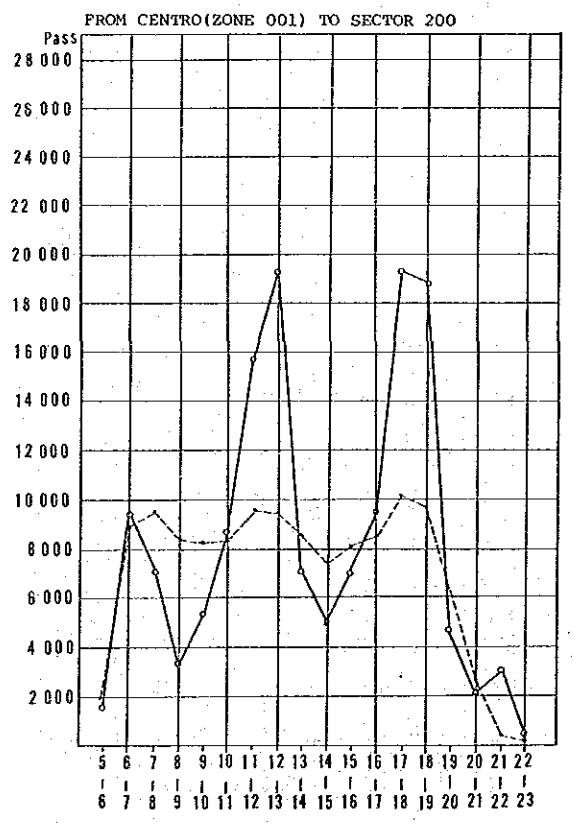


Fig. E–2–6 Desire Line of Bus Passengers in 1983 (Private)

Appendix E–3







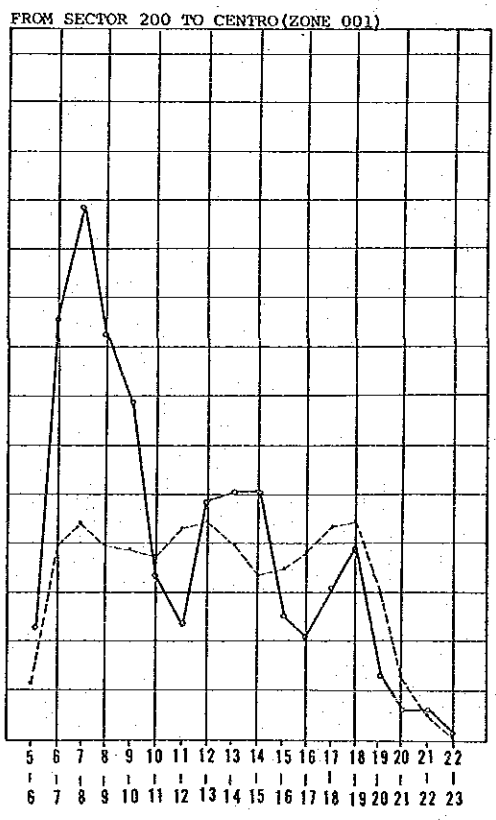


Fig. E–3–1 (1) Relationship of Demand and Supply of Bus Transport at the Boundary of City Center

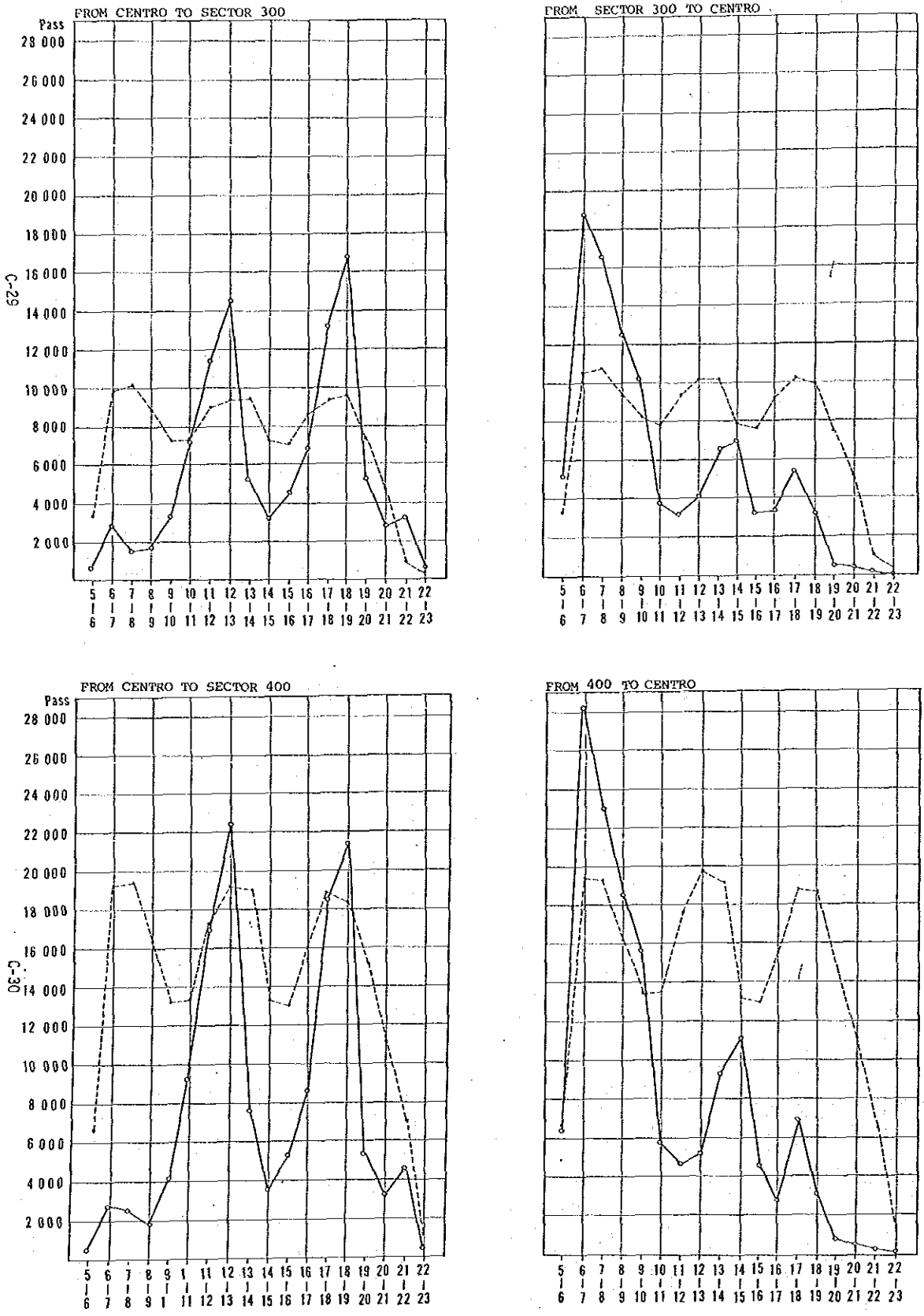


Fig. E–3–1 (2) **Relationship of Demand and Supply of Bus Transport at the Boundary of City Center**

Appendix E–4 Bus Maintenance Conditions

Table E–4–1 The Maintenance Activities of Each Urban Bus Company

	1st Level	2nd Level		3rd Level	
Company	No. Activ.	No. Activ.	% of Activ.	No. of Act.	% Activ.
Coochofal	3	23.0%	–	–	1	16.7
Coolitoral	4	30.7%	7	100.0	1	16.7
Cootranorte	–	–	–	–	1	16.7
Cootrantico	–	–	–	–	1	16.7
Cootrasol	–	–	–	–	1	16.7
Cootratlantico	5	38.5%	–	–	1	16.7
Embusa	6	46.1%	2	28.6	5	83.3
Flota Angulo	6	46.1%	4	57.1	5	83.3
Flota Roja	3	23.0%	4	57.1	4	66.7
Sobusa	7	53.8%	4	57.1	5	83.3
Sodetrans	–	–	–	–	–	–
Sotrausque	–	–	–	–	–	–
Transdiaz	7	53.8%	4	57.1	5	83.3
Transmecar	–	–	–	–	–	–
T. Atlantico	2	15.4%	7	100.0	–	–
T. Lolaya	7	53.8%	3	42.8	5	83.3
T. Monterrey	–	–	–	–	–	–
Transoledad	4	30.8	–	–	1	16.7
Transurbar	–	–	–	–	1	16.7
Trasalfa	2	15.4	–	–	–	–
Trasalianco	7	53.8	4	57.1	5	83.3

Table E–4–2 Number of Company by Level of Maintenance

Maintenance Level	Number of Company Without Maintenance Activity	With Maintenance
1st Level	8 (38.0%)	13 (62.0%)
2nd Level	12 (57.1%)	9 (42.9%)
3rd Level	6 (28.6%)	15 (71.4%)

Table E–4–3 Classification of Maintenance Level by Company

Bus Company	Motor	Gear Box	Clutch	Suspension	Steering	Brakes Control	Cooling System	Fuel System	Exhaust System	Other System	Body Repair	Electricity	Washing and Greasing	Oil Change	Station Service	Tire Change
1. Coochofal	–	–	–	–	–	–	–	–	–	–	–	–	1st	1st	3rd	1st
2. Coolitoral	3rd	2nd	–	2nd	2nd	2nd	2nd	2nd	2nd	1st	1st	1st	–	1st	–	–
3. Cootransnorte	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4. Cootrantico	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3rd	–
5. Cootrasol	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
6. Cootratlantico	–	–	–	–	–	–	–	–	–	1st	1st	–	1st	1st	3rd	1st
7. Embusa Ltda.	3rd	3rd	1st	3rd	1st	2nd	2nd	3rd	3rd	1st	1st	1st	–	1st	–	–
8. Flota Angulo Ltda.	3rd	3rd	1st	3rd	2nd	2nd	2nd	2nd	3rd	1st	1st	1st	–	1st	3rd	1st
9. Flota Roja Ltda.	3rd	3rd	1st	3rd	2nd	2nd	2nd	2nd	3rd	1st	–	1st	–	–	–	–
10. Sobusa S.A.	3rd	3rd	1st	3rd	2nd	2nd	2nd	2nd	3rd	1st	1st	1st	1st	1st	3rd	1st
11. Sodetrans Ltda.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
12. Sotrausque Ltda.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
13. Transdiaz S.A.	3rd	3rd	1st	3rd	2nd	2nd	2nd	2nd	3rd	1st	1st	1st	1st	1st	3rd	1st
14. Transmecar Ltda.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
15. Transp. Atlántico	1st	2nd	1st	2nd	2nd	2nd	2nd	2nd	2nd	–	–	–	–	–	–	–
16. Transp. Lolaya Ltda.	3rd	3rd	1st	3rd	2nd	2nd	3rd	2nd	3rd	1st	1st	1st	1st	1st	–	1st
17. Transp. Monterrey Ltda.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
18. Transoledad S en C.	–	–	–	–	–	–	–	–	–	–	1st	1st	1st	1st	3rd	–
19. Transubar Ltda.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3rd	–
20. Trasalfa Sc. A	–	–	–	–	–	–	–	–	–	–	1st	–	–	1st	–	–
21. Trasalianco S.A.	3rd	3rd	1st	3rd	2nd	2nd	2nd	2nd	3rd	1st	1st	1st	1st	1st	3rd	1st

Table E–4–4 (1) Classification of Maintenance Levels

Part	Motor	Gear Box	Clutch	Suspension	Steering	Brakes/ Control	Cooling System	Fuel System
Level	1	2	3	4	5	6	7	8
1st Level	1.7	2.2 2.6	3.1 3.2 3.3	4.1 4.2 4.6 4.7	5.3 5.4 5.5	6.1	–	8.3
2nd Level	–	2.1 2.5 2.4 2.7	–	4.8 4.9 4.10 4.11 4.3	5.1 5.2	6.2 6.3	7.2 7.1	8.1 8.2 8.4
3rd Level	1.1 1.2 1.4 1.5 1.3 1.6	2.3	–	4.4 4.5	5.6	–	–	–

Table E–4–4 (2) Classification of Maintenance Levels

Part	Exhaust System	Painting and Repairing	Body	Electricity	Washing and Greasing	Oil Change	Station Service	Tire
Level	9	10	11	12	13	14	15	16
1st Level	–	10.1 10.2 10.3 10.4	11.1	12.1 12.2 12.3 12.4 12.5	13.1 13.2	14.1 14.2	–	16.1
2nd Level	9.3	–						
3rd Level	9.1 9.2	–					15.1	

Appendix F–1 CARGO DISTRIBUTION CENTER

1) Background

Gran Abastos is planned to be constructed at the west of the Barranquilla airport. It's function is mainly the wholesale of agricultural and marine products such as grain, fruits, vegetables, fishes, etc., therefore, many wholesale dealers will shift its location from the present location in Barranquilla to the site of Gran Abastos. In addition to the wholesale market, the following facilities are also included in the plan.

1) Warehouse
2) Parking area for trucks
3) Administration office etc.

Gran Abastos is expected to function as a distribution center in the Metropolitan Area. However, considering the existing situation of cargo transport in Barranquilla, there seems to exist a necessity of an another distribution center with different functions.

According to the survey on the cargo transport companies, the cargo is classified into two types:

1) Parcel Cargo
2) Massive Cargo

For the first type, two types of trucks are used for its transportation: one is heavy truck for intercity transport, the other is medium or small sized trucks for collecting and distributing cargo inside of the city. The parcel cargo is mainly composed of daily goods such as clothes, paper, furnitures (wooden products), electric utensiles, etc.

Therefore, this type necessitates a place where cargo is unloaded, stored and loaded to change the trucks from one to another. At present, the transport volume of this type is not so large, however it is anticipated to grow rapidly in future in accordance with the population growth in the Metropolitan Region.

The 2nd type is mainly composed of industrial products and imported and exported goods from seaport, therefore their main destinations are factories and ports.

For this type, there is no necessity to change trucks, since the lot size is enough large for heavy trucks. Only the facility required for this type is the parking spaces during the night and for receiving documents prepared by administration offices.

It is also found from the survey that there exist the following problems for cargo transport.

a. Difficulties to park the trucks in the Central District.
b. Inadequacy of maintenance and spare parts particularly for small companies.
c. Security of the cargo and the trucks.
d. Difficulties to provide a timely transport service in appropriate type of trucks and drivers, due to the irregulatory of transport demand.
e. Necessity of coordination among the transporters.

2) Objectives

The main objectives of a new cargo distribution center is to solve the transport problems in distribution, transportation, storage, safety, use of vehicles and information in general.

3) Estimation of the Required Area

According to the Cordon Line Survey in 1983, the total interregional cargo movement related to Barranquilla was about 32,700 tons/day, of which 78% was either originated or destinated in Barranquilla and the rest, 22% was those in transit.

From the daily cargo volume above, the cargo volume, which has a possibility to utilize the cargo distribution center if it is newly constructed, is estimated below on the basis of the following assumptions.

(1) The cargo without either origin or destination in Barranquilla will not use the said distribution center.
(2) The agricultural products will be dealt with in the Central de Gran Abastos.
(3) Growth rate of cargo transport demand from 1983 to 2000 is assumed to be corresponding with the GRDP growth by sector.
(4) The cargo departed from the industrial area and the port will be excluded since they may be transported directly from the loading spot to the destinations without dropping in the cargo terminal.

As a result, the total cargo transport demand in 2000 is estimated as shown in Table 2.

From 24,416 tons/day required for the cargo distribution center in the year 2000, 20% (4,883 tons/day) are considered to be absorbed by transport companies that have their own terminals and 80% (19,533 tons/day) of the rest of cargo will be assigned to the cargo distribution center. In the same way, it is considered for 1983 and 1990 (See Table F–1–1).

Table F–1–1 Daily Cargo Required for the Cargo Distribution Center

(tons/day)

Year	Cargo Required	Net Cargo
1983	11,608	9,286
1990	15,583	12,467
2000	24,416	19,533

Source: Based on Table F–1–2.
Note: It is estimated that 80% of the cargo will be assigned to the Cargo Distribution Center.

According to Table F–1–1, for the year 2000 the total cargo is 19,533 tons/day and 30% of it will be assigned to storage, for which a total area (1) of 7.9 ha. is required (Including circulation).

For the warehouse platform area an average of 8.5 tons/truck is estimated according to the result of the total cargo (32,652 tons) over the total loaded trucks (3,849 tons) in Barranquilla. Therefore, 19,533 tons give as a result 2,298 trucks; of which 75% (1,724 trucks) is destinated to loading and unloading and 25% (574 trucks) to parking. In this way, in 8 hours of work 639 platforms are required which will use an area(2) of 5.1 ha. including 25% for circulation.

For trucks parking, an area of 4.6 ha. was considered and 539 for vehicle parking, the area(3) will be 0.84 ha. Includes circulation.

Complementary services, which are areas required to give complementary services to the distribution activities and also for the improvement of the conditions for drivers, workers and

(1) One ton is equivalent to 11.7 m^2.
(2) One truck occupies an area of 64 m^2.
(3) One vehicle occupies an area of 12.5 m^2.

Table F–1–2 Daily Cargo Movement in Barranquilla by Kind of Product

Products	Cargo Flow (tons/day)			
	Origin	Desatination	In transit	Total
Agricultural	1,266	2,595	1,362	5,223
Wood	197	86	46	329
Minerals	483	2,320	659	3,462
Metal-mechanic	793	1,494	80	2,367
Chemical	4,753	1,436	1,651	7,840
Paper products	3,176	5,638	1,496	16,310
Manufactures	186	146	161	493
Junk	314	54	91	459
Especial	388	275	1,506	2,169
TOTAL	11,556	14,044	7,052	32,652

Source : JICA, Cordon Line Survey, 1983.

Table F–1–3 Projection of Total Cargo Movement, Barranquilla – Cargo Terminal

(tons/day)

Products	Total Daily Cargo (1)	Terminal Cargo 1983 (2)	Terminal Cargo 1990 (3)	Terminal Cargo 2000 (4)
Wood	283	152	200	296
Mineral	2,803	2,033	2,730	4,280
Metal-mechanic	2,287	444	596	935
Chemical	6,189	2,791	3,748	5,876
Paper	8,814	5,560	7,466	11,706
Manufacture	332	106	142	223
Junk	368	165	222	348
Especial	663	357	479	752
Total	21,739	11,608	15,583	24,416

Source: 1- JICA. Cordon Line Survey, 1983.
2- Estimated based on Table. No. 1-1

Note: 3. Projection based on GRDP growth rate for the secondary sector of 4.3% (1983–1990)
4. Projection based on GRDP growth rate for the secondary sector of 4.6% (1990–2000)
5. Projection based on GRDP growth rate for the primary sector of 4.0%

vehicles, such as the administration building, information, communication, banks, offices of transport companies will have an area of 6.2 ha.

The total operation area is 24.6 ha (See Table F–1–4).

The other area required as an open spaces is classified into: road network (15%), and green zones (10%) of the total operation area, with 6.1 ha., and 4.9 ha. respectively.

After analyzing all these aspects, the spatial needs of the terminal was estimated for the year 2000; It is estimated that the terminal requires 30.8 ha. plus 30% for expansion area, this is a total of 38.2 ha. (See Table F–1–4).

At present, the traffic of trucks and cargo moves mainly by the road to Malambo, with 37%, Puente Pumarejo (29.8%) and Cordialidad Road with 24.8%, and it requires an adequate operation facility with services, equipment, and conditions to meet all their basic needs.

For this, 11 sites were selected and analyzed from the following points of view:

Road connection with the city, its easy access to the city, cargo volumes arriving and departing by each regional road, the future circulation in the city and its development plans.

Afterwards, the sites were evaluated, and 5 priority sites were selected (See Fig. F–1–1), because they had the best conditions. For the analysis of the preferential zone of the Cargo Distribution Center, the following aspects were considered: Development pole, functionality and usefulness. As a result, zone 1 was found to be the highest priority site because it presents

Table F–1–4 Areas of the Barranquiola Cargo Dist. Center

(ha.)

	1983	I Stage	II Stage
Storage Area	3.8	5.0	7.9
Warehouse Platform Area	2.4	3.3	5.1
Parking Area	2.6	3.3	5.4
Complementary Services Area	3.8	3.8	6.2
Total Operational Area	12.6	15.4	24.6
Urban Works Construction:			
Roads, Green Zones	1.9	2.3	3.7
Required Area	15.7	19.3	30.8
Expansion Area			7.4
Total Terminal Area	15.7	19.3	38.2

Source: Estimated by Study Team
Note: Including 25% for circulation.

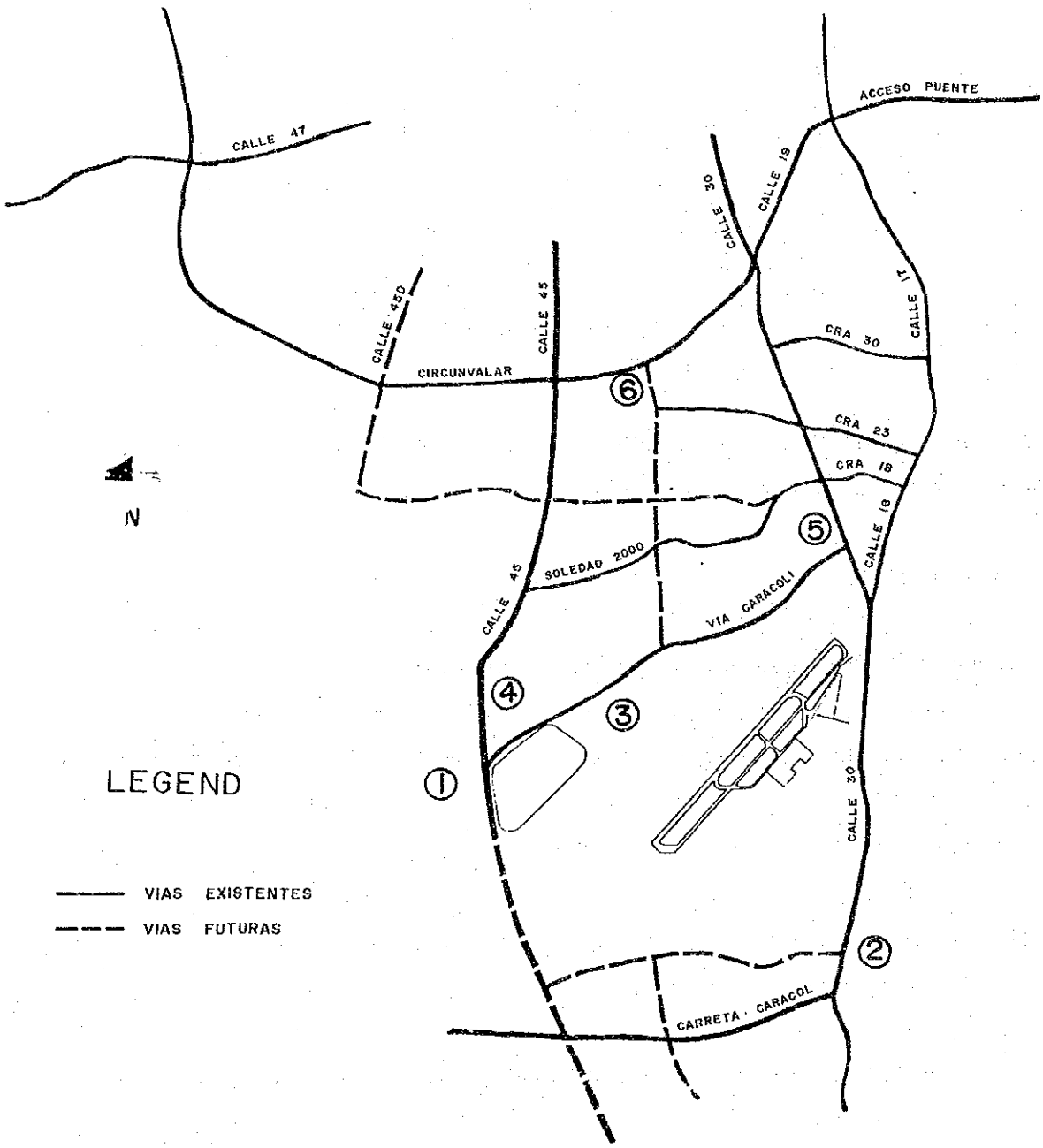


Fig. F–1–1 Location of Candidate Site for Cargo Distribution Center

Table F–1–5 Number of Trucks and Areas in the Transport Companies in Barranquilla

	Companie's	Affiliated
No. of trucks with terminal	278	1,983
No. of trucks without terminal	1,119	6,543
Total	1,397	8,526
Terminal Area	64,850 m^2	
Warehouse Area	95,038 m^2	
Office Area	54,062 m^2	
Total Area	231,950 m^2	

Source: Survey of 58 Transport Companies, 1984.

superiority in terms of its location, influence zone and topography. In addition, it is a site by which almost all the cargo pass when arriving or departing to/from the city.

5) Functionality

A Cargo Distribution Center is a place for the concentration of cargo transportation companies and must serve as a storage place for the commercial and industrial companies.

Cargo Distribution Center should be a planned as a transport complex in order to encourage transportation industries, commerce and services, by developing distribution activities, storage, gathering, consolidation and disconsolidation of national and international cargo. And one of the most important function is to transfer cargo from one mode to another.

Therefore, it is classified into 3 zones, which include the following services:

(1) Truck Terminal: offices, warehouses, and parking lots for all transport companies.

(2) disconsolidation function of the cargo, modal integration and others, as well as the corresponding infrastructure.

(3) Complementary Services: the rest of common services, such as restaurants, cafeterias, residences, stores, etc.

The cargo terminal must have an administration unit in charge of coordinating and regulating common services to the users and to promote the interdependent relationship among them, and will also provide maintenance, vigilance and cleaning. It will also ease the companies of transportation, industry, commerce, finance and services, concentrate their efforts in the works of collection, consolidation, storage, distribution, and financing.

* CENCAR – Based on the Cargo Terminal Financing, Cali, 1981.

6) Requirements and Recommendations

Among the conditions required for the Barranquilla Cargo Distribution Center, the following can be listed:

- The project must be supported by the Government, transport companies, and economic groups.
- The Cargo Distribution Center must be constructed by stages and the first stage is recommended to be started after the completion of Central de Abastos, this is, approximately in the year 1990, with an area of 20 ha. and a value of approximately 2000 millin pesos.
- It is recommended to make a land use regulation for the zone.
- For road plans and transport policies, it is recommended to include the construction of access roads to the site, within the existing road plans.
- In respect to possible land use around the terminal, it is recommended to look for the compatibility, similarity or complement to the activities that will be developed in the terminal.
- Since the construction of the terminal and Gran Abastos will raise the value of the land, it is recommended to buy an additional area in order to obtain income in the future.
- The government should establish legal standards and mechanisms to protect the central district from the circulation of vehicles above 5 tons.
- In order to give a greater encouragement to the project, the Government must give tax incentives to the construction society as well as to the users who will settle in the terminal area.

Appendix F–2 Distribution Plan of Population and Employment

Table F–2–1 (1) Future Population Distribution Plan

Integrated Zone	M. Zone	PT Zone	POPULATION			DENSITY		
			1983	1990	2000	1983	1990	2000
1	1	1	284	0	0	16.0	0	0
		2	137	0	0	12.2	0	0
		3	1,075	210	670	58.1	49.2	36.2
		4	296	0	0	14.0	0	0
		Subtotal	1,792	910	670	26.1	13.3	9.8
	2	5	1,743	1,480	1,090	99.0	84.1	61.9
		6	1,537	1,340	960	68.3	59.6	42.7
		7	1,316	1,110	830	126.5	106.7	79.8
		8	863	730	540	47.9	40.6	30.0
		Subtotal	5,459	4,660	3,420	79.7	68.0	49.9
	3	9	1,485	7,000	7,000	19.9	93.6	93.6
		10	355	3,000	6,000	8.7	73.5	147.1
		11	29	0	7,000	0.7	0	158.7
		19	205	0	0	9.0	0	0
		Subtotal	2,074	10,000	20,000	11.4	54.8	109.6
	4	12	2,498	0	0	54.8	0	0
		13	3,237	3,380	3,580	109.4	114.2	120.9
		14	4,840	5,050	5,330	126.4	131.9	139.2
		Subtotal	10,575	8,430	8,910	93.2	74.3	78.5
	TOTAL		19,900	24,000	33,000	45.9	55.4	76.2
2	5	15	–	–	–	–	–	–
		16	150	160	170	4.2	4.4	4.7
		17	53	60	70	1.7	1.9	2.2
		18	9,874	10,780	11,040	131.3	133.4	146.8
		Subtotal	10,077	11,000	11,280	40.6	44.4	45.5
	6	29	9,652	10,460	10,630	109.1	118.2	120.1
		64	68	70	80	1.2	1.2	1.4
		Subtotal	9,720	10,530	10,710	66.3	71.9	73.1
	7	63	17,147	18,870	19,610	168.6	185.5	192.8
	TOTAL		36,944	40,400	41,600	74.5	81.4	83.8
3	8	27	33,691	36,070	36,460	157.4	168.6	170.4
		28	8,089	8,630	8,720	90.2	96.2	97.2
		Subtotal	41,780	44,700	45,180	137.6	147.2	148.8
	9	62	22,237	24,700	26,120	83.2	92.4	97.8
	TOTAL		64,017	69,400	71,300	112.1	121.6	124.9
4	10	24	12,936	13,570	13,690	235.6	247.2	249.4
		25	18,755	18,960	19,050	242.6	245.3	246.4
		26	9,696	10,170	10,270	161.6	169.5	171.7
		Subtotal	41,387	42,700	43,010	215.3	222.2	223.8
	11	35	9,700	10,650	11,200	214.6	235.6	247.8
		36	25,630	27,450	28,150	233.9	250.5	259.1
		Subtotal	35,330	38,100	39,350	228.2	246.1	254.2
	12	38	20,857	21,880	21,910	171.1	179.5	179.7
		60	32,464	34,820	35,830	178.8	191.7	197.3
		Subtotal	53,321	56,700	57,740	175.7	186.8	190.2
	TOTAL		130,038	137,500	140,100	199.9	211.4	215.4
	13	21	–	–	–	–	–	–
		22	–	–	–	–	–	–
		Subtotal	–	–	–	–	–	–

Table F–2–1 (2) Future Population Distribution Plan

Integrated Zone	M. Zone	PT Zone	POPULATION			DENSITY		
			1983	1990	2000	1983	1990	2000
6	14	20	14,140	17,000	18,780	171.0	205.6	227.1
		23	22,523	23,630	24,000	266.9	280.0	284.4
		Subtotal	36,663	40,630	42,780	219.4	243.1	256.0
	15	30	31,485	37,040	38,520	230.3	271.0	281.8
		39	8,625	9,730	9,800	81.0	91.4	92.0
		Subtotal	40,110	46,770	48,320	164.9	192.3	198.7
	TOTAL		76,773	86,400	91,100	187.1	213.0	222.0
	16	31	41,773	44,900	45,830	239.7	257.6	262.9
		40	21,798	24,200	25,660	198.9	120.8	234.1
		Subtotal	63,571	69,100	71,490	223.9	243.4	251.8
7	17	32	10,742	11,510	11,640	153.5	164.4	166.3
		33	16,616	17,800	18,000	225.5	241.5	244.2
		34	12,877	13,930	14,270	372.1	359.0	367.8
		46	10,806	11,260	11,300	222.8	232.2	233.0
		Subtotal	51,051	54,500	55,210	221.0	235.9	239.0
	18	42	12,607	13,290	13,680	223.5	275.6	242.6
		44	13,289	13,710	13,740	255.6	263.7	264.2
		45	14,229	14,880	15,170	241.6	252.6	257.6
		47	14,973	15,470	15,520	242.7	250.7	251.5
		Subtotal	55,098	57,350	58,110	240.6	250.4	253.8
	19	41	12,090	13,460	13,960	260.6	290.1	300.9
		43	21,777	23,280	23,780	253.5	271.0	276.8
		50	19,530	23,150	34,400	215.3	255.2	269.0
		52	43,181	46,260	47,250	292.4	313.2	319.9
		Subtotal	96,578	106,150	109,390	260.5	286.4	295.1
	TOTAL		266,298	287,100	294,200	238.9	257.6	264.0
8	20	37	30,555	31,990	32,090	244.2	255.7	256.5
		48	15,372	16,050	16,100	273.0	285.1	286.0
		49	24,419	25,690	25,770	257.3	270.7	272.5
		Subtotal	70,346	73,730	73,960	254.6	266.8	267.7
	21	53	25,034	26,820	27,620	210.0	225.0	231.7
		55	37,210	40,350	42,220	170.6	185.0	193.6
		Subtotal	62,244	67,170	69,840	184.5	199.1	207.1
	TOTAL		132,590	140,900	143,800	216.1	229.6	234.4
9	22	51	31,735	41,200	50,800	112.3	145.8	170.8
		54	44,811	53,100	64,800	132.1	156.6	191.1
		56	11,176	17,900	24,500	77.4	124.0	179.7
		Subtotal	87,722	112,200	140,100	114.5	146.5	182.9
	23	57	33,556	36,700	37,630	141.9	155.2	159.1
		58	16,565	19,600	20,100	112.8	133.5	136.9
		59	20,188	22,700	23,270	76.8	86.4	88.6
		Subtotal	70,309	79,000	81,000	108.8	122.3	125.4
	24	70	7,608	15,000	70,300	10.6	20.8	97.6
		71	10,754	36,300	57,000	11.6	39.3	61.7
		Subtotal	18,362	51,300	127,300	11.2	31.2	77.5
	TOTAL		176,393	242,500	348,400	57.7	79.4	114.0
	25	61	12,825	22,900	33,000	45.5	81.3	117.2
	26	65	13,381	26,500	39,600	39.6	78.5	117.3
		66	17,887	26,800	39,600	53.0	79.5	117.4
		Subtotal	31,268	53,300	79,200	46.3	79.0	117.4

Table F–2–1 (3) Future Population Distribution Plan

Integrated Zone	M. Zone	PT Zone	POPULATION			DENSITY		
			1983	1990	2000	1983	1990	2000
	27	67	23,255	27,800	39,800	50.6	60.5	86.6
	28	68	3,800	4,800	42,800	2.1	2.6	23.1
	29	69	138	9,500	133,500	0.2	10.6	149.4
	TOTAL	Subtotal	71,286	118,300	328,300	17.1	28.4	78.9
11	30	72	–	53,100	144,000	–	31.9	68.4
	31	73	8,678	73,700	130,000	8.9	75.7	133.6
		78	994	1,000	1,100	2.4	2.4	2.7
		Subtotal	9,672	74,700	131,100	7.0	53.9	94.5
	TOTAL		9,672	127,800	245,100	3.2	41.9	80.3
12	32	74	35,321	38,130	39,100	165.6	178.8	183.3
	33	75	28,045	30,280	31,050	255.0	275.3	282.3
		76	4,731	5,110	5,240	33.8	36.5	37.4
		Subtotal	32,776	35,390	36,290	131.1	141.6	145.2
	34	77	54,632	58,980	60,510	25.6	27.6	28.4
	TOTAL		122,729	132,500	105,900	47.3	51.0	52.3
GRAND TOTAL			1,106,640	1,407,800	1,872,800	63.5	80.8	107.5

Table F–2–2 (1) Future Employment Distribution Plan

Zone	M. Zone	P.T. Zone	1983				1990				2000			
			1°	2°	3°	TOTAL	1°	2°	3°	TOTAL	1°	2°	3°	TOTAL
1	1	1	81	2,235	23,851	26,167	70	2,730	23,900	26,700	70	4,820	23,900	28,790
		2	60	1,065	3,902	5,027	60	1,000	3,900	4,960	60	790	3,900	4,750
		3	76	3,196	14,123	17,395	70	3,900	18,400	22,370	70	4,210	20,900	25,180
		4	149	2,558	15,357	18,064	130	3,220	18,000	21,350	130	4,030	20,000	24,160
		Subtotal	366	9,054	57,233	66,653	330	10,850	64,200	75,380	330	13,850	68,700	82,860
	2	5	–	1,106	4,931	6,037	–	1,350	6,430	7,780	–	1,470	7,300	8,770
		6	46	1,385	5,856	7,287	40	1,690	7,640	9,370	40	1,750	8,680	10,470
		7	22	188	2,032	2,242	20	230	2,650	2,900	20	610	3,010	3,640
		8	–	395	3,231	3,626	–	800	5,000	5,800	–	1,310	6,500	7,810
		Subtotal	68	3,074	16,050	19,192	60	4,070	21,720	25,850	60	5,140	25,490	30,690
	3	9	68	758	3,827	4,653	40	900	5,000	5,940	–	1,180	5,860	7,040
		10	69	444	1,221	1,734	50	400	1,590	2,040	–	400	2,000	2,400
		11	–	432	599	1,031	–	300	790	1,090	–	220	1,090	1,310
		19	32	1,284	2,838	4,154	30	1,000	3,700	4,730	–	1,000	4,200	5,200
		Subtotal	169	2,918	8,485	11,572	120	2,600	11,080	13,800	–	2,800	13,150	15,950
	4	12	25	785	4,232	5,042	20	800	5,000	5,820	20	1,000	10,000	11,020
		13	–	872	2,030	2,902	–	900	2,650	3,550	–	1,000	4,000	5,000
		14	–	675	1,363	2,020	–	500	1,770	2,270	–	400	2,020	2,420
		Subtotal	25	2,314	7,625	9,964	20	2,200	9,220	11,640	20	2,400	16,020	18,440
	TOTAL		628	17,360	89,393	107,381	530	19,720	106,420	126,670	410	24,190	123,360	147,960
2	5	15	–	45	51	96	–	50	70	150	–	60	90	150
		16	1	143	50	194	–	160	70	230	–	190	90	280
		17	7	789	521	1,317	–	900	710	1,610	–	1,100	910	2,010
		18	–	1,091	3,119	4,210	–	1,250	4,250	5,500	–	1,520	5,450	6,970
		Subtotal	8	2,068	3,741	5,817	–	2,360	5,100	7,460	–	2,870	6,540	9,410
	6	29	57	2,368	3,221	5,646	50	2,710	4,390	7,150	40	3,300	5,620	8,960
		64	–	1,039	699	1,738	–	1,190	950	2,140	–	1,450	1,220	2,670
		Subtotal	57	3,407	3,920	7,384	50	3,900	5,340	9,290	40	4,750	6,840	11,630
	7	63	–	2,391	4,762	7,153	–	2,730	6,480	9,210	–	3,330	8,300	11,630
	TOTAL		65	7,866	12,423	20,354	50	8,990	16,920	15,960	40	10,950	21,680	32,670
3	8	27	105	3,674	14,523	18,302	90	4,230	19,690	24,010	70	5,160	25,180	30,410
		28	–	1,037	5,100	6,137	–	1,190	6,920	8,110	–	1,450	8,850	10,300
		Subtotal	105	4,711	19,623	24,439	90	5,420	26,610	32,120	70	6,610	34,030	40,710
	9	62	111	2,255	15,244	17,590	90	2,600	20,640	23,330	70	3,180	26,400	29,650
	TOTAL		216	6,966	34,847	42,029	180	8,020	47,250	55,450	140	9,790	60,430	70,360

Table F–2–2 (2) Future Employment Distribution Plan

Zone	M. Zone	P.T. Zone	1983				1990				2000			
			1°	2°	3°	TOTAL	1°	2°	3°	TOTAL	1°	2°	3°	TOTAL
4	10	24	81	2,867	5,539	8,487	70	3,310	7,550	10,930	50	4,050	9,670	13,770
		25	109	1,250	4,883	6,242	90	1,450	6,660	8,200	70	1,770	8,530	10,370
		26	11	1,126	2,787	3,924	10	1,300	3,800	5,110	10	1,590	4,870	6,470
		Subtotal	201	5,246	13,209	18,653	170	6,060	18,010	24,240	130	7,410	23,070	30,610
	11	35	–	130	1,656	1,786	–	150	2,260	2,410	–	180	2,900	3,080
		36	–	628	2,757	3,385	–	720	3,760	4,480	–	880	4,820	5,700
		Subtotal	–	758	4,413	5,171	–	870	6,020	6,890	–	1,060	7,720	8,780
	12	38	26	773	3,671	4,470	20	890	5,010	5,920	10	1,090	6,420	7,520
		60	100	688	3,860	4,648	90	800	5,260	6,150	70	980	6,740	7,790
		Subtotal	126	1,461	7,531	9,118	110	1,690	10,270	12,070	80	2,070	13,160	15,310
	TOTAL		327	7,462	25,153	32,492	280	8,620	34,300	43,200	210	10,540	43,950	54,700
5	13	21	47	943	2,310	3,300	40	1,070	3,110	4,220	30	1,300	3,980	5,310
		22	18	2,093	2,493	4,604	10	2,370	3,360	5,740	10	2,870	4,290	7,170
		Subtotal	65	3,036	4,803	7,904	50	3,440	6,470	9,960	40	4,170	8,270	12,480
6	14	20	–	1,265	1,597	2,862	–	1,510	2,870	4,380	–	1,870	4,760	6,630
		23	51	808	2,087	2,946	40	950	3,420	4,410	30	1,180	5,450	6,660
		Subtotal	51	2,073	3,664	5,808	40	2,460	6,290	9,790	30	3,050	10,210	13,290
	15	30	169	436	1,680	2,285	140	630	2,460	3,230	110	780	3,120	4,010
		39	32	561	1,034	1,627	30	660	1,390	2,080	20	820	1,770	2,610
		Subtotal	201	997	2,714	3,912	170	1,290	3,850	5,310	130	1,600	4,890	6,620
	TOTAL		252	3,070	6,398	9,720	210	3,750	10,140	14,100	160	4,650	15,100	19,910
7	16	31	142	2,213	3,716	6,071	120	2,580	5,450	8,150	90	3,170	7,020	10,280
		40	–	1,039	2,347	3,386	–	1,240	3,170	4,410	–	1,530	4,080	5,610
		Subtotal	142	3,252	6,063	9,457	120	3,820	8,620	12,560	90	4,700	11,100	15,890
	17	32	12	501	2,430	2,943	10	580	3,640	4,230	10	710	4,690	5,410
		33	–	1,511	2,108	7,619	–	1,740	3,250	4,990	–	2,140	4,180	6,320
		34	–	1,199	1,832	3,031	–	1,390	2,870	4,260	–	1,710	3,700	5,410
		46	10	348	1,861	2,219	10	410	2,890	3,310	10	500	3,720	4,230
		Subtotal	22	3,559	8,231	11,812	20	4,120	12,650	16,790	20	5,060	16,290	21,370
	18	42	–	403	1,966	2,369	–	470	2,590	3,060	–	580	3,330	3,910
		44	–	341	900	1,241	–	390	1,630	2,020	–	480	2,100	2,580
		45	–	458	1,473	1,931	–	540	2,390	2,930	–	660	3,080	3,740
		47	25	581	1,526	2,132	20	670	2,450	3,140	20	820	3,150	3,990
		Subtotal	25	1,783	5,865	7,673	20	2,070	9,060	11,150	20	2,540	11,660	14,220

Table F–2–2 (3) Future Employment Distribution Plan

Zone	M. Zone	P.T. Zone	1983				1990				2000			
			1°	2°	3°	TOTAL	1°	2°	3°	TOTAL	1°	2°	3°	TOTAL
	19	41	–	251	814	1,065	–	310	1,120	1,430	–	380	1,440	1,820
		43	–	1,332	2,143	3,475	–	1,540	3,300	4,840	–	1,890	4,250	6,140
		50	75	859	829	1,763	70	1,060	1,710	2,840	50	1,300	2,200	3,550
		52	41	813	2,249	3,103	30	1,000	3,080	4,110	20	1,230	3,970	5,220
		Subtotal	116	3,255	6,035	9,406	100	3,910	9,210	13,220	70	4,800	11,860	16,730
	TOTAL		305	11,849	26,194	38,348	260	13,920	39,540	53,720	200	17,100	50,910	68,210
8	20	37	23	793	4,159	4,975	20	970	5,590	6,580	10	1,210	7,040	8,260
		48	–	538	1,137	1,675	–	660	1,530	2,190	–	820	1,930	2,750
		49	24	524	1,825	2,373	20	640	2,450	3,110	20	800	3,080	3,900
		Subtotal	47	1,855	7,121	9,023	40	2,270	9,570	11,880	30	2,830	12,050	14,910
	21	53	–	261	782	1,043	–	320	2,080	2,400	–	400	3,560	3,960
		55	–	203	1,750	1,953	–	240	3,350	3,590	–	290	5,220	5,510
		Subtotal	–	464	2,532	2,996	–	560	5,430	5,990	–	690	8,780	9,470
	TOTAL		47	2,319	9,653	12,019	40	2,830	15,000	17,870	30	3,520	20,830	24,380
9	22	51	25	2,358	1,232	3,615	20	2,910	5,620	8,550	10	3,920	10,000	13,830
		54	–	365	866	1,231	–	630	5,090	5,720	–	1,110	9,470	10,580
		56	–	15	78	93	–	180	3,990	4,170	–	420	7,780	8,200
		Subtotal	25	2,738	2,176	4,939	20	3,720	14,700	18,440	10	5,350	27,240	32,600
	23	57	42	307	558	907	40	430	4,430	4,900	30	550	800	8,580
		58	–	312	334	646	–	420	580	1,000	–	530	750	1,280
		59	–	103	456	559	–	170	720	990	–	230	930	1,160
		Subtotal	42	722	1,348	2,112	40	1,020	5,730	6,790	30	1,310	9,680	11,020
	24	70	–	299	357	656	–	520	840	1,360	–	2,280	4,370	6,650
		71	19	104	339	462	20	750	1,710	2,480	20	1,530	3,380	4,930
		Subtotal	19	403	696	1,118	20	1,270	2,559	3,840	20	3,810	7,750	11,580
	TOTAL		86	3,863	4,220	8,169	80	6,010	22,980	29,070	60	10,470	44,670	55,200
10	25	61	69	749	5,463	6,321	60	1,140	7,600	8,800	50	1,680	10,100	11,830
	26	65	112	398	2,079	2,589	90	780	5,780	6,650	70	1,340	7,990	9,400
		76	–	1,474	6,374	7,848	–	1,880	8,730	10,610	–	2,670	11,670	14,340
		Subtotal	112	1,862	8,453	10,437	90	2,660	14,510	17,260	70	4,010	19,660	23,740
	27	67	123	5,136	4,923	10,182	100	5,920	6,630	12,650	80	7,540	8,990	16,610
	28	68	403	2,128	2,221	4,752	340	2,430	2,940	5,710	270	4,090	11,750	16,110
	29	69	–	61	624	685	–	300	1,290	1,590	–	4,100	27,130	31,230
	TOTAL		707	9,986	21,684	32,377	590	12,450	32,970	46,010	470	21,420	77,630	99,520
11	30	72	24	113	–	137	20	1,450	7,550	9,020	20	3,590	17,304	20,950
	31	73	27	1,045	958	2,030	20	3,700	13,500	17,220	10	8,690	34,520	43,220
		78	–	528	2,387	2,915	–	600	3,100	3,700	–	730	3,870	4,600
		Subtotal	27	1,573	3,345	4,945	20	4,300	16,600	20,920	10	9,420	38,690	47,820
	TOTAL		51	1,686	3,345	5,082	40	5,750	24,150	29,940	30	13,010	55,730	68,770

Table F–2–2 (4) Future Employment Distribution Plan

Zone	M. Zone	P.T. Zone	1983				1990				2000			
			1°	2°	3°	TOTAL	1°	2°	3°	TOTAL	1°	2°	3°	TOTAL
12	32	74	26	844	3,176	4,046	20	1,010	4,270	5,300	20	1,250	5,380	6,640
	33	75	139	526	2,309	2,964	120	630	3,590	4,340	100	780	4,880	5,760
		76	117	459	916	1,492	100	550	1,240	1,890	80	680	1,560	2,320
		Subtotal	256	985	3,225	4,466	220	1,180	4,830	6,230	180	1,460	6,440	8,080
	34	77	189	2,029	2,217	6,435	150	2,410	7,180	9,740	120	2,970	10,160	13,250
	TOTAL		471	3,858	10,618	14,947	390	4,600	16,280	21,270	310	5,680	21,980	27,970
GRAND TOTAL			3,220	79,321	248,731	331,272	2,700	98,100	372,420	473,220	2,100	135,500	544,540	682,140

Appendix G–1 Person Trips by Bus in 2000

Table G–1–1 (1) Person Trips by Bus in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** BUS & SCHOOL ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	2019	1565	2733	755	74	21	15	61	0	0	7	0	13	0	3	9105
2)	1121	4222	6513	47	902	5	21	0	0	0	26	0	15	6	0	15395
3)	23472	29517	102213	6842	3648	5821	2329	5718	0	41	192	154	593	72	76	244491
4)	4431	3414	10755	6280	103	140	383	2773	0	0	12	160	29	20	4	36613
5)	2088	8279	18111	274	5993	2448	0	4	1	4	0	0	0	0	0	29283
6)	1724	3055	22978	783	18	1599	204	64	6	0	48	0	0	0	0	31554
7)	1339	838	15453	3583	15	1060	18773	8564	0	0	1	60	0	0	0	50776
8)	2706	1342	6675	3571	0	84	4420	5283	0	0	0	213	166	0	0	32825
9)	46	8	34	0	0	0	0	0	0	0	0	0	0	0	0	290
10)	140	175	327	0	11	0	0	80	0	0	0	0	0	0	0	1940
11)	34	70	177	0	0	0	0	0	0	0	0	0	0	0	0	1917
12)	768	269	607	187	0	0	52	581	0	0	0	0	0	0	0	9277
13)	282	368	905	47	59	0	25	51	0	0	0	0	0	0	0	8110
14)	63	25	138	27	3	0	0	0	0	0	0	0	0	0	0	726
15)	48	18	74	0	0	0	0	0	0	0	0	0	0	0	0	901
16)	40281	53165	187693	22396	10826	11178	26222	23179	7	45	286	587	816	98	83	473201

Table G–1–1 (2) Person Trips by Bus in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** BUS & WORK ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	2450	1173	3444	1176	129	39	316	146	2	23	27	40	51	26	63	7266
2)	6216	2574	4663	596	425	52	227	197	0	116	8	102	95	22	102	12878
3)	72565	23185	101215	14104	10537	3247	11178	3442	11	349	716	1903	959	556	524	180688
4)	12513	2145	11623	4186	85	94	2790	1559	0	98	47	804	294	79	296	28504
5)	1008	1663	12159	292	11028	1389	116	21	4	1571	27	2	2	0	1	37202
6)	2289	1409	17181	875	4450	2447	1487	197	26	16	905	47	224	1	0	30479
7)	1576	348	8563	2658	33	164	23085	6029	0	0	20	8276	11	0	13	49686
8)	9004	1669	6543	3278	70	91	6629	3517	0	34	225	1521	88	4	150	24460
9)	142	21	119	4	0	0	0	4	0	0	0	0	0	0	0	88
10)	768	213	600	257	81	8	0	13	0	0	0	0	0	0	0	733
11)	630	216	896	152	0	0	0	23	0	0	0	0	0	0	0	281
12)	3762	1052	2807	986	0	4	150	516	0	0	0	0	0	0	0	2464
13)	3092	915	3112	764	0	0	105	124	0	0	0	0	0	0	0	1737
14)	273	65	267	33	0	4	0	84	0	0	0	0	0	0	0	256
15)	376	91	253	118	0	0	8	55	0	0	0	0	0	0	0	140
16)	116664	36737	173445	29479	26838	7539	46091	15927	43	2207	1975	12695	1724	688	1149	376862

Table G–1–1 (3) Person Trips by Bus in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** BUS & PRIVATE ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	2728	1334	4193	881	23	1	166	92	2	56	138	61	161	148	176	10160
2)	4961	2820	5070	388	159	109	98	127	1	102	65	80	46	75	122	14203
3)	42660	10546	63807	4767	903	439	1851	1584	10	879	1181	1078	743	669	853	131950
4)	7058	1102	7141	2430	2	42	417	973	1	249	141	329	214	205	283	20587
5)	2102	1497	5486	178	606	87	12	4	2	2332	39	0	0	0	0	12345
6)	3459	881	9394	461	338	279	140	42	18	29	1189	16	47	0	18	16291
7)	3701	486	11397	2761	7	62	10296	3049	0	2	80	4095	356	0	21	36313
8)	3825	516	4134	1435	1	26	1852	3063	1	24	61	800	120	38	38	15934
9)	15	5	20	0	0	0	0	0	0	0	0	0	0	0	0	40
10)	192	67	251	43	2	2	2	3	0	0	0	0	0	0	0	562
11)	467	145	422	46	0	0	0	30	0	0	0	0	0	0	0	1110
12)	943	284	1709	729	0	2	103	275	0	0	0	0	0	0	0	4045
13)	1661	423	2944	515	0	2	2	115	0	0	0	0	0	0	0	5662
14)	448	376	1248	50	12	15	41	76	0	0	0	0	0	0	0	2266
15)	853	206	1292	243	38	0	45	21	0	0	0	0	0	0	0	2698
16)	75053	20688	118508	14907	2071	1066	15025	9454	35	3673	2894	6459	1687	1135	1511	274166

Table G–1–1 (4) Person Trips by Bus in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** BUS & HOME ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	10674	15709	204397	40203	7423	13340	13392	21589	239	1694	1783	7256	7619	1262	1483	348063
2)	4446	11491	67303	6834	12514	6425	2082	3619	36	457	466	1605	1784	495	328	119885
3)	11488	17471	297435	31570	38394	56335	41334	18385	178	1295	1613	5421	7538	1720	1660	531835
4)	3214	1150	28044	15554	791	2375	10721	9772	4	304	198	1959	1375	163	366	75990
5)	231	1474	15678	192	18886	5171	63	72	0	94	0	0	59	15	38	41973
6)	61	166	9707	277	3967	4449	1323	204	2	12	4	8	2	19	0	20201
7)	596	349	15981	3726	133	1950	56572	13822	0	2	0	322	136	41	57	93687
8)	466	357	11087	5460	33	336	19856	12998	4	96	53	1376	300	160	80	52662
9)	4	1	21	1	7	50	0	1	0	0	0	0	0	0	0	85
10)	96	227	1313	355	3914	45	2	58	0	0	0	0	0	0	0	6010
11)	186	99	2105	200	66	2144	102	287	0	0	0	0	0	0	0	5189
12)	111	183	3156	1297	2	63	12438	2540	0	0	0	0	0	0	0	19790
13)	234	157	2321	573	3	271	369	379	0	0	0	0	0	0	0	4307
14)	198	104	1305	304	0	1	0	43	0	0	0	0	0	0	0	1955
15)	287	249	1567	604	1	18	36	212	0	0	0	0	0	0	0	2974
16)	32292	49187	661420	107150	86134	92973	158290	83981	463	3952	4117	17947	18813	3875	4012	1324606

Table G–1–1 (5) Person Trips by Bus in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** BUS & BUSINESS ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	903	792	1940	313	79	0	76	156	0	106	77	322	276	335	622	5997
2)	996	424	1172	123	100	8	109	14	0	78	107	170	171	284	354	4110
3)	7841	2818	12272	1033	2020	50	1018	623	2	484	841	940	990	627	1328	32887
4)	1716	397	1906	701	92	3	318	350	0	0	111	316	157	87	790	6944
5)	35	40	642	3	14	3	1	0	0	458	3	9	2	0	4	1214
6)	233	177	1118	44	562	67	64	2	1	22	327	10	15	3	12	2657
7)	264	155	1527	261	17	5	2421	249	0	0	32	2325	50	0	122	7428
8)	865	122	1136	537	5	0	780	449	0	2	71	822	189	473	319	5770
9)	8	2	29	3	15	1	1	2	1	0	1	0	1	0	0	64
10)	36	7	59	4	73	6	1	5	0	20	0	0	0	0	0	211
11)	86	12	96	6	5	3	5	1	0	0	14	0	0	0	0	228
12)	157	32	194	103	1	1	305	66	0	0	0	47	139	0	0	1045
13)	133	29	167	47	1	2	68	58	0	0	0	1	68	0	0	574
14)	112	49	135	20	0	9	2	1	0	0	0	0	0	140	0	468
15)	403	55	263	153	0	2	18	60	0	0	0	0	0	0	245	1199
16)	13788	5111	22656	3351	2984	160	5187	2036	4	1170	1584	4962	2058	1949	3796	70796

Table G–1–1 (6) Person Trips by Bus in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** BUS & SHOPPING ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	3477	374	1118	402	5	0	99	167	0	17	14	10	9	24	45	5761
2)	3411	1875	1225	119	8	0	3	33	0	9	0	1	1	1	25	6711
3)	65700	4055	30200	2351	590	200	623	343	0	44	16	21	26	8	114	104291
4)	16201	173	2051	2658	2	1	136	155	0	8	0	4	36	0	21	21446
5)	2225	1075	2638	47	1259	43	5	4	0	7	0	0	1	0	0	7304
6)	5888	1080	6782	256	365	124	119	33	0	0	2	0	0	0	0	14649
7)	6776	410	5921	1719	8	37	4418	2214	0	0	1	7	2	0	2	21515
8)	6054	92	1033	1488	1	3	921	1135	0	0	1	6	5	1	24	10764
9)	36	2	5	0	0	2	0	0	0	0	0	0	0	0	0	45
10)	594	2	115	4	0	2	0	0	0	0	0	0	0	0	0	717
11)	652	35	118	0	0	4	0	0	0	0	0	0	0	0	0	809
12)	1783	0	298	57	0	2	17	4	0	0	0	0	0	0	0	2161
13)	2584	80	577	49	0	0	4	10	0	0	0	0	0	0	0	3304
14)	478	29	67	53	0	0	0	0	0	0	0	0	0	0	0	627
15)	206	13	41	5	0	0	4	4	0	0	0	0	0	0	0	273
16)	116065	9295	52189	9208	2238	418	6349	4102	0	85	34	49	80	34	231	200377

Table G–1–1 (7) Person Trips by Bus in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** BUS & ALL PURPOSE ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	22251	20947	217825	43730	7733	13401	14064	22211	243	1896	2046	7689	8129	1795	2392	386352
2)	21151	23406	85946	8107	14088	6599	2540	3990	37	762	672	1958	2112	883	931	173182
3)	223726	87592	607142	60647	56092	66092	58333	30095	201	3090	4559	9517	10849	3652	4555	1226142
4)	45133	8381	61520	31809	1075	2655	14765	15582	5	659	509	3572	2105	554	1760	190084
5)	7689	14028	54714	986	37786	9141	197	105	7	4466	69	11	64	15	43	129321
6)	13634	6768	67160	2696	9700	8965	3337	542	53	79	2475	81	288	23	30	115831
7)	14252	2586	58842	14708	213	3278	115565	33927	0	4	134	15085	555	41	215	259405
8)	229920	4098	30608	15769	110	540	34458	26445	5	156	411	4738	868	676	611	142413
9)	251	39	228	8	22	53	1	7	1	0	1	0	1	0	0	612
10)	1826	691	2665	663	4081	63	5	159	0	20	0	0	0	0	0	10173
11)	2055	577	3814	404	71	2151	107	341	0	0	14	0	0	0	0	9534
12)	7524	1820	8771	3359	3	72	13065	3982	0	0	0	47	139	0	0	38782
13)	7986	1970	10026	1995	63	275	573	737	0	0	0	1	68	0	0	23694
14)	1572	648	3160	487	15	29	43	204	0	0	0	0	0	140	0	6298
15)	2173	632	3490	1123	39	20	111	352	0	0	0	0	0	0	245	8185
16)	394143	174183	1215911	186491	131091	113334	257164	138679	552	11132	10890	42699	25178	7779	10782	2720008

Appendix G–2 Person Trips by Car in 2000

Table G–2–1 (1) Person Trips by Car in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** CAR & SCHOOL ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	1084	587	823	317	18	3	2	9	0	0	1	0	2	0	0	2846
2)	534	2785	2986	9	236	0	5	0	0	0	5	0	3	1	0	6564
3)	6213	9171	40991	2110	1035	1227	541	1303	0	8	38	31	118	13	16	62815
4)	1070	722	3399	2961	21	26	95	746	0	0	2	32	5	4	0	9083
5)	548	2323	5986	69	0	642	0	1	0	1	0	0	0	0	0	9570
6)	348	673	4869	157	4	387	47	11	2	0	11	0	0	0	0	6509
7)	284	177	3799	882	3	233	11594	2541	0	0	0	14	0	0	0	19527
8)	561	285	1536	985	0	15	1233	1907	0	0	0	45	32	0	0	6599
9)	8	1	6	0	0	0	0	0	0	0	0	0	0	0	0	15
10)	29	36	69	0	3	0	0	15	0	0	0	0	0	0	0	152
11)	7	14	38	0	0	0	0	0	0	0	0	0	0	0	0	59
12)	159	56	128	42	0	0	15	128	0	0	0	0	0	0	0	528
13)	55	73	189	10	13	0	6	11	0	0	0	0	0	0	0	357
14)	12	5	30	6	0	0	0	0	0	0	0	0	0	0	0	53
15)	9	4	14	0	0	0	0	0	0	0	0	0	0	0	0	27
16)	10921	16912	64863	7548	1333	2533	13538	6672	2	9	57	122	160	18	16	124704

Table G–2–1 (2) Person Trips by Car in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** CAR & WORK ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	2239	576	1320	597	35	7	89	38	0	7	7	10	10	6	6	4947
2)	3386	2856	3678	219	174	16	78	65	0	37	2	34	33	6	29	10613
3)	26089	11347	71232	5492	4363	1038	3538	1125	0	95	168	530	260	154	144	125575
4)	4254	543	3969	3956	16	15	873	579	0	24	9	204	63	18	80	14583
5)	545	979	8010	153	0	766	62	11	2	930	14	1	1	0	1	11475
6)	608	358	4707	217	1196	1095	378	53	9	4	243	11	59	0	0	8938
7)	446	94	2895	955	9	47	12571	2460	0	0	7	2698	2	0	1	22185
8)	2278	401	1798	1060	16	20	2607	1390	0	7	54	422	18	1	36	10108
9)	38	5	31	0	0	0	0	0	0	0	0	0	0	0	0	74
10)	206	56	164	68	25	2	0	3	0	0	0	0	0	0	0	524
11)	160	57	239	40	0	0	0	6	0	0	0	0	0	0	0	502
12)	1064	282	790	294	0	0	61	162	0	0	0	0	0	0	0	2653
13)	810	241	825	204	0	0	30	32	0	0	0	0	0	0	0	2142
14)	68	19	70	7	0	0	0	23	0	0	0	0	0	0	0	187
15)	89	20	63	24	0	0	2	11	0	0	0	0	0	0	0	209
16)	42280	17834	99791	13266	5834	3006	20289	5958	11	1104	504	3910	446	185	297	214715

Table G–2–1 (3) Person Trips by Car in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** CAR & PRIVATE ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	2862	962	2296	472	8	0	103	41	0	19	48	20	55	55	55	6996
2)	3126	3021	4444	216	55	90	45	63	0	49	31	31	18	39	59	11287
3)	19305	7184	39790	2409	729	137	702	609	2	463	367	442	288	244	333	73004
4)	2704	336	3707	2016	0	10	196	384	0	65	38	96	58	57	76	9743
5)	1630	766	5235	154	6299	76	10	2	2	2153	33	0	0	0	0	16360
6)	1140	458	3169	141	113	148	48	10	8	10	386	4	16	0	5	5656
7)	1347	178	4661	1177	1	22	10307	1294	0	0	28	1633	98	0	6	20752
8)	1215	204	1421	634	0	7	763	1218	0	8	18	262	34	10	11	5805
9)	5	1	8	0	0	0	0	0	0	0	0	0	0	0	0	14
10)	65	23	88	14	0	0	0	1	0	0	0	0	0	0	0	191
11)	157	50	148	16	0	0	0	10	0	0	0	0	0	0	0	381
12)	341	100	621	275	0	0	49	110	0	0	0	0	0	0	0	1496
13)	564	144	991	182	0	0	0	39	0	0	0	0	0	0	0	1920
14)	154	130	433	18	4	5	16	27	0	0	0	0	0	0	0	787
15)	292	69	440	81	13	0	15	5	0	0	0	0	0	0	0	915
16)	34907	13626	67452	7805	7222	495	12254	3813	12	2767	949	2488	567	405	545	155307

Table G–2–1 (4) Person Trips by Car in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** CAR & HOME ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	8120	8545	72129	12762	4155	3812	4097	5822	61	465	499	2094	2140	363	447	125511
2)	2323	9804	30312	1642	4846	1781	564	909	7	115	130	438	479	163	95	53608
3)	4864	12308	164316	11948	21219	14557	13292	5104	47	354	458	1624	2166	550	519	253326
4)	1537	483	11131	9702	407	579	3624	3148	0	82	56	629	409	47	106	31940
5)	61	468	6328	37	8316	1414	14	16	0	28	0	0	13	4	13	16712
6)	10	106	2447	51	1511	1675	311	42	0	2	1	0	0	5	0	6161
7)	219	128	4947	1204	75	503	36288	4902	0	0	0	130	36	16	17	48465
8)	148	144	3111	1753	15	80	7116	4890	0	19	16	401	82	50	16	17841
9)	0	0	2	0	4	19	0	0	0	0	0	0	0	0	0	25
10)	29	88	575	91	3089	14	0	15	0	0	0	0	0	0	0	3901
11)	59	38	577	49	47	641	35	72	0	0	0	0	0	0	0	1518
12)	30	65	1005	333	1	15	4346	730	0	0	0	0	0	0	0	6525
13)	69	54	675	133	1	75	100	84	0	0	0	0	0	0	0	1191
14)	66	46	412	79	0	0	0	11	0	0	0	0	0	0	0	614
15)	68	96	516	159	1	5	7	50	0	0	0	0	0	0	0	902
16)	17603	32373	298483	39943	43687	25170	69794	25795	115	1065	1160	5316	5325	1198	1213	568240

Table G–2–1 (5) Person Trips by Car in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** CAR & BUSINESS ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	4560	1173	2748	431	84	0	71	220	0	97	66	309	248	298	605	10910
2)	1682	2634	2216	144	120	10	120	13	0	90	118	194	189	315	376	8221
3)	101229	4378	31953	1461	2726	39	1158	769	2	553	883	993	1041	635	1496	58216
4)	1926	454	2547	2613	83	0	422	439	0	0	92	294	127	74	712	9783
5)	56	68	1153	7	2060	5	2	0	0	753	5	13	3	0	6	4131
6)	239	202	1094	43	538	535	60	1	1	22	311	10	14	4	9	3083
7)	282	148	1697	290	17	4	5779	269	0	0	32	2488	47	0	111	11164
8)	802	114	1181	580	2	0	862	3714	0	1	63	806	165	395	281	8966
9)	5	4	20	3	16	3	0	3	26	0	0	0	2	0	0	82
10)	38	8	62	6	76	6	2	4	0	936	0	0	0	0	0	1138
11)	73	11	96	5	5	3	3	2	0	0	658	0	0	0	0	856
12)	155	30	191	105	2	2	331	70	0	0	0	2123	139	0	0	3146
13)	128	27	158	48	1	4	66	60	0	0	0	2	2961	0	0	3455
14)	95	48	138	23	0	9	2	2	0	0	0	0	0	6421	0	6738
15)	403	60	294	159	0	3	19	59	0	0	0	0	0	0	9202	10199
16)	20571	9359	45548	5918	5730	623	8897	5625	29	2452	2228	7232	4936	8142	12798	140088

Table G–2–1 (6) Person Trips by Car in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** CAR & SHOPPING ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	1935	198	425	151	0	0	25	60	0	3	3	0	2	5	7	2814
2)	1499	1142	1200	39	3	0	0	16	0	2	0	0	0	0	8	3909
3)	20522	2610	12303	1120	201	45	166	74	0	9	4	2	9	1	23	37089
4)	4734	41	873	789	0	0	40	44	0	2	0	1	7	0	3	6534
5)	1432	778	1988	31	2017	27	3	1	0	5	0	0	0	0	0	6282
6)	1716	292	1812	64	101	45	30	6	0	0	1	0	0	0	0	4067
7)	2020	115	1937	610	1	9	1816	821	0	0	0	1	0	0	0	7330
8)	1768	19	349	469	0	0	299	375	0	0	0	1	0	0	3	3283
9)	10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	12
10)	165	0	33	0	0	0	0	0	0	0	0	0	0	0	0	198
11)	175	9	33	0	0	1	0	0	0	0	0	0	0	0	0	218
12)	530	0	85	18	0	0	5	1	0	0	0	0	0	0	0	639
13)	711	21	161	13	0	0	0	0	0	0	0	0	0	0	0	906
14)	129	9	17	16	0	0	0	0	0	0	0	0	0	0	0	171
15)	57	2	2	1	0	0	0	0	0	0	0	0	0	0	0	62
16)	37403	5236	21220	3321	2323	127	2384	1398	0	21	8	5	18	6	44	73514

Table G–2–1 (7) Person Trips by Car in 2000

* * * ALL PERSON TRIP BY PURPOSE IN 2000 * * *

*** CAR & ALL PURPOSE ***

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1)	20800	12041	79741	14730	4300	3822	4387	6190	61	591	624	2433	2457	727	1120	154024
2)	12550	22242	44836	2269	5434	1897	812	1066	7	293	286	697	722	524	567	94202
3)	87122	46998	360585	24540	30273	17043	19397	8984	51	1482	1918	3622	3882	1597	2533	610025
4)	16225	2579	25626	22017	527	630	5250	5340	0	173	197	1256	669	200	977	81666
5)	4272	5382	28700	451	18692	2930	91	31	4	3870	52	14	17	4	20	64530
6)	4061	2089	18098	673	3463	3885	874	123	20	38	953	25	89	9	14	34414
7)	4598	840	19936	5118	106	818	78355	12287	0	0	67	6964	183	16	135	129423
8)	6772	1167	9396	5481	33	122	12880	13494	0	35	151	1937	331	456	347	52602
9)	66	11	69	3	20	22	0	3	26	0	0	0	2	0	0	222
10)	532	211	991	179	3193	22	2	38	0	936	0	0	0	0	0	6104
11)	631	179	1131	110	52	645	38	90	0	0	658	0	0	0	0	3534
12)	2277	533	2820	1067	3	17	4807	1201	0	0	0	2123	139	0	0	14987
13)	2337	560	2999	590	15	79	202	226	0	0	0	2	2961	0	0	9971
14)	524	257	1100	149	4	14	18	63	0	0	0	0	0	6421	0	8550
15)	918	251	1329	424	14	8	43	125	0	0	0	0	0	0	9202	12314
16)	163685	95340	597357	77801	66129	31954	127156	49261	169	7418	4906	19073	11452	9954	14913	1276568

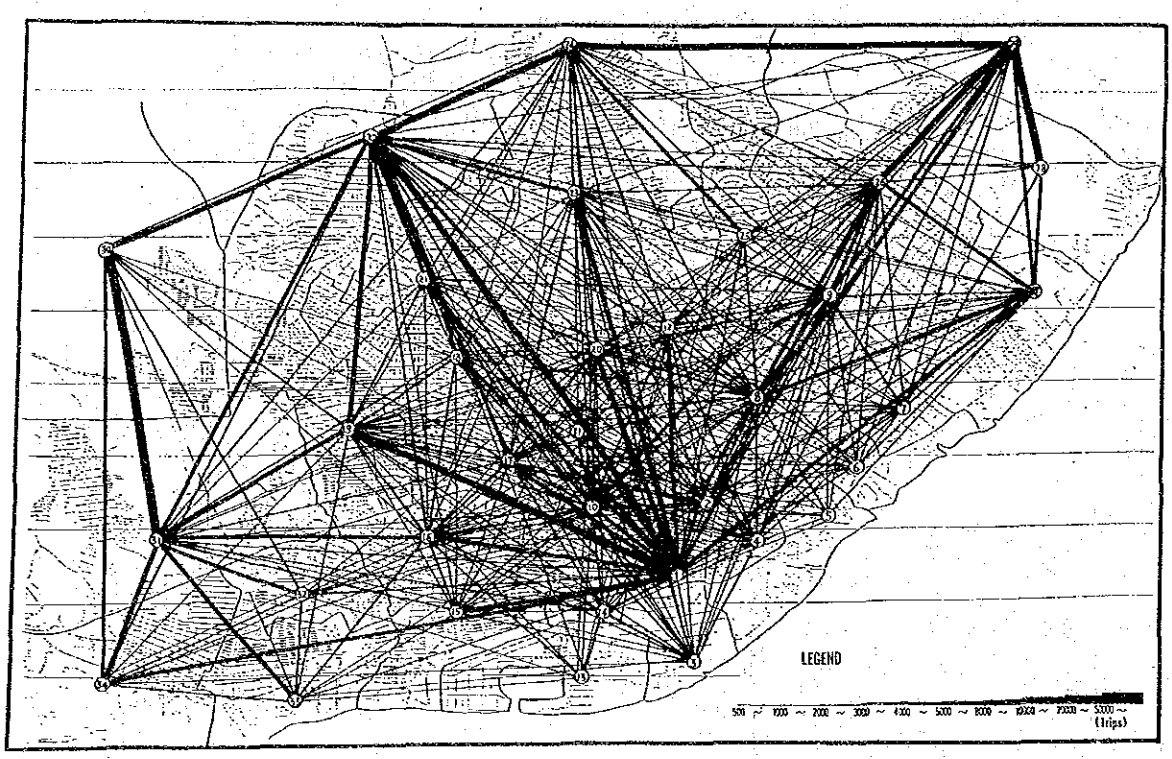


Fig. G–3–1 OD Pattern in 2000 (Work)

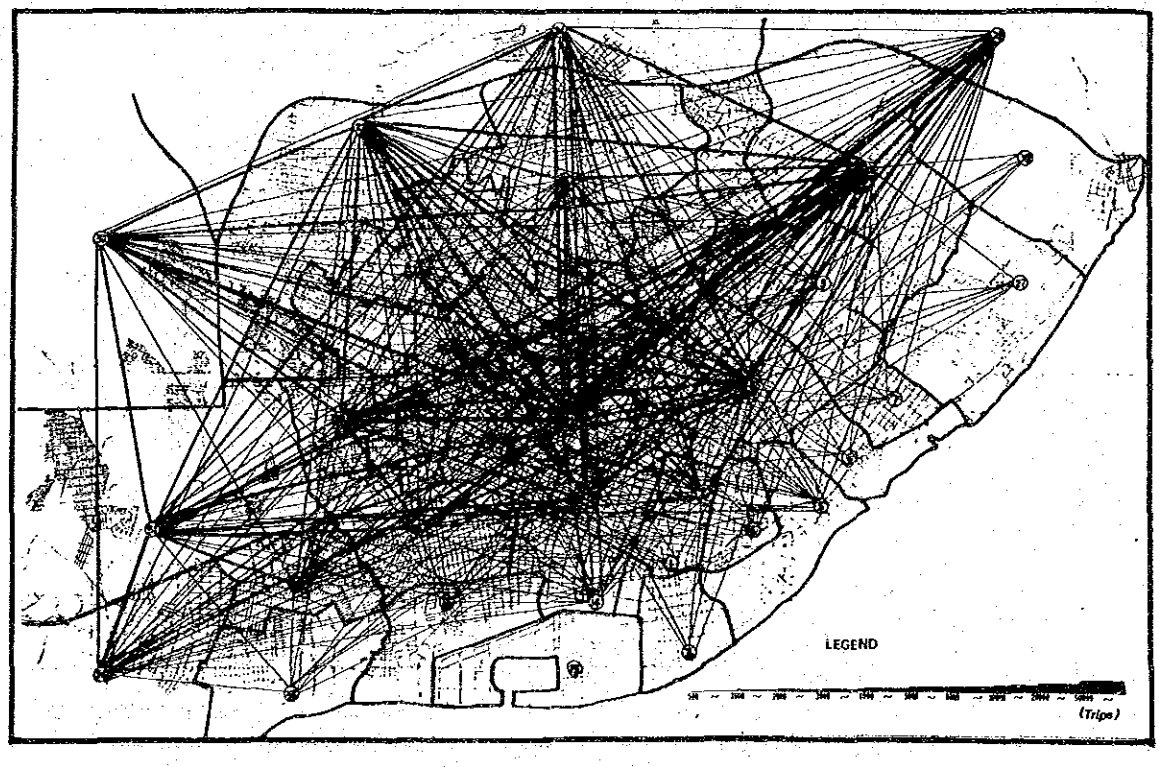


Fig. G–3–2 OD Pattern in 2000 (School)

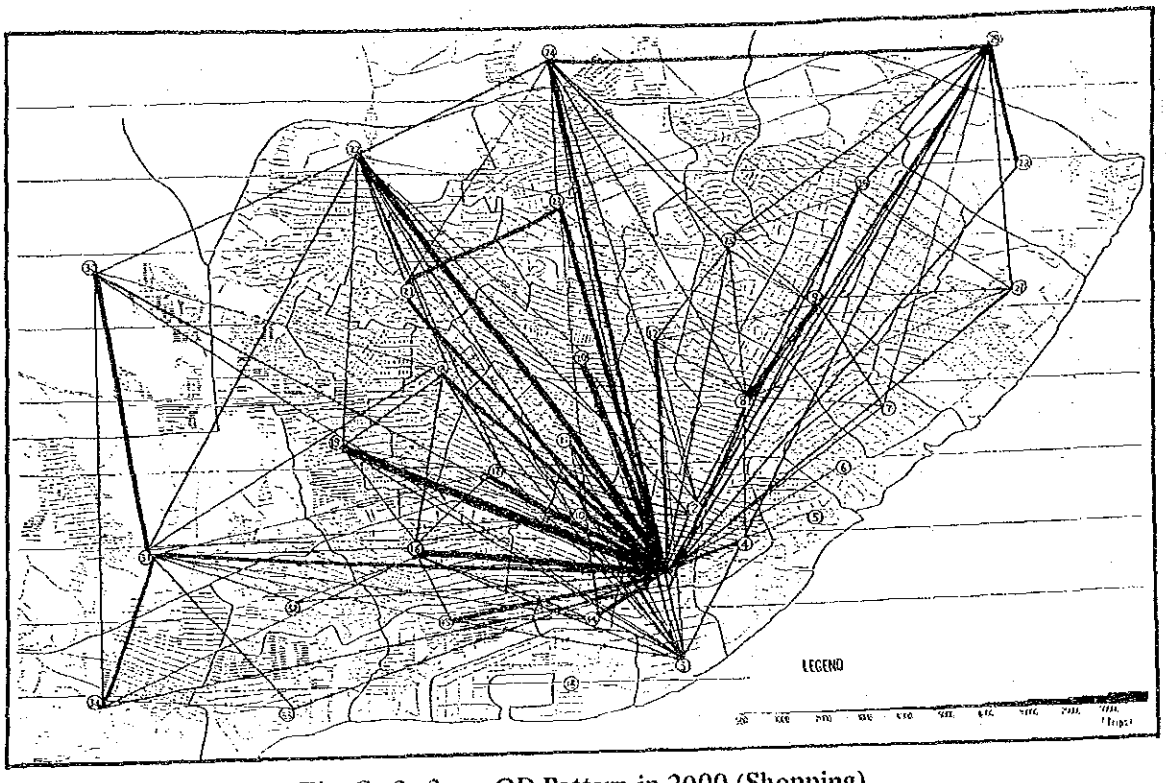


Fig. G–3–3 OD Pattern in 2000 (Shopping)

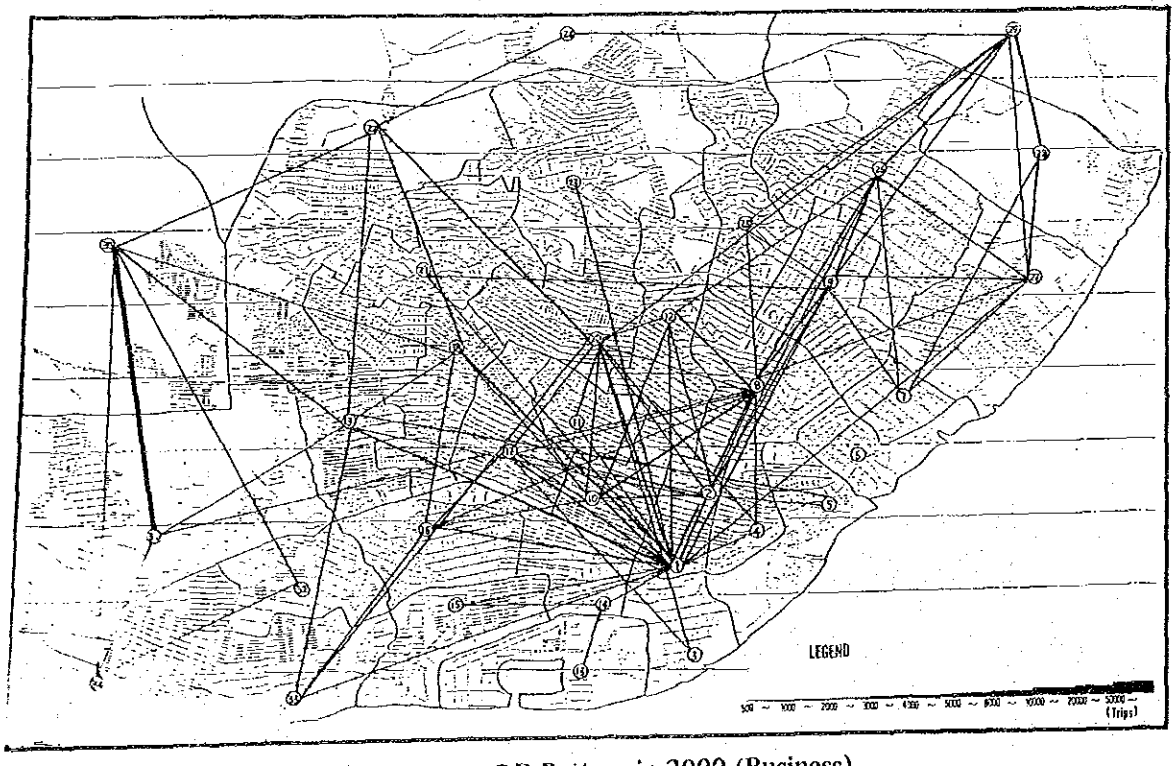


Fig. G–3–4 OD Pattern in 2000 (Business)

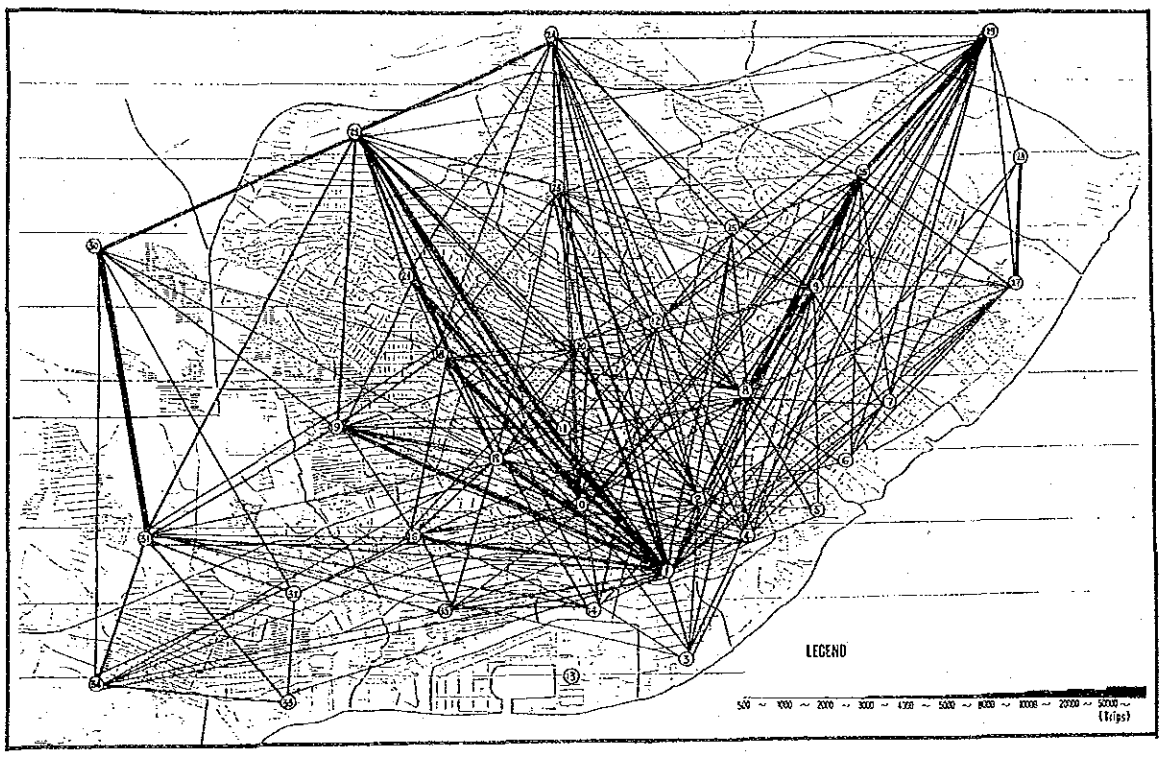


Fig. G–3–5 OD Pattern in 2000 (Private)

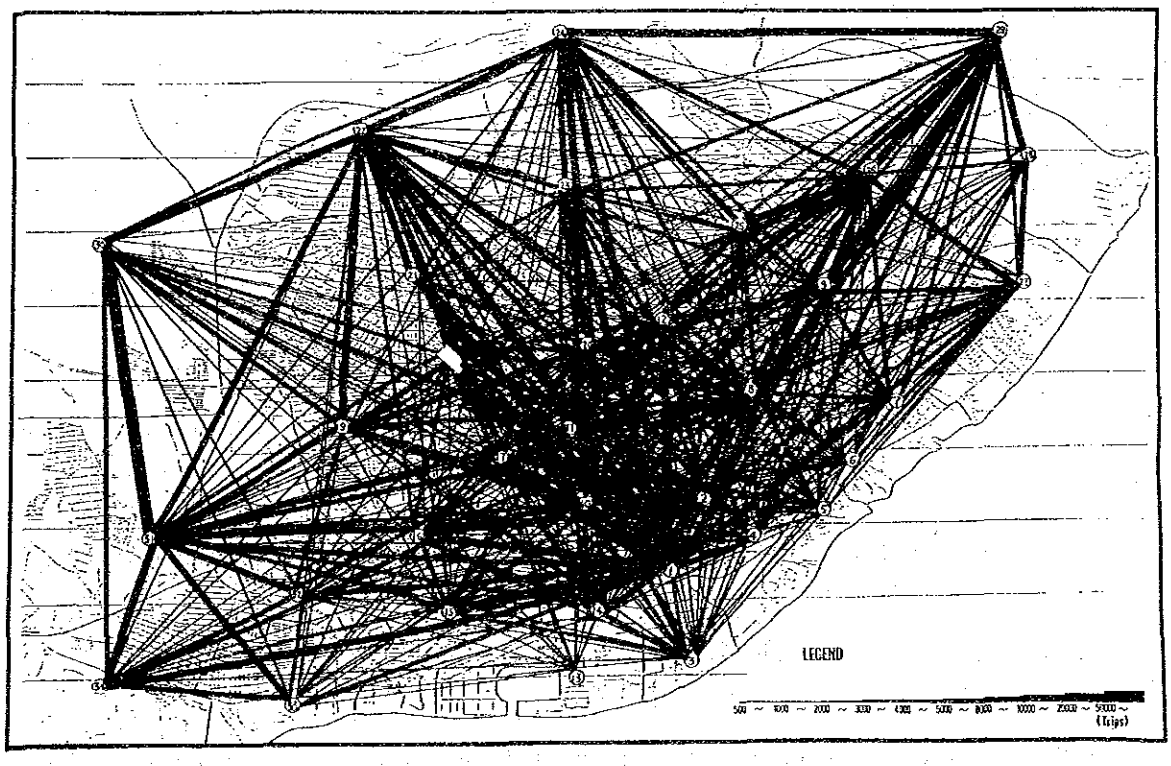


Fig. G–3–6 OD Pattern in 2000 (Home)

Appendix H–1 ESTIMATION OF BENEFITS BY ALTERNATIVES

The total benefit by each alternative plan is calculated by estimating the savings in the total of vehicle operating costs and travel time costs. Namely it is expressed by the following formula.

$$B = (VDC^{WO} + TC^{WO}) - (VOC^{W} + TC^{W})$$

where, VOC^{WO} : Vehicle Operating Cost in Do Nothing Case
TC^{WO} : Travel Time Cost in Do Nothing Case
VOC^{W} : Vehicle Operating Cost in each alternative case
TC^{W} : Travel Time Cost in each alternative case

VOC and TC are expressed by the following equations:

$$VOC = \sum_{k} RC_k \cdot VL_k + \sum_{k} FC_k \cdot VT_k$$

where, RC_k : Unit running cost of mode k
Note : Since the operating cost of the rail transit is counted in the cost stream, it is not included here.
VL_k : Vehicle km per year of mode k
FC_k : Unit fixed cost of mode k
VT_k : Vehicle time per year of mode k

$$TC = \sum_{k} V \cdot T_k$$

where, V : Unit time value of passengers
T_k : Total passenger time of mode k
Note (1) In the case with a rail transit, the passengers of the rail are taken into account.
(2) Only the trips for work and business are considered.

As a calculation result, the total benefits in 2000 by each case are obtained as shown in Table H–1–1.

Table H–1–1 Vehicle Cost and Time Cost in 2000

(Million Pesos)

CASE	Vehicle Operating Cost		Travel Time Cost		Total Cost	Benefit
	Running Cost	Fixed Cost	Vehicle	Rail Transit		
Do nothing	15,321	18,042	11,287	–	44,650	–
Alternative 1	14,485	15,564	4,133	–	34,181	10,181
Alternative 2	14,583	14,756	4,006	–	33,345	11,305
Alternative 3	14,782	14,194	3,770	–	32,746	11,904
Alternative 4	13,374	13,113	2,905	382	29,774	14,876
Alternative 5	13,546	12,441	2,763	378	29,146	15,504

The benefits generated in each year are estimated in the following manner.

Firstly, the total costs of VOC and TC in 1983, 1990, 2000 for Do Nothing Case are estimated (Points A, B, C).

Since the implementation of the projects is assumed to be started in 1986, the benefits accrued from the projects in 1986 are zero, the total cost of VOC and TC for an alternative plan in 1986 corresponds with that of Do Nothing Case (Point D).

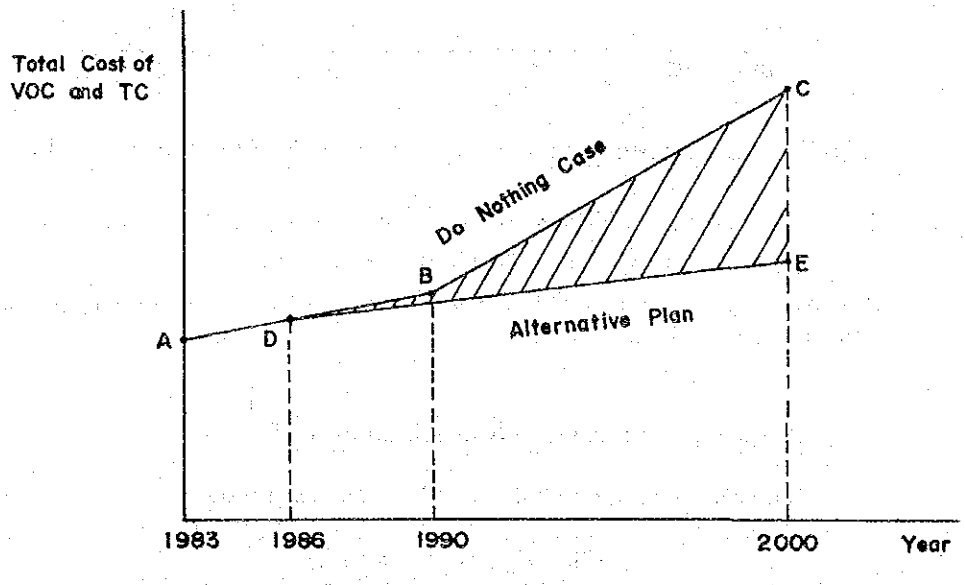


Fig. H–1–1 Estimation of Benefits by Year for Alternatives 1–3

Assuming that the total cost of VOC and TC grows in a linear line for the years from 1986 to 2000, the benefit for each year is expressed by the shaded area in Fig. H–1–1.

In the case of Alternatives 4 and 5, the construction schedule of the rail transit system is assumed as follows:

1988 – 1991	Engineering and Land Acquisition
1992 – 1995	Construction and Purchase of Rolling Stocks

Therefore, the benefits may have a sudden jump up in 1996 owing to the effects of the rail transit, as shown in Fig. H–1–2.

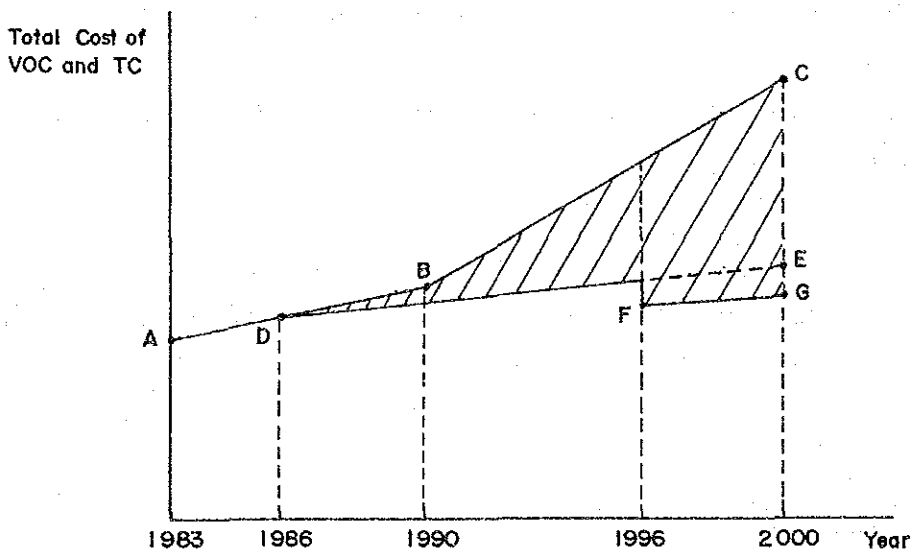


Fig. H–1–2 Estimation of Benefits by Year for Alternatives 4 and 5

Note E: The total costs of VOC & TC for the cases 4 or 5 without a rail transit.
G: The total costs of VOC & TC for the cases 4 or 5.
The growth rate from F to G is assumed to be 3.8% per annum which is the growth rate of traffic demand.

Construction Schedule of Rail Transit System

The construction cost for the rail transit is as follows:

Year	Million pesos at 1984 prices	
1988	177	
1989	177	Engineering
1990	177	and Land Acquisition
1991	177	
1992	4.944	
1993	4.944	
1994	7.846	Construction
1995	17.158	and Rolling Stocks

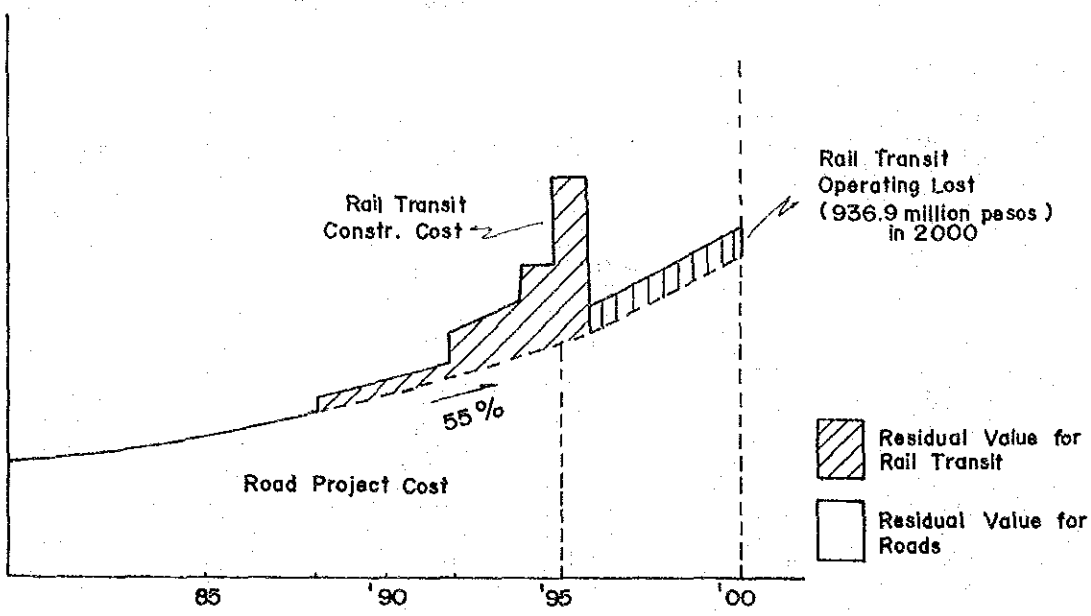


Fig. H–1–3 Project Cost for Alternatives 4 and 5

Appendix H–2

Table H–2–1 (1) Evaluation Results

CASE: ALTERNATIVE I

NO.	YEAR	DO NOTHING	ALTERNATINE	BENEFIT	COST	BENEFIT-COST
1	1985	15100	15100	0	0	0
2	1986	16378	16378	0	1127	-1127
3	1987	17657	17650	7	1189	-1183
4	1988	18935	18922	13	1255	-1242
5	1989	20213	20193	20	1324	-1304
6	1990	21491	21465	26	1397	-1371
7	1991	23807	22737	1070	1474	-403
8	1992	26123	24008	2114	1555	560
9	1993	28438	25280	3158	1640	1518
10	1994	30754	26552	4203	1730	2472
11	1995	33070	27823	5247	1825	3421
12	1996	35386	29095	6291	1926	4365
13	1997	37702	30366	7335	2032	5303
14	1998	40017	31638	8379	2144	6236
15	1999	42333	32910	9423	2261	7162
16	2000	44649	34181	10468	2386	8082
17	2001	0	0	0	-15123	15123
	TOTAL	478419	420665	57754	10141	47612

NPV= 6847.3
B/C= 1.98
IRR= 24.15 (%)

CASE: ALTERNATIVE II

NO.	YEAR	DO NOTHING	ALTERNATINE	BENEFIT	COST	BENEFIT-COST
1	1985	15100	15100	0	0	0
2	1986	16378	16378	0	1141	-1141
3	1987	17657	17597	59	1204	-1145
4	1988	18935	18817	118	1270	-1152
5	1989	20213	20036	177	1340	-1163
6	1990	21491	21255	236	1414	-1177
7	1991	23807	22474	1333	1491	-158
8	1992	26123	23693	2430	1573	856
9	1993	28438	24912	3527	1660	1867
10	1994	30754	26131	4623	1751	2872
11	1995	33070	27350	5720	1848	3872
12	1996	35386	28569	6817	1949	4868
13	1997	37702	29788	7914	2056	5857
14	1998	40017	31007	9010	2170	6841
15	1999	42333	32226	10107	2289	7818
16	2000	44649	33445	11204	2415	8789
17	2001	0	0	0	-16486	16486
	TOTAL	956838	415143	63276	9086	54190

NPV= 8527.0
B/C= 2.24
IRR= 26.91 (%)

Table H–2–1 (2) Evaluation Results

CASE: ALTERNATIVE III

NO.	YEAR	DO NOTHING	ALTERNATINE	BENEFIT	COST	BENEFIT-COST
1	1985	15100	15100	0	0	0
2	1986	16378	16378	0	1125	-1125
3	1987	17657	17541	116	1187	-1071
4	1988	18935	18703	232	1252	-1020
5	1989	20213	19865	348	1321	-973
6	1990	21491	21027	464	1394	-930
7	1991	23807	22190	1617	1470	147
8	1992	26123	23352	2771	1551	1220
9	1993	28438	24514	3924	1636	2288
10	1994	30754	25676	5078	1726	3351
11	1995	33070	26839	6231	1821	4410
12	1996	35386	28001	7385	1921	5463
13	1997	37702	29163	8538	2027	6511
14	1998	40017	30325	9692	2139	7553
15	1999	42333	31488	10845	2256	8589
16	2000	44649	32650	11999	2380	9619
17	2001	0	0	0	-16424	16424
	TOTAL	478419	409180	69239	8783	60456

NPV= 10370.4
B/C= 2.53
IRR= 30.41 (%)

CASE: ALTERNATIVE IV

NO.	YEAR	DO NOTHING	ALTERNATINE	BENEFIT	COST	BENEFIT-COST
1	1985	15100	15100	0	0	0
2	1986	16378	16378	0	1127	-1127
3	1987	17657	17650	7	1189	-1183
4	1988	18935	18922	13	1432	-1419
5	1989	20213	20193	20	1501	-1481
6	1990	21491	21465	26	1574	-1548
7	1991	23807	22737	1070	1651	-580
8	1992	26123	24008	2114	6499	-4384
9	1993	28438	25280	3158	6584	-3426
10	1994	30754	26552	4203	9576	-5374
11	1995	33070	27823	5247	18983	-13737
12	1996	35386	25299	10087	2791	7296
13	1997	37702	26426	11276	2915	8361
14	1998	40017	27548	12470	3044	9425
15	1999	42333	28664	13669	3180	10489
16	2000	44649	29774	14875	3323	11552
17	2001	0	0	0	-42110	42110
	TOTAL	478419	400186	78234	23259	54975

NPV= 2436.3
B/C= 1.16
IRR= 14.61 (%)

Table H–2–1 (3) Evaluation Results

CASE: ALTERNATIVE V

NO.	YEAR	DO NOTHING	ALTERNATINE	BENEFIT	COST	BENEFIT-COST
1	1985	15100	15100	0	0	0
2	1986	16378	16378	0	1125	-1125
3	1987	17657	17548	109	1187	-1078
4	1988	18935	18717	218	1429	-1211
5	1989	20213	19886	327	1498	-1171
6	1990	21491	21055	436	1570	-1134
7	1991	23807	22224	1583	1647	-64
8	1992	26123	23393	2729	6495	-3766
9	1993	28438	24562	3876	6580	-2704
10	1994	30754	25731	5023	9572	-4549
11	1995	33070	26901	6169	18979	-12810
12	1996	35386	24969	10417	2787	7630
13	1997	37702	26020	11682	2910	8772
14	1998	40017	27067	12951	3039	9912
15	1999	42333	28109	14224	3175	11050
16	2000	44649	29146	15503	3317	12186
17	2001	0	0	0	-43410	43410
	TOTAL	956838	393172	85247	21901	63347

NPV= 4980.9
B/C= 1.32
IRR= 17.66 (%)

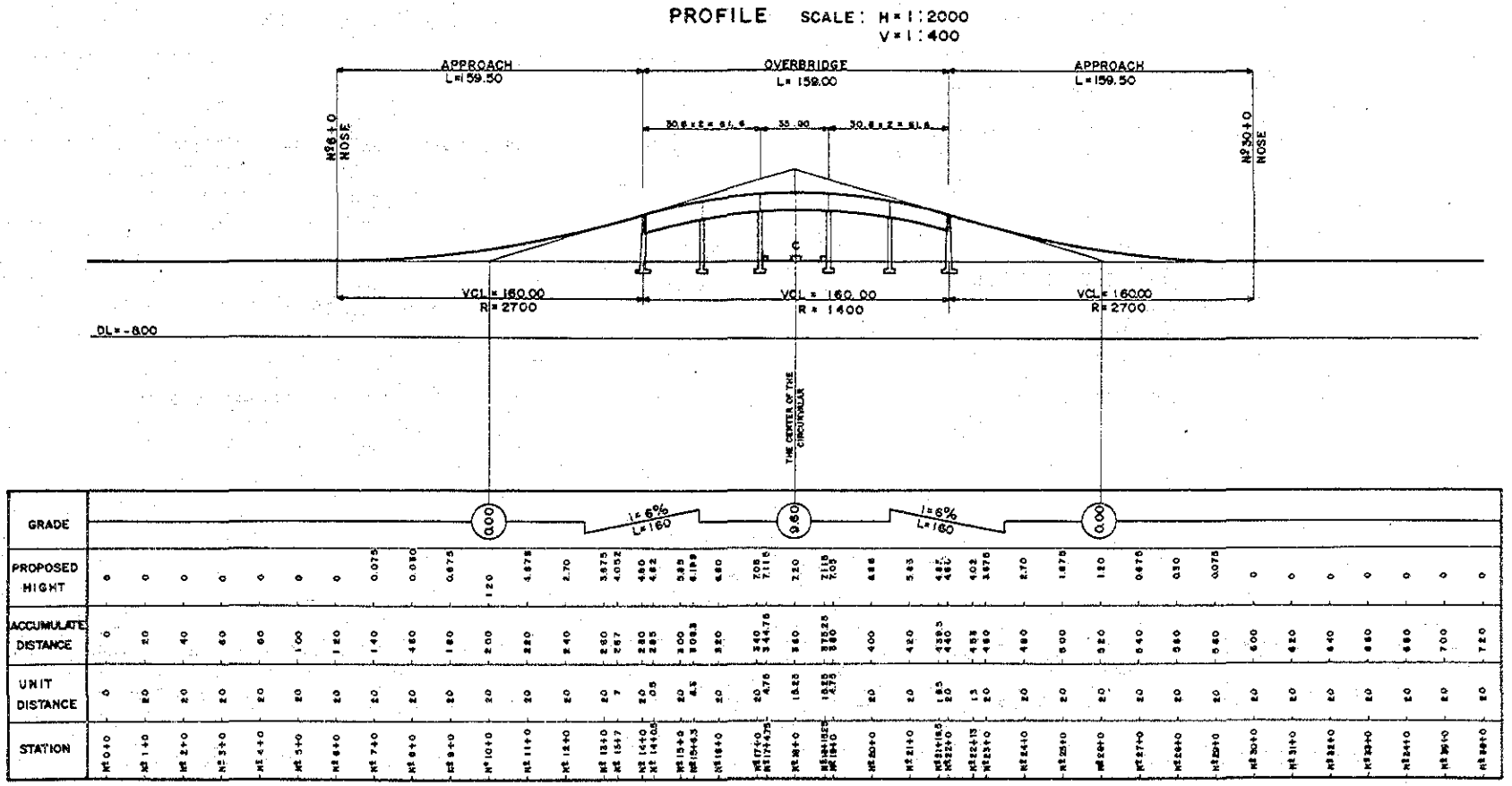


Fig. I–1–1 Bridge Plan for Overpassing Circunvalar (1)

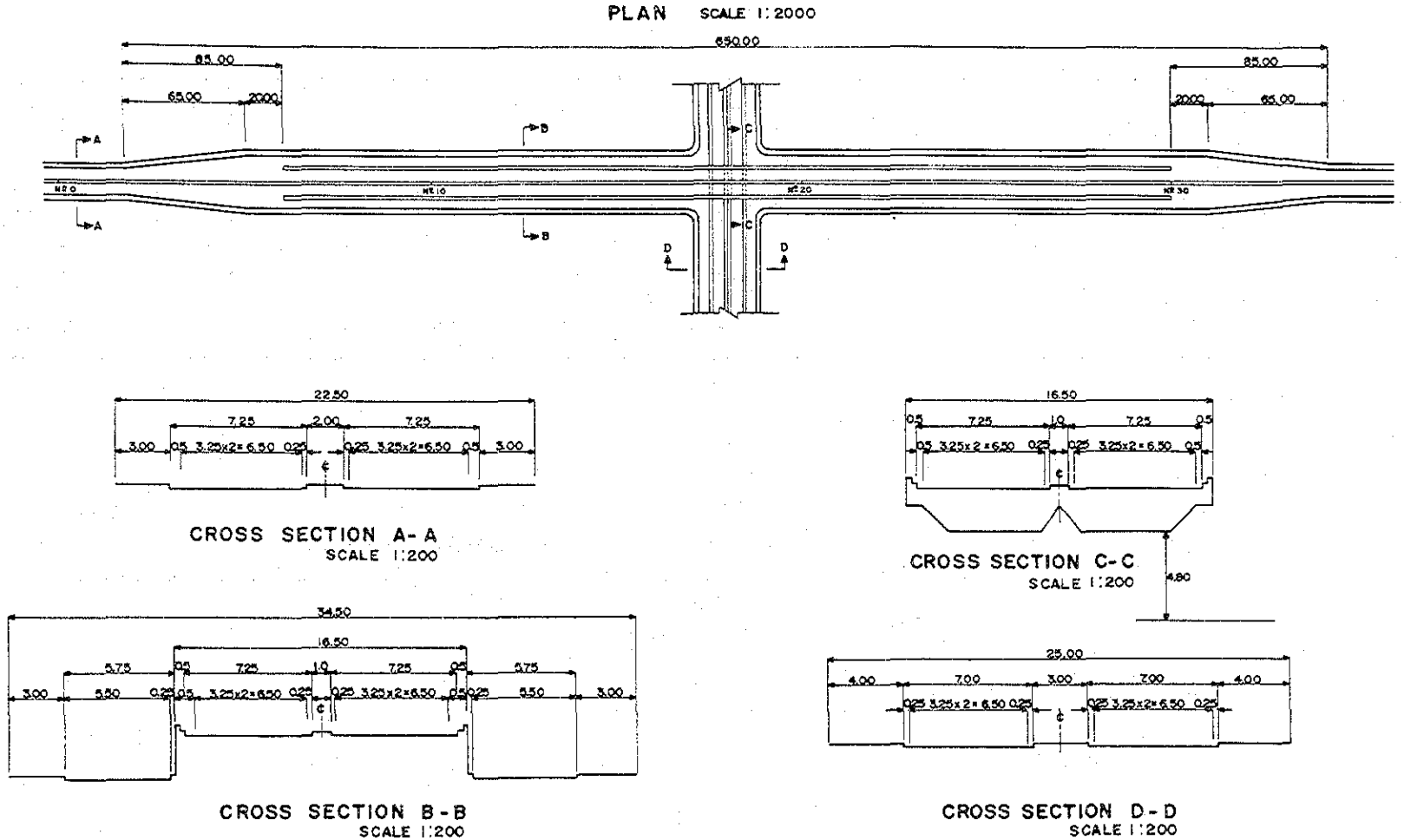


Fig. I–1–2 Bridge Plan for Overpassing Circunvalar (2)

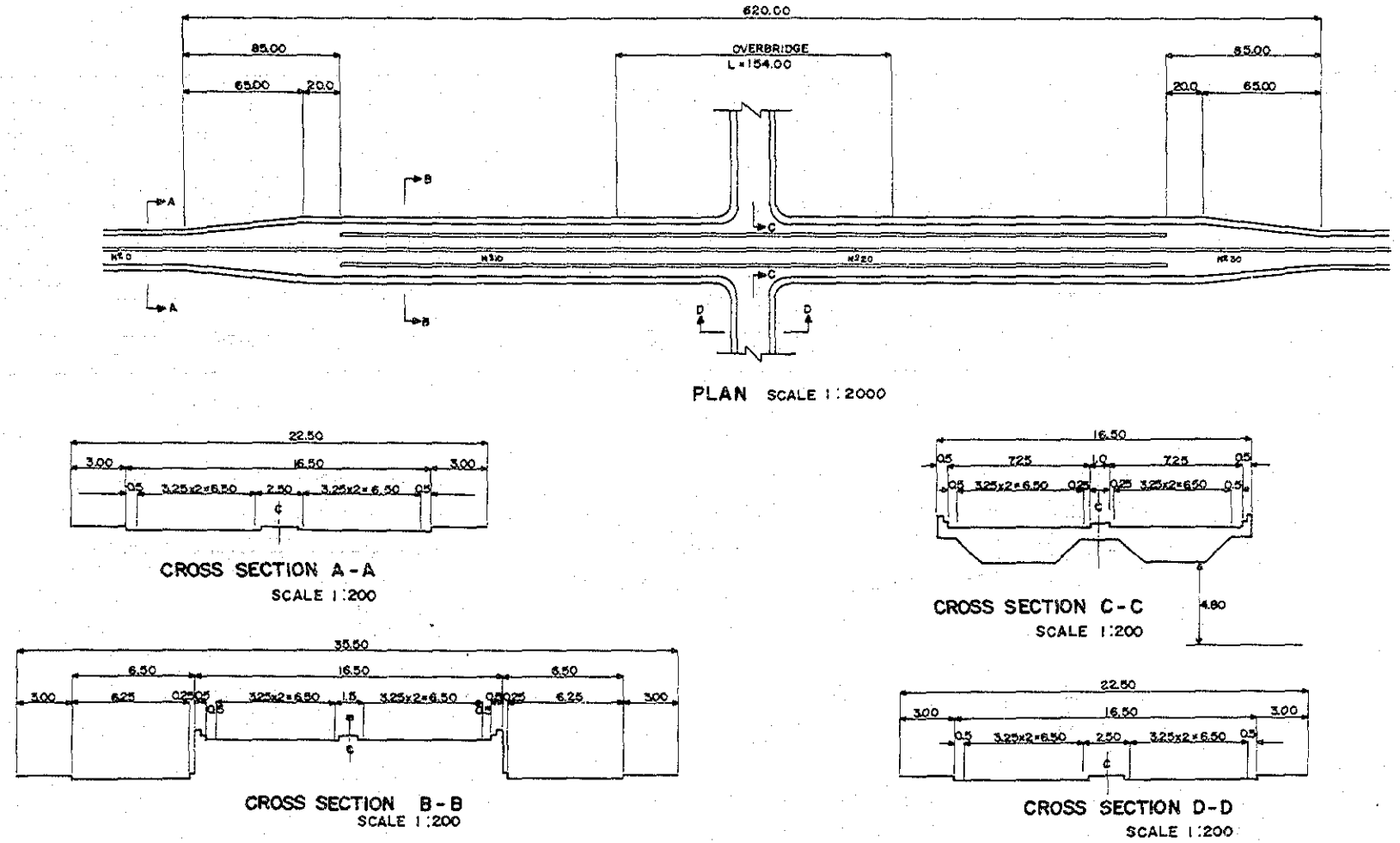


Fig. I–1–3 (1) Typical Overbridge Plan

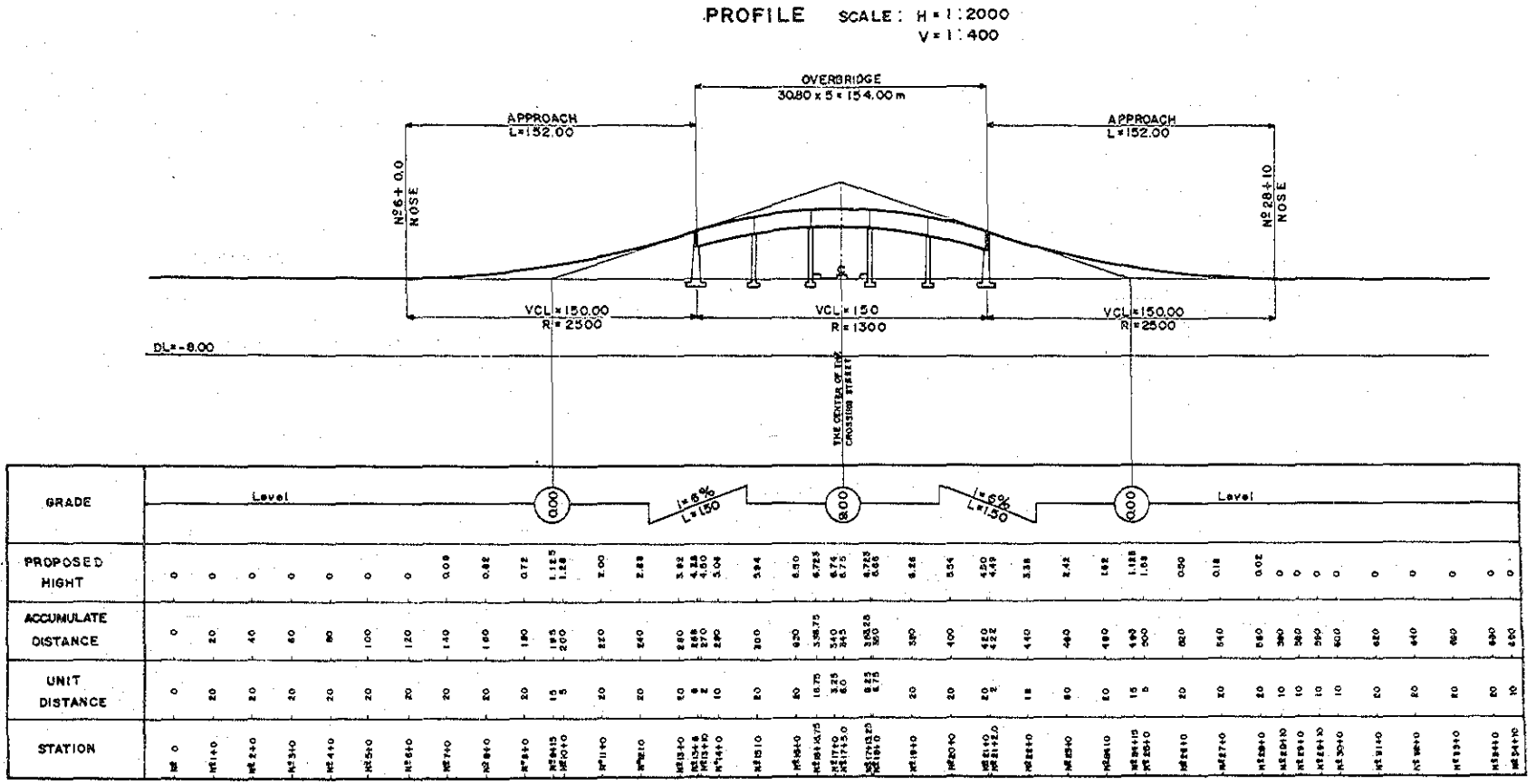


Fig. I–1–3 (2) Typical Overbridge Plan

Appendix I–2 Cost Estimates for Roads and Drainage Projects

Table I–2–1 Repavement Short Term Plan

Financial Direct Cost (1,000 pesos)

Road Name	From	To	Repavement Cost		Pavement Cost		Asphalt Sheet	Subtotal
			Concrete	Asphalt	Concrete	Asphalt		
Cra. 54-51B	Vía 40	Circunvalar	605.70	1,019.40				1,625.10
Cra. 46	Circunvalar	Calle 3	1,600.00					1,600.00
Cra. 45	Calle 30	Calle 72	1,053.30					1,053.30
Cra. 44	Calle 6	Calle 76	18,167.90					18,167.90
Cra. 43	Calle 3	Diag. 96	9,189.10					9,180.10
Cra. 38	Circunvalar	Terminal	1,837.60	57.97				1,895.60
Calle 6	Caño	Cra. 38	36,276.00					36,276.00
Calle 3	Cra. 45	Cra. 41B	437.90					437.90
Calle 74;22;70C	Vía 40	Cra. 16	1,750,00		17,696.60			21,456.60
Cra.14	Calle 30	Calle 64	20,660.10					20,660.10
Calle 76;77	Cra. 43	Vía 40	294.60					294.60
Calle 85;84	Cra. 38	Vía 40	980.00	40.10			2,459.30	3,479.40
Calle 45	Cra. 22	Vía 40	231.40				291.60	523.00
Cra. 30;27; Calle 760	Calle 17	Circunvalar	4,814.80	13,942.60	8,609.10	6,699.30		34,065.80
Vía La Playa	Las Flores	Brisas del Mar		2,782.60		8,374.10		11,156.70
Calle 17;18	Cra. 38	Calle 30	5,742.50					5,742.50
Cra. 30 (Soledad)	Calle 18	La Arboleda	1,764.30					1,764.30
SUBTOTAL								169,387.90

Table I–2–2 New Bridge Construction

Direct cost by 1,000 pesos

Location		Direct Cost	Remarks
Bypass – Caño de la Ahuyama		149,940.00	
Bypass – Caño Arriba		149,940.00	
Bypass – Caño de los Tramposos		147,000.00	
Bypass – Caño de las Compañías (1)		147,000.00	
Bypass – Caño de las Compañías (2)		147,000.00	
Cra. 22 – Arroyo de Rebolo		39,200.00	
Cra. 64 – Circunvalar		65,856.00	Overpass only
Calle 760 – Circunvalar		61,152.00	Overpass only
Calle 45 – Circunvalar		120,000.00	Interchange bridge
Cra. 38 – Circunvalar		120,000.00	Interchange bridge
	Subtotal	1,147,088.00	
Cra. 38 – Caño		25,480.00	Improvement bridge
Calle 6 – Caño		33,600.00	Improvement bridge
	Subtotal	59,080.00	
Circunvalar – Parque Muvdi		5,610.40	Pedestrian overpass
Circunvalar – Estadio Metropolitano		5,610.40	Pedestrian overpass
Circunvalar – Calle 450		5,610.40	Pedestrian overpass
Circunvalar – El Pueblo		5,610.40	Pedestrian overpass
Circunvalar – Los Olivos		5,610.40	Pedestrian overpass
	Subtotal	28,052.00	

Table I–2–3 Road Project Cost

* Cost by Million pesos

			Total Construction Cost	Land Cost	Compensation Cost	
1	C01	Bypass I	1,921.2	258.0	0	
2	C02	Bypass II	1,525.2	161.1	0	
3	C03	Cra. 46	296.8	16.5	0	
4	C04	Calle 17	397.5	93.6	0	
5	C05	Vía Caracolí I	560.6	59.3	0	
6	C06	Transversal I	158.8	14.0	0	
7	C07	Avenida Las Moras	123.2	10.5	0	
8	C08	Transversal II	111.1	2.8	0	
9	C09	V. Central Abastos	386.1	23.6	0	
10	C10	Calle 450 Ext.	92.1	12.1	0	
11	C11	Calle 45 Ext.	1,616.1	17.7	0	
12	C12	Carretera Metro	3,739.1	46.7	0	
13	C13	Anillo Rural	1,273.6	81.0	0	
14	C14	Transversal Rural	569.2	39.2	0	
15	I01	Calle 30 I	398.8	165.1	812.7	
16	I02	Calle 30 II	301.1	0.0	0	
17	I03	Circunvalar I	670.3	0.0	0	
18	I04	Circunvalar II	454.9	0.0	0	
19	I05	Circunvalar III	660.9	0.0	0	
20	I06	Circunvalar IV	1,099.8	0.0	0	
21	I07	Vía 40	414.5	0.0	0	
22	I08	Cra. 22 I	234.8	44.6	130.0	
23	I09	Cra. 22 II	273.4	35.4	123.7	
24	I10	Avenida Arenosa I	437.7	70.1	516.6	
25	I11	Avenida Arenosa II	169.0	29.5	145.1	
26	I12	Vía Caracolí II	83.0	24.2	43.7	
27	I13	Vía Soledad 2000	237.5	80.0	0	
28	I14	Ac. Pte. Pumarejo	128.9	8.0	0	
29	I15	Calle 45D I	586.7	69.1	606.8	
30	I16	Avenida Arenosa III	177.8	14.7	681.7	
31	I17	Calle 45D II	364.8	10.4	129.7	
32	I18	Cra. 26 – Calle 76D	306.8	0.0	0	
33	I19	Cra. 38	170.2	7.5	12.8	
34	I20	Cra. 38 Oc.	972.9	33.8	21.1	
35	I21	Cra. 50 – Cra. 54	404.2	79.8	810.2	
36	I22	Cra. 54 – Cra. 51B	229.2	0.0	0	
37	I23	Cra. 60 – Cra. 64	706.6	25.0	0	
38	I24	Carretera Oriental	258.1	0.0	0	
39	I25	Cra. 46 Abajo	132.6	13.2	39.1	
		TOTAL	22,645.1	1,546.5	4,073.2	28,264.8

The costs of the projects C05; C06; C07; C08 were increased because of drainage system.

The cost of the project C09 was done for 4 lanes, it is decreased for a 2 lanes.

The land costs were adjusted.

I25: Aditional improvement project of Cra. 46 to 6 lanes from Vía 40 to Calle 45.

Table I–2–4 Arroyo Countermeasure Facility

Direct Cost by 1,000 pesos

		Direct Cost	Remarks
Arroyo Project I		82,551.30	Short term plan
Arroyo Project II		97,820.35	Short term plan
Arroyo Project III		12,389.71	Short term plan
Arroyo Project IV		15,393.98	Short term plan
	Subtotal	208,155.30	
Arroyo Project V		64,727.30	Long term plan
Arroyo Project VI		5,603.30	Long term plan
Arroyo Project VII		20,590.40	Long term plan
	Subtotal	90,381.00	
Arroyo Project VIII		174,169.70	Recommendable
Arroyo Project IX		78,499.00	Recommendable
Arroyo Project X		27,768.30	Recommendable
Arroyo Project XI		20,071.90	Recommendable
Arroyo Project XII		4,131.50	Recommendable
	Subtotal	304,640.40	
	Total	603,176.70	

Table I–2–5 Arroyo Facility for Central District

Cost by $1,000

		Direct Cost	
Parque Universal Reservoir		501,759.90	
Box Culvert of Calle 47		563,197.70	
	Subtotal	1,064,957.60	1,064,957.60
Talleres E.P.M. Reservoir		323,251.10	
Box Culvert of Cra. 25		327,645.00	
	Subtotal	650,896.10	650,896.10
Cra. 41 Reservoir		235,714.10	
Box Culvert of Calle 59		729,038.00	
	Subtotal	964,752.10	964,752.10
	Total Direct Cost		2,680,605.80

Table I–2–6 Improvement Plan of the Collectors Streets in Centro

Cost by $1,000

Street Name	From	To	Distance (km)	Direct Cost	Compensation Cost
Cra. 40	Calle 40	Calle 45	0.47	24,877.00	1,334.60
Cra. 45	Calle 30	Calle 54	1.66	71,980.30	9,493.30
Calle 37	Cra. 33	Cra. 50	1.60	82,576.70	35,841.00
Calle 38	Cra. 38	Cra. 50	0.70	53,114.60	8,276.00
Calle 44	Cra. 33	Cra. 50	1.40	88,605.80	42,947.70
		Subtotal		$ 321,154.10	$ 97,892.60

Table I–2–7 Drainage Facility Plan in Central District

Cost by $1,000

	Item	Distance (m)	Direct Cost
1.	Gutter type A	64,110	1,907,041.7
2.	Gutter type B	13,780	763,886.7
3.	Box culvert type A	460	35,926.1
4.	Box culvert type B	940	117,084.5
5.	Channel I	140	3,121.7
6.	Channel II	200	6,996.0
7.	Channel III	140	3,899.3
8.	Channel IV	...	...
9.	Channel V	160	3,905.0
10.	Channel VI	686	40,557.3
11.	Box culvert I	585	35,088.3
12.	Box culvert II	40	2,436.0
13.	Box culvert III	170	12,399.3
14.	Box culvert IV	145	10,575.9
15.	Box culvert V	75	5,815.1
16.	Box culvert VI	330	30,621.2
17.	Box culvert VII	125	12,461.0
18.	Box culvert VIII	75	7,821.4
19.	Box culvert IX	120	17,053.6
20.	Box culvert X	125	18,809.1
21.	Box culvert XI	40	6,386.7
		Subtotal	$ 3,001,308.7

Note: No. 10 (Channel VI), clarified
Channel IV does not exist, it was replaced by a Box Culvert

Table I–2–8 The Drainage System in Barranquillita

Cost by $1,000

Item	Unit	Quantity	Direct Cost	Remarks
Banking in Barranquillita area	M3	543,696.0	556,146.30	Without the area between Riverside Bypass and Rio Magdalena.
Cutting in Barranquillita area	M3	2,486.4	793.16	For filling R1
Cutting in Loma I (R5)	M3	16,936.0	7,563.62	For filling R3
Filling R1	M3	95,305.0	42,887.25	R1 – 2,486.40
Filling R2	M3	66,852.0	30,083.40	
Filling R3	M3	8,054.0	3,624.30	R3 -- R5
Filling R4	M3	10,360.0	4,662.00	
Wall Work	LM	528.0	35,602.60	
Channels	ML	3,162.0	168,025.52	Average section 2.5 x 2
Box Culvert I	ML	676.0	155,404.63	
Box Culvert II	ML	282.0	18,841.75	
		Subtotal	1,023,634.53	