



management & technical consulting group, inc.

**STUDY AND EVALUATION OF EXISTING
PUBLICO VEHICLE TERMINALS
IN BAYAMON, CAGUAS, AND MAYAGUEZ**

FINAL REPORT

PR-08-0014, TASK 245

SUBMITTED TO:

**COMMONWEALTH OF PUERTO RICO
DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**

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"This report is the product of a study financed in part by the U.S. Department of Transportation, Urban Mass Transportation Administration. The contents of this report reflect the views of the author(s) which is(are) responsible for the facts and accuracy of the data presented herein. The contents of this report do not necessarily reflect the official views or policy of the Puerto Rico Department of Transportation and Public Works or the U.S. Department of Transportation. This report does not constitute a standard, specification, or regulation."

EXECUTIVE SUMMARY

A. BACKGROUND

On April 6, 1980, the first terminal facility in Puerto Rico built especially for the use of publico-cars was inaugurated in the City of Caguas. The Caguas Transportation Terminal, the first to be funded via funds (up to 80% of the total cost) from the Urban Mass Transportation Administration (UMTA), was the culmination of over a decade of planning integrated with the rapid urban development of the City of Caguas. Subsequently, other major terminal facilities were constructed in the cities of Bayamón and Mayaguez as well as smaller facilities in numerous towns throughout the island.

The terminals are usually multi-storied structures with areas for passenger loading and unloading, vehicle circulation and vehicle holding (waiting). Many include space for restrooms, cafeteria, administration offices, maintenance, and even terminal space for other modes such as buses and taxis.

In the past, the planning and design processes utilized to determine the need for such facilities were not altogether consistent. As was the case very often, the analyses were made knowing that there was a need for a terminal (or terminals), but based mainly upon urban development needs such as parking space shortages, internal street and sidewalk system congestion, urban area renewal, etc.

The expected benefits of the terminals with respect to the public transit users for passengers of the "publico-cars" included improved schedule of services (frequencies), protection from the adverse natural elements, simplification of transfers, and improved accessibility. The publico operators were to benefit from reduced operating costs and increased passenger demand. On the other hand, the central urban areas, particularly the commercial sectors, would benefit by the reduction of traffic congestion, increased parking supply, improved vehicle accessibility, and the minimization of pollution problems.

Although the principal major publico terminals in the cities of Bayamón, Caguas, and Mayaguez have been in operation for several years now, very little has been done to evaluate the impacts that they have made upon the development of the respective urban areas, the public transit service, and general acceptance of the facilities. There is some concern and need to know just how effectively these terminals have been, not only in terms of public transit service and area traffic and parking impacts, but also in terms of economic effectiveness.

Cognizant of this situation, the Puerto Rico Department of Transportation and Public Works (DPTW) solicited professional transportation engineering and planning firms to conduct a study to address the aforementioned concerns. The consulting firm of **MANAGEMENT AND TECHNICAL CONSULTING GROUP, INC.** was selected to undertake this study based upon the objectives presented in the following section.

B. STUDY OBJECTIVES

The principal objective of this work was the study and evaluation of the operations of the "publico" vehicle terminals in the cities of Bayamón, Caguas, and Mayaguez, all built with matching funds from the Urban Mass Transportation Administration. The study also addressed, among others:

- The processes, data, and studies utilized for the identification of the local transportation problems, site alternatives, design, solicitation of funds, and construction of the terminals.
- The evaluation of the current conditions with respect to the construction and subsequent operation of the terminals.
- The quantification of the present public transit service in each municipality.
- The comparison of the public transit service before and after the implementation of the terminals.
- The determination of each facility's operational performance, with respect to both vehicular/pedestrian use and administrative organization.
- The determination of public opinion (transit user, business, etc.) concerning the impact of the terminals.
- The review of the implementation of half-fare systems.
- The review of the terminal needs and selection processes and the establishment of new guidelines or criteria for future facilities.

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C. STUDY APPROACH

To accomplish the aforementioned objectives, the following work program was established. The analysis of the terminals included the Caguas Transportation Center (249 vehicle capacity), the Mayaguez Public Transportation Terminal (400 vehicle capacity), and Bayamón's two terminal buildings: the Kuilan and Guardarrama Terminals, with capacities of 442 and 239, respectively.

Task 1 Data Collection

This task involved the recopilation of all basic data that were previously used and considered for the terminal project approval and construction. This included documents, studies, and field data available for each of the municipalities.

In order to complete the basis for analysis, it was necessary to undertake a series of surveys at each Municipality, covering such factors as:

1. Inventory of existing public transit services,
2. Current publico-car passenger and vehicle movements,
3. A limited analysis of the existing urban street system,
4. A survey of opinions of the current publico-car users, public transit operators and local businessmen concerning the benefits (or non-benefits) and operations of the terminals, and their perceived observations concerning the terminals and their operations,
5. A review of the land use impacts,
6. An overview of the internal terminal facilities and maintenance.

Task 2 Evaluation of Terminal Planning and Operations

This task included review of the planning procedures conducted for each terminal facility. Also included was the evaluation of each terminal facility with respect to internal vehicular and pedestrian movements, accesses, location of restrooms and concessionaires, passenger loading and drop-off areas, vehicle holding areas, roadway (ramp) geometrics, etc.

Task 3 Review of Elderly and Handicapped Fare System

This task consisted of the review and the evaluation of the impacts of the special fare programs (required by UMTA) as originally implemented by the municipalities including opinions concerning its use and acceptance and administrative procedures employed.

Task 4 Economic Evaluation

An evaluation of the terminal's perceived cost effectiveness was made based upon its general cost, the number of spaces available and the maximum accumulation of vehicles (or maximum utilization).

Task 5 Conclusions and Recommendations

This task involved the conglomeration of all of the outputs of the previous tasks, based on each Municipality, into a set of recommendations. These recommendations address improvements in terminal planning procedure, traffic and parking problems and controls, impact upon public routes, terminal capacity, interaction with public operators and the public in general, promotional procedures, municipal and commonwealth agency responsibilities, terminal maintenance and operations, improvement costs, etc.

D. THE STUDY TERMINALS

1. BAYAMON'S PUBLICO-CAR TERMINAL SYSTEM

Bayamón's publico-car terminal system consists primarily of two large terminal buildings (Kuilan Terminal, capacity 442; and Guardarrama Terminal, capacity 239), two surface lots and a terminal stand at El Canton Mall. The city no longer has authorized curbside terminals.

The public transportation sector is served by six Metropolitan Bus Authority (MBA) and six private bus routes with over 50 buses of different types and sizes (from both the private and public [MBA] sectors). There are 41 authorized publico-car routes with a total of approximately 987 authorized vehicles. Taxis also service the area but to a limited degree.

a. Kuilan Terminal

The Municipality of Bayamón inaugurated the Tomás Kuilán Pérez Transportation Terminal, Puerto Rico's second of its kind, in late July 1982. The terminal, located off Parque Street to the east, between Dr. Veve Street and PR-2, and right across from the Market Plaza, has a total capacity of 442 vehicles. The ground floor includes the passenger concourse area with 55 publico-car berths, passenger discharge areas, and 66 primary vehicle holding areas. An additional 321 vehicle spaces are located in a four split-level garage structure which covers an area less than one-half of the ground floor.

The Kuilán Terminal serves as the base for 26 routes (987 vehicles). These routes were mainly those that had terminals assigned along Parque Street, at the Market Plaza, along Doctor Veve and Betances Streets, and some from the area adjacent to the MBA Terminal. The local Bayamón taxi services are provided with spaces along a marginal street fronting Parque Street and the terminal building.

b. Guardarrama Terminal

The second facility, the Guardarrama Terminal, was inaugurated in 1986. The terminal, with a capacity for 239 vehicles, is located in the southeastern sector of the Bayamón CBD. It is bordered on the north by Isabel Street, on the east by PR-5, on the south by PR-2 and on the west by Degetau Street and the Bayamón City Hall.

The terminal consists of a ground level passenger concourse area with 26 loading berths and three additional levels of holding areas with a total of 213 spaces, yielding a total of 239 spaces. The passenger loading area has half of its area (13 spaces) utilized for other non-transportation uses. The terminal is connected to the City Hall via a pedestrian bridge.

This terminal is used by only four of Bayamón's routes (96 vehicles). These routes were originally located in two off-street lots along Barbosa Street in the eastern area of the CBD. Three of the routes serve the southeastern urbanizations along the PR-174 corridor.

2. CAGUAS' PUBLICO-CAR TERMINAL

Public passenger transportation in the region and city of Caguas is provided by a combination of privately owned bus lines, publico-cars, and taxis. It is estimated that there are currently 41 Caguas based routes with 631 público vehicles serving the Municipality of Caguas either in rural, interurban, or intraurban service.

Currently there are four interurban and nine local urban bus routes with a total of approximately thirty-one (31) buses serving the City of Caguas. There are three taxi organizations plus a number of independents with over 136 vehicles serving Caguas. These taxis are provided with off-street spaces at or near the Terminal plus some spaces at Plaza Palmer and various area shopping centers.

Caguas' público-car terminal system consists of one major terminal building, Caguas Transportation Terminal (CTC)-- capacity 249) and several existing curbside terminals in the western and southern sectors of the CBD. The Caguas Transportation Terminal was inaugurated on April 6, 1980, making it Puerto Rico's first truly intermodal terminal to specifically include público-cars, buses, and taxis. The terminal is located in the northeastern sector of the city's Central Business District bounded on the north by Dr. Goyco Street, on the west by Acosta Street, on the south by Celis Aguilera Street (and south terminal access road), and on the east by a surface parking lot off Rafael Cordero Avenue.

The CTC is a two level facility with a total vehicular capacity of 249. The ground floor consists of a large, continuous passenger concourse area with 74 público-car berths. The second level contains 175 spaces comprising the holding area. The CTC serves as the terminal for 27 of Caguas' publico-car routes, representing 502 vehicles (or 80 percent of the total system vehicles).

The CTC also includes a nine-berth bus terminal plus three curbside bus stop areas to the east of the main terminal. This area provides the terminal area for both local and intercity private bus lines.

A taxi stand has been provided along Goyco Street. The main taxi terminals, however, are located opposite the terminal on the south side of Aguilera Street.

3. MAYAGUEZ'S PUBLICO-CAR TERMINAL

The public transportation sector of Mayaguez is served by 32 authorized publico-car routes with a total of approximately 703 authorized vehicles. Taxis also service the area but to a limited degree. No local bus service is provided.

The Mayaguez Public Transportation Center (MPTC) was inaugurated in September of 1983. The facility was constructed as a four level terminal structure with a total capacity for 400 vehicles. The first two levels were designed as passenger boarding areas; whereas, the remaining levels are for use as holding areas.

The terminal is located in the northeastern sector of the CBD approximately three blocks north of Plaza Colón. It is bounded on the West by Peral Street, plus a local circumference street, and residences; on the South by Palmita Street and the local street; and on the North and East by the Yaguez River.

The terminal (MPTC) currently serves as the base for 17 of Mayaguez' 32 routes. These routes make up only 40 percent of the authorized vehicles. At the present time the terminal is used only by interurban routes and two of the taxi services. The local routes (including urban and rural) maintain their curbside terminals in the eastern, northeastern and southeastern sectors of the CBD.

E. PUBLIC TRANSIT PASSENGER AND VEHICLE VOLUMES

1. Current Service

In order to assess the impact of the terminal facilities upon the publico-car operations in Bayamón, Caguas and Mayaguez it was necessary to obtain information concerning current average vehicle and passenger volumes. For this purpose, extensive public transit vehicle and passenger count surveys were conducted during April of 1987 at selected cordon and interior count stations.

These stations were generally established at or near the CBD limits along the principal public transit route corridors. The information collected at these stations included publico-car vehicles by route, passenger occupancy, and bus and passenger volumes, where appropriate.

The results of the counts indicated that the number of daily publico-car passenger and vehicles entering the Bayamón CBD was approximately 15,680 and 2,434, respectively. Exiting the CBD, the numbers were 23,734 and 2,475, respectively. These values represent an average vehicle occupancy of about 8.0 passengers/vehicle. These values do not include passengers in segments traveling totally outside the cordon nor do they include vehicles entering or leaving the inner cordon area through smaller streets. These stations also correspond to station locations covered during cordon count surveys prior to the opening of the terminals.

In Caguas, the recorded volumes at the peripheral CBD stations indicated a total of 4,901 publico-cars, (2,403 in and 2,498 out) and 39,151 passengers (18,137 in and 21,014 out). These values represent an average vehicle occupancy of about 8.0 passengers/vehicle. It should be pointed out that these values represent minimum daily vehicle and passengers trips since these counts were made at cordon stations.

The results of the cordon counts indicate that the number of daily publico-car passenger and vehicles entering the Mayaguez CBD is approximately 5,138 and 3,230, respectively. Exiting the CBD, the numbers are 7,525 and 4,036, respectively. The total number of estimated weekday trips are 12,663 passengers and 7,266 vehicles, with an average occupancy of 1.74.

3. Comparison with Previous Volumes

A comparison of the existing publico-car vehicle and passenger volumes for each city was made with similar data obtained prior to the opening of the terminals.

The following summary presents a comparison of the 1987 counts with the recorded Bayamon publico and passenger volumes in 1981 prior to the implementation of the terminals.

BAYAMON			
Trips (In+Out)	1981 Counts (Before)	1987 Counts (After)	% Change (1981-1987)
Publico-cars	7,397	4,909	-33.6%
Passengers	54,543	39,414	-27.7%
Occupancy	7.4	8.0	+7.9%

The results presented in the above table indicate that both the number of publico-car vehicle and passenger trips entering and leaving the Bayamón CBD has been reduced significantly. The only positive factor is the vehicle occupancy which increased by almost 8 percent.

The following summary presents a comparison of the recorded Caguas publico and passenger volumes prior to the implementation of the terminal (1980) with the present counts (1987):

CAGUAS			
Trips (In+Out)	1980 Counts (Before)	1987 Counts (After)	% Change (1981-1987)
Público-cars	6,751	4,962	-26.5%
Passengers	48,411	39,875	-17.6%
Occupancy	7.2	8.0	+11.1%

The results presented in the above table indicate that both the number of público-car vehicle and passenger trips entering and leaving the Caguas CBD seem to have decreased during the past seven years of terminal operation. On the other hand, the vehicle occupancy increased by 11.1 percent, indicating an improved operational function. It should be pointed out, however, that each of the count surveys was made during one day each year and may not necessarily reflect any significant decrease in ridership.

The following summary presents a comparison of the Mayaguez publico passenger counts made in 1982, prior to the implementation of the terminal, with the present counts (1987). No number of público vehicles was obtained since the 1982 survey study only presented passenger volumes.

MAYAGUEZ			
Trips (In+Out)	1982 Counts (Before)	1987 Counts (After)	% Change (1981-1987)
Publico-cars	N/A	4,909	N/A
Passengers	7,964	10,381	+30.3%
Occupancy	N/A	1.9	N/A

While the preceding numbers seem to indicate a possible negative impact with respect to passenger volumes caused directly or indirectly by the terminals, it is not possible to correctly assess the negative impact. The reduction in passenger vehicle trips can be due to various factors not associated with the terminals. For example, since 1981, private vehicle acquisition and use in Bayamón (and the SJMA) has increased, reflecting the general driving characteristics towards the use of the private auto in place of the public transit modes. For example, the following statistics for private automobile registration in the Municipalities of Bayamon, Caguas and Mayaguez, as well as for Puerto Rico for fiscal years 1985-1988 indicate an average annual rate of increase in ownership from 5.08 percent to 5.38 percent. In contrast, the observed change in publico-car passengers results in an average annual rate of -5.27 percent for Bayamon between fiscal years 1985 and 1987, -2.73 percent for Caguas between fiscal years 1980 and 1987, and, in contrast, an apparent +5.4 percent increase for Mayaguez between fiscal years 1982 and 1987.

Municipality	<u>Automobile Registration, Fiscal Year</u>				Annual % Growth Rate
	1985	1986	1987	1988	
Bayamon	98,174	105,282	112,064	114,397	5.23
Caguas	49,588	53,178	56,605	57,536	5.08
Mayaguez	39,114	41,945	44,648	45,776	5.38
Puerto Rico	1,114,359	1,195,027	1,272,013	1,304,171	5.38

Another related cause may be an increase in the use of private vehicles in areas not presently served or inadequately served by publicos. This may be due directly to poor route coverage and infrequent service.

Because the terminals are located at points very close to the majority of the previous curbside terminals, it cannot be readily concluded that the terminals or their locations are the root cause of the decrease in publico-car passenger volumes at the CBDs.

F. TERMINAL UTILIZATION

1. Introduction

A very important factor to consider in evaluating the impact of a publico-car terminal is the determination of the utilization of the terminal. The method used to determine the utilization is based upon the accumulation of the publico-cars within the terminal in relation to the terminal's capacity. This accumulation includes those vehicles within the loading areas, holding areas and in circulation within the terminal.

Bayamon's Kuilan Terminal registered a maximum accumulation of 209 vehicles between 10 and 10:30 AM, representing 47.3 percent of the terminal's capacity. This indicates what can be considered as an underutilized terminal facility.

A similar analysis of Bayamon's Guardarrama Terminal result in a maximum accumulation of 69 vehicles at 11 AM representing a utilization of 28.9 percent. This represents a significant underutilization of the terminal (capacity of 239 spaces). This can be construed to mean that this terminal was overdesigned.

The maximum accumulation at the Caguas Transportation Center was registered at 160 vehicles between 9:30 and 10:00 A.M., representing 64.3 percent of the terminal's capacity. This indicates what can be considered as an efficiently utilized terminal facility.

The maximum accumulation registered at the Mayaguez Public Transportation Center was 43 vehicles between 8:30 and 9 AM, representing 10.8 percent of the terminal's capacity. This indicates what can be considered as a significant underutilization of a terminal facility.

2. Private Vehicles in Terminals

One situation that has been observed is the use of the terminals by private vehicles. This use is not limited just to passenger discharge or pickup but also to parking. It must be pointed out that the use of the terminals (funded by the Urban Mass Transportation Administration) for uses other than public transit is not sanctioned.

From the field surveys, it was found that the maximum accumulation of private vehicles within the Kuilán Terminal was 27 vehicles recorded at 12 Noon. This represents 11.3 percent of the terminal's capacity. It should be noted that only a small number of these vehicles actually park within the terminal. The large majority are motorists entering to discharge passengers.

The situation at the Guardarrama Terminal is completely different in that practically all of the private vehicles use the terminal for parking. The maximum accumulation of private vehicles was recorded as 138 vehicles at 11 AM. This represents 57.7 percent of the terminal's capacity, twice as much as that determined for publico-cars.

At the Caguas Transportation Center, it was found that the maximum accumulation of private vehicles within the CTC was 15 vehicles recorded at 6:30 A.M. This represents 6.0 percent of the terminal's capacity. It should be noted that none of these vehicles actually park within the terminal. These are mainly motorists entering to discharge passengers.

For the Mayaguez Public Transportation Center, it was determined that the maximum accumulation of parked private cars was 33 vehicles at 10 AM. This represents 8.8 percent of the terminal's capacity. This value is almost the same as for the publico-car accumulation.

G. IMPACT UPON PUBLICO-CAR USERS

The results of a special survey of the public transit riders indicate that the users are generally satisfied with the terminals. The following is a comparative summary of the most important factors.

**Opinion Concerning Location of Terminal(s):
Percent (%) of Total Respondents**

	<u>Bayamón</u>	<u>Caquas</u>	<u>Mayaguez</u>
1. Good	91.1	94.0	62.2
2. Fair	7.7	4.7	27.6
3. Bad	1.1	1.3	10.2
	(Kuilan)		

**Opinion Passenger Boarding Areas:
Percent (%) of Total Respondents**

	<u>Bayamón</u>	<u>Caquas</u>	<u>Mayaguez</u>
1. Good	86.4	81.3	76.4
2. Fair	13.6	12.5	20.5
3. Bad	0.00	6.3	3.1

**Opinion Concerning Sanitary Facilities:
Percent (%) of Total Respondents**

	<u>Bayamón</u>	<u>Caquas</u>	<u>Mayaguez</u>
1. Good	14.1	6.0	30.1
2. Fair	20.2	19.4	24.7
3. Bad	65.7	74.5	45.2

The major benefits cited by the users include, among others, ease of transfer, good accessibility (except in Mayaguez), and comfort. The major complaints or areas of improvements seem to be, again, the general maintenance and the lack of adequate and/or clean public sanitary facilities.

H. IMPACT UPON PUBLICO-CAR OPERATORS

A series of surveys were directed at each city's público-car operators. These surveys were geared to obtaining relative perceived reactions to the terminals' influence upon their service. The following is a comparative summary of the most important factors.

**Opinion Concerning Location of Terminal(s):
Percent (%) of Total Respondents**

	<u>Bayamón</u>	<u>Caguas</u>	<u>Mayaguez</u>
1. Good	86.4	81.3	38.5
2. Fair	13.6	12.5	34.6
3. Bad	0.00	6.3	26.9

**Impact on Gasoline Expenditures:
Percent (%) of Total Respondents**

	<u>Bayamón</u>	<u>Caguas</u>	<u>Mayaguez</u>
1. Increased	54.5	17.6	84.6
2. Decreased	13.6	11.8	7.7
3. No change	31.8	70.6	7.7

**Number of Passengers:
Percent (%) of Total Respondents**

	<u>Bayamón</u>	<u>Caguas</u>	<u>Mayaguez</u>
1. Increased	9.1	0.0	11.5
2. Decreased	59.1	41.2	69.2
3. No change	31.8	58.8	19.2

**Operators' Incomes:
Percent (%) of Total Respondents**

	<u>Bayamón</u>	<u>Caguas</u>	<u>Mayaguez</u>
1. Increased	0.0	5.9	3.8
2. Decreased	45.5	41.2	84.6
3. No change	54.5	52.9	11.5

The general results of the survey is that many of the operators in the terminals have noted some change in operating economies (such as fuel and repairs) and more efficient and orderly público operations.

There are some complaints concerning the problems of some transferring passengers coming from non-terminal based routes and other internal situations such as lack of an efficient terminal maintenance, security, and lack of adequate sanitary facilities.

The design of the Kuilan Terminal in Bayamón was criticized because of inadequate headrooms between floors, very tight curves on the access ramps, and the large number of levels with limited space on each level. The Guardarrama Terminal is considered to be too large for the services stationed there.

In Caguas, the main complaints seem to do with the sanitary facilities, maintenance and the large number of private autos that are allowed within the terminal area.

In Mayaguez, the main complaint has been the terminal's location within the CBD. The inadequacies of the access streets, the long walking distances for their passengers and the confusing and congested internal CBD street system seem to be major complaints.

I. IMPACT UPON LOCAL BUSINESSES

One of the most important impacts to be considered is that caused by the implementation of a terminal system upon the local CBD businesses. These impacts can be classified into two categories: (1) direct impact upon sales of a business established at or near where the curb-side público-car terminals used to be located, and (2) the resulting influence in the development of new or enhanced businesses in and around the CBD.

In order to determine the magnitude of these impacts, a special survey was made of the business owners/managers in each of the three cities (limited to the CBD and the areas directly influenced by both, the curbside and transportation terminals). The following tables show a comparison of the responses per city.

Opinion Concerning Location of Terminal(s): Percent (%) of Total

	Bayamón Kuilan	Bayamón Guardarrama	Caguas	Mayaguez
1. Good	50.8	15.0	59.8	43.8
2. Fair	15.6	26.5	17.3	20.2
3. Bad	33.6	58.4	22.8	36.0

**Preference for Type of CBD Público-Car Terminal Type:
Percent (%) of Total**

	<u>Bayamón</u>	<u>Caguas</u>	<u>Mayaguez</u>
1. Curb-side terminals	52.6	39.6	44.5
2. Central terminals (s)	30.4	33.6	37.0
3. No preference	17.0	26.9	18.5

**Impact of Terminals on Sales:
Percent (%) of Total**

	<u>Bayamón</u>	<u>Caguas</u>	<u>Mayaguez</u>
1. Increased	19.4	19.8	8.9
2. Decreased	54.6	36.4	43.3
3. No change	25.9	43.8	47.8

**Impact on Traffic Congestion:
Percent (%) of Total**

	<u>Bayamón</u>	<u>Caguas</u>	<u>Mayaguez</u>
1. Increased	6.7	10.9	15.7
2. Decreased	44.8	48.7	38.2
3. No change	47.0	40.3	46.1

Generally, the acceptance or opinions of the local businessmen depend greatly upon the city and/or the terminal's location and the business location within the CBD. For example, the majority of the businessmen agree that the terminal locations are good or fair. However, it was noted that the large majority of those businessmen who did not like the terminals' location were mainly those farthest away or where access was impeded either by the street layout or the natural topographic feature.

It is also noteworthy that the Bayamón and Mayaguez businessmen seem to prefer having the público-cars occupying curbside terminals particularly closer to the main commercial streets.

There is a tendency for the businessmen to indicate current lower sales compared to before the terminal. Again, the data showed that the establishments perceived to be the most affected were those farthest away from the terminal (i.e., Dr. Veve Street near the Bayamón Town Plaza) and/or had terminals in front of their stores prior to the opening of the terminal building.

From the local businessmen's viewpoint, there has been a notable positive impact upon the internal traffic conditions in the CBD's.

J. CONCLUSIONS AND OBSERVATIONS OF THE BAYAMON TERMINALS

+ Kuilan Terminal

1. This terminal exhibits various poor design features such as:
 - (a) Insufficient clearance for vehicles between levels.
 - (b) Inadequate turning radii of ramps.
 - (c) The proliferation of small businesses resulting in the interference of pedestrians with the internal vehicle movements.
 - (d) Insufficient cover for a large portion of the passenger boarding and drop-off area.
 - (e) Six/seven story height hampers internal operations resulting in general disuse of upper levels.
 - (f) The internal pedestrian circulation is too complicated and with dangerous pedestrian and vehicle conflict points.
2. The location of the terminal is very good since it is basically in the same area (Calle Parque, Market Place) where the majority of Bayamón's routes were located.
3. Congestion is still a factor in Bayamón, but it has been eased compared to when the públicos still had their curb-side terminals.
4. The parking situation was improved since the relocation of the públicos to the terminals freed dozens of curb spaces and a large portion of the Market Plaza parking area.
5. An access problem is prevalent at Calle Parque and the exit ramp from the terminal. Southbound and westbound routes have problems entering Parque Street.

6. Some complaints from local businessmen concerning the long walking distances from the main shopping streets.

+ Guardarrama Terminal

1. The terminal can be considered to be significantly overdesigned with respect to capacity. The público-cars utilize less than 30% of the available spaces.
2. The use of the terminal for city employee parking is inappropriate.

K. CONCLUSIONS AND OBSERVATIONS OF THE CAGUAS TRANSPORTATION CENTER

1. Traffic congestion within the CBD is still prevalent, but it is generally perceived that the congestion would have been much more critical without the terminal, with the curbside terminal located around the Plaza Plamer (Town Square).
2. Of the four terminals evaluated in this study, this terminal is the more efficiently utilized terminal by both públicos and passengers.
3. No significant access problems are present. All routes are adequately served.
4. Private vehicles are permitted within certain areas of the terminal often creating an increase in vehicle-pedestrian conflicts.
5. Some new commercial areas have been established in adjacent areas.
6. The relocation of the públicos from the Town Plaza area has contributed to new development in that area.

L. CONCLUSIONS AND OBSERVATIONS OF MAYAGUEZ PUBLIC TRANSPORTATION CENTER

1. The physical limitations of the terminal's accesses (streets) is one of the contributing factors of congestion along those streets as well as other primary streets such Dr. Basora Street. Congestion in the CBD is generally about the same or worse than before the construction of the terminal.

2. The majority of the local intraurban routes are not located in the MPTC.
3. The location of the MPTC has influenced many of the operators not to relocate to the MPTC.
4. The area around the MPTC has been slowly converted from residential to a more commercial-related activity.
5. The terminal can be considered to be overdesigned with respect to capacity. The publico-cars utilize less than 11% of the available space, even after six years of use.

M. ELDERLY AND HANDICAPPED FARE SYSTEM

As one of the conditions for the obtainment of funding, UMTA requires that an effort be made to implement a special half-fare system for the elderly and handicapped of the area being benefitted. The municipalities involved in this study had originally indicated that some form of special fare program would be implemented as part of the implementation of the terminals. However, efforts to accomplish this purpose were not effective due mainly to the municipalities' legal inability to control fares of the private operators.

The Municipality of Bayamón had the most advanced program wherein those elderly and handicapped, who wished to partake of the program, were registered and photographed. In Caguas, the program plan was prepared, but not implemented. In Mayaguez, however, the program was planned, but not completed.

It is fair to say, based upon past passenger surveys and cultural factors, that the number of elderly using the publico-cars is small; whereas, the number of handicapped requiring special equipment is practically non-existent. These two sectors of the population are often provided their transportation services either by close family members, friends, or special non-profit organizations (many aided by UMTA funding) geared towards providing these services.

N. RECOMMENDATIONS

Based on the results and conclusions of this study, the following recommendations are made:

1. It is necessary to maintain the existing requisite by the Puerto Rico Department of Transportation and Public Works and UMTA of a detailed feasibility study for the need and location of any public transit terminal, particularly those for públicos. It is necessary to quantify the justification for the terminal and present alternate actions with respect not only to terminal locations but also to terminal types and operations.

The requisite study should include, as a minimum, the following aspects.

- a. the detailed identification and the quantification of the transportation problems within the study area. This includes traffic congestion and parking problems,
- b. the determination of the absolute need for the terminal(s),
- c. the selection of alternate actions and/or potential sites,
- d. the designation of the routes to use each terminal facility including any necessary changes to their existing routes,
- e. the determination of the needed capacity and type of each terminal,
- f. the determination of any required changes to the existing traffic and parking patterns and regulations,
- g. the preparation of conceptual terminal designs including accesses, passenger boarding and discharge areas, and internal and external vehicular and pedestrian circulation, among others,
- h. the determination of the direct costs related to the terminal(s),

- i. the potential direct impacts upon the local businesses, the traffic conditions, and the parking situation, and
 - j. the active participation of the general public, the corresponding governmental agencies and the public transit operators.
 - k. the preparation of an Environmental Assessment (EA) following the requirements established by UMTA and/or the local governmental entities.
2. It is recommended that the municipal governments re-evaluate the current terminal administrative procedures to assure proper maintenance of the terminal, especially the sanitary facilities.
3. The possibility of establishing an internal shuttle bus system in the study areas should be given serious consideration. It should be noted that UMTA is not promoting the establishment of these types of systems with federal funds with respect to priority for other major systems.
4. It is necessary to maintain a monitoring program not only to provide a continuous evaluation of the terminals but also to assess the changes in the public transit systems in each urban area with respect to service and operations. This program should also include periodic evaluations of the traffic and parking situations.
5. The provision of satellite terminals is necessary in Caguas and Mayaguez. In the latter case, although the MPTC is considered to be oversized, this does not preclude the need to provide adequate off-street facilities in the Balboa and Market Plaza Sectors. In Caguas, the south satellite terminal is currently under construction and the west terminal is being planned. Nevertheless, in order to assure that the subsequent satellite terminals will not be oversized, it is necessary to undertake a detailed needs and location study including an accurate estimate of the terminal space needs.

6. The implementation of the Satellite Terminal Plan in Caguas should be accelerated. This plan should consider the inclusion the proposed Shuttle Bus System as an integral element of the Transportation Plan for the Caguas Metropolitan Area.
7. The existing traffic and parking regulations in each of the study areas should be strictly enforced or reassessed. Little is accomplished by relocating the public transit vehicles to off-street terminal facilities if blatant traffic and parking violations are permitted.
8. The establishment of terminals should be accompanied by a firm municipal public policy with regards to traffic, parking and the promotion of public transit use.

O. RECOMMENDED PROCEDURE FOR THE DEVELOPMENT OF PUBLICO-CAR TERMINALS IN PUERTO RICO

Before considering the development of a centralized publico-car terminal facility or multiple, integrated terminal facilities, a **Feasibility Study for Terminal Need and Location** should definitely be conducted. This study should be conducted prior to choosing the terminal site (or sites) or alternate improvement action and prior to the initiation of the solicitation of federal/local funds for implementation.

Prior to the Feasibility Study, the local entity should have the proposed study included in the State Unified Work Program with the subsequent terminal included in the State Transportation Improvement Program. For the major metropolitan and/or urbanized areas, this is usually done under UMTA Sections 5 & 9, Technical Assistance Programs. For terminal projects under UMTA Section 18, Transit Assistance Program for Non-urbanized Areas, a request must be submitted for a Feasibility Study for Terminal Need and Location, based on the availability of funds from the Rural Transit Assistance Program (RTAP).

Basically, the Feasibility Study Process should cover, as a minimum, the following aspects:

- (1) Identification and quantification of the transportation problems within the city or town, including, as a minimum, the type and number of public transit vehicles serving the area, vehicle and passenger volumes, traffic volumes, critical corridors and intersections, and the parking characteristics,

- (2) The determination of the needed terminal capacity, based upon the actual number of publico-cars and their operations within the city/town, especially their parking accumulation characteristics,
- (3) The evaluation of potential terminal sites or alternate actions optimizing existing terminal use,
- (4) The assignment of the publico-car routes (and local buses, if available) to the terminal,
- (5) The determination of traffic and parking impacts and the required changes to traffic patterns and parking controls and regulations,
- (6) The conceptual design for the terminal facility including vehicle and passenger movements within and around the facility,
- (7) Justify direct and reasonable costs related to the terminal,
- (8) Potential impacts on businesses, parking and traffic congestion, historical sites and districts and environmentally sensitive sectors (the latter should be coordinated with the State Historic Preservation Officer [SHPO] as per Executive Order 12372 and other pertinent regulations),
- (9) Citizen and private sector participation including publico-car operators, public transit users, local businessmen, residents, etc.,
- (10) The project and land use consultation process through the Planning Board and Permits and Regulations Administration,
- (11) Land acquisition and/or family and/or business relocation.

Following the preparation of the Feasibility Study, the results and potential sites should be presented at Public Hearings. The comments and results of the hearings should be incorporated in the final selection process.

Once having made the terminal site selection and assured the local funding source, the application for UMTA funding can be made via the Department of Transportation and Public Works. This application would include the Feasibility Study and all of the necessary documentations, and cost and time estimates.

Upon approval of the project and funds, the design and construction of the terminal would be undertaken. It is highly recommended that any necessary changes to the existing transportation system related to the terminal (or terminal system), such as changes to traffic patterns and parking regulations, should be planned as soon as the project is in the design phase. This would permit approval of any necessary changes to local city/town ordinances before the end of the construction. In addition, it would be necessary to establish the proper coordination between the various government agencies involved in the project.

Ample publicity is necessary before the inauguration of the terminal facility. Television, radio, and newspapers should be utilized to the fullest to properly disseminate the information. Particular attention should be given to changes to the circulation patterns or parking regulations.

P. FEASIBILITY STUDY FOR TERMINAL NEED AND LOCATION

The following is an outline of the recommended Feasibility Study process:

- (1) Inventory description of current public transit service. This includes service fleet, passenger and vehicle volumes and vehicle accumulation at the terminals.
- (2) Identification of local transit and traffic problems. The types of problems that can be and generally are stated include, among others,
 - . Traffic congestion, caused in part by the curbside publico-car terminals
 - . Lack of adequate parking
 - . Inadequate and/or uncoordinated public transit service
 - . Poor accessibility
 - . Uncomfortable and unsafe terminal facilities (exposed to the natural elements)
 - . Congestion of sidewalks

- (3) Establishment or identification of local transportation related goals. The goals and objectives for implementing a terminal should be assessed and not only just stated. Another aspect that should be considered in this phase is how all of the transportation problems can be integrated and, hopefully, resolved within the context of the CBD's development.
- (4) Inventory and evaluation of potential sites. This includes the determination of the needed terminal capacity and the evaluation of potential sites considering the following parameters:
 - a. Site Location
 - b. Lot Configuration, Size and Topography
 - c. Allocation of Routes
 - d. City Planning, Land Use, and Operations
 - e. Accessiblity
 - f. Environmental Impacts
 - g. Terminal System Integration
 - h. Terminal Design Parameters and Requirements
 - i. Terminal Costs including operations and land acquisition
- (5) Selection of recommended site. This phase would include schematic design drawings of the selected alternate site (or action), traffic and parking control plans, access and circulation plans, environmental considerations (Environmental Assessment), public hearings, intra-agency coordination, recommended modifications to existing municipal ordinances or the establishment of new ones, and all cost items including acquisition and construction.

CHAPTER 1

INTRODUCTION AND STUDY PROCEDURE

A. PUBLICO-CAR SERVICE

The "Publico-car" service or system, which constitutes the major element of the public transportation system of Puerto Rico, is a paratransit system based on privately operated and publically authorized automobiles and passenger vans. These vehicles (often referred to as publicos) operate on fixed or non-fixed routes providing for both interurban (town to town) and intraurban (suburb to town or rural community to town) passenger service.

As defined by law, publicos are:

"Public-automobile enterprises which include any person other than taxi and tour enterprises, who as a public carrier, owns, controls, operates, or manages in Puerto Rico any motor vehicle of a capacity not over seventeen (17) passengers (excluding the driver) and equipment incidental to the transportation thereof, over any public overland highway, regardless of whether or not such transportation is carried out between fixed or irregular terminals."¹

The Publico-car System is the Island's major public transportation service. A major policy study conducted in 1980 found that the Publico-car system consisted of approximately 12,000 vehicles and almost 900 routes providing for over 600,000 daily passenger trips, constituting the major form of public transportation in Puerto Rico.² By 1989 the number of Publico-car vehicles (according to the Public Service Commission) had decreased to 11,127 operating on 949 routes. The number of passengers, however, was not available but it is thought to have decreased below the 1980 estimates. The system is able to operate as self-supporting individual enterprises within an open market structure, under conditions which do not necessarily lend themselves to the existence of other forms of public transportation.

¹Puerto Rico Law 16, August 1974, as amended (1980)

²"Intraurban Passenger Services in Puerto and the Publico-Car System", Final Report, P.R. Public Service Commission, Consultores Técnicos Asociados, 1980.

In general, the publico system offers three types of public transportation services: (1) intercity, providing connections directly between towns and cities, (2) intraurban, providing connections directly between rural and suburban areas with the central urban area of the town and cities, and (3) publico line service, which provides for scheduled operations and/or door to door service.

Publico vehicles typically operate as a demand responsive, fixed route, non-scheduled system. Publicos pick up passengers at predetermined terminals usually located near the center of business activity which in the majority of the towns is near the main plaza. During the trip, passengers are discharged at any point along the established route. Potential passengers may also hail a publico vehicle anywhere along its route.

The publico operator is usually self-employed, using his vehicle for transportation service and personal use, thus absorbing all of the vehicle's operating costs and retaining all passenger receipts. The operator can also rent a publico vehicle by paying its owner a negotiated percentage of the revenues. In neither case do the operators receive any direct governmental subsidies for their operation.

Most publico drivers are organized into associations, cooperatives, or unions; each group serving a specified route. These organizations are used by publico drivers to prevent competition, to establish an order of departure at the terminal, to buy automobile parts at lower costs, and to bargain with the government for the location of terminals, route extensions, fare increases, and other benefits.

The Public Service Commission is the government agency that regulates the "publico" system with respect to entry into service, equipment and safety standards, insurance, fares, and routes. The Department of Transportation and Public Works regulates the publico operators' licensing, vehicle registration, terminals and stops on state roads, and traffic control on state roads. The municipal government has the authority to regulate terminals, stops, and traffic control on municipal roads.

Although the publico system contributes significantly to the Island's economic sector by providing employment to the operators and providing an essential transportation service, it also contributes to magnify problems such as congestion, parking, noise and air pollution. A primary cause is that publicos mostly operate from street terminals located in the main commercial activity center thus aggravating the traffic circulation, parking, and pollution problems.

Publico terminals consist of either reserved curbside spaces designated by the municipal or state governments or off-street parking areas for the exclusive use of the publicos. A large majority of the publico-car terminals in Puerto Rico consist of the curbside type with some of the larger urban municipalities providing major off-street parking areas or terminal facilities. The traditional and usually the most desired terminal sites are located at or near the town plaza. The town plaza is locally synonymous with the municipality's main business district.

Publico terminal operations are controlled by the operators themselves. The normal manner of operation is a first-in first-out turn method. The majority of the routes utilize a "starter", a person assigned to organize and keep track of the turn to direct passengers to the correct vehicles.

Operators often wait for their vehicle to fill to capacity (or the completion of a maximum time limit) or, as in the case of several routes which have a considerable number of in-route passenger boarding and alighting, they will wait until a specified number of passengers have boarded.

Vehicles unable to use the terminal, either because of a lack of accomodation or spaces distant from their terminals, float around the area until their turn comes up or a space becomes available. This, however, does not occur in the areas where major terminal facilities include adequate holding area capacities.

The publico curbside terminals tend to contribute to problems related to traffic congestion and parking mainly within the Central Business Districts (CBD) of the municipal urban areas. In order to address these problems several municipalities have taken corrective measures such as increasing roadway widths, providing angled terminal bays, relocating existing routes to small off-street terminal areas, converting existing parking areas partially or in whole to publico terminal use and, as in many of the larger urban areas, the construction of major terminal buildings.

B. TERMINAL DEVELOPMENT BACKGROUND

On April 6, 1980, the first terminal facility in Puerto Rico built especially for the use of publico-cars was inaugurated in the City of Caguas. The Caguas Transportation Terminal, built with a capacity for 249 vehicles in addition to areas for public bus and taxi terminals, was the culmination of over a decade of planning integrated with the rapid urban development of the City of Caguas.

The Caguas terminal was the first to be funded via funds (up to 80% of the total cost) from the Urban Mass Transportation Administration (UMTA). Subsequently, other major terminal facilities were constructed in the cities of Bayamón and Mayaguez as well as smaller facilities in numerous towns throughout the island.

The terminals are usually multi-storied structures with areas for passenger loading and unloading, vehicle circulation and vehicle holding (waiting). Many include space for restrooms, cafeteria, administration offices, maintenance, and even terminal space for other modes such as buses and taxis.

The planning and design process utilized to determine the need for such facilities were not altogether consistent. At first there were no real guidelines established except those as required by UMTA with respect to the funding application. These guidelines were basically generic, applicable for all modes of transit and all types of transit related facilities. (The Puerto Rico Department of Transportation subsequently developed a set of guidelines for the preparation of applications for UMTA Section 18 [Rural Areas] funds. The guidelines included some of the basic items required for the justification and development of operations for a small terminal facility).

As was the case very often, the analyses were made knowing that there was a need for a terminal (or terminals), but based mainly upon urban development needs such as parking space shortages, internal street and sidewalk system congestion, urban area renewal, etc. In some cases, the lack of detailed alternatives evaluation covering items such as site development and public transit impacts seem to be understated. Some of the expected benefits for passengers of the "publico-cars" included improved schedule of services (frequencies), protection from the adverse natural elements, simplification of transfers, and improved accessibility. The publico operators would benefit from reduced operating costs and increased passenger demand. On the other hand, the central urban areas, particularly the commercial sectors, would benefit by the reduction of traffic congestion, increased parking supply, improved vehicle accessibility, and the minimization of pollution problems.

Although the principal major publico terminals in the cities of Bayamón, Caguas, and Mayaguez have been in operation for several years now, very little has been done to evaluate the impacts that they have made upon the development of the respective urban areas, the public₃ transit service, and general acceptance of the facilities.³ In addition, since these terminals also vary considerably in configuration and design, a very limited number of detailed operational evaluations have been made, and even these often vary within the constraints of other study objectives. There is some concern and need to know just how effectively these terminals have been, not only in terms of public transit service and

³The exception is the earlier study prepared on the Mayaguez Transportation Terminal: "Evaluation of the Impact of a Publico Terminal Facility on Urban Transportation", School of Engineering, University of Puerto Rico, Urban Mass Transportation Administration, Washington; March 1984.

area traffic and parking impacts, but also in terms of economic effectiveness.

Cognizant of this situation, the Puerto Rico Department of Transportation and Public Works (DPTW) solicited professional transportation engineering and planning firms to conduct a study to address the aforementioned concerns. The consulting firm of **MANAGEMENT AND TECHNICAL CONSULTING GROUP, INC.** was selected to undertake this study based upon the objectives presented in the following section.

C. STUDY OBJECTIVES

The principal objective of this work was the study and evaluation of the operations of the "publico" vehicle terminals in the cities of Bayamón, Caguas, and Mayaguez, all built with matching funds from the Urban Mass Transportation Administration. The study also addressed, among others:

- The processes, data, and studies utilized for the identification of the local transportation problems, site alternatives, design, solicitation of funds, and construction of the terminals.
- The evaluation of the current conditions with respect to the construction and subsequent operation of the terminals.
- The quantification of the present public transit service in each municipality.
- The comparison of the public transit service before and after the implementation of the terminals.
- The determination of each facility's operational performance, with respect to both vehicular/pedestrian use and administrative organization.
- The determination of public opinion (transit user, business, etc.) concerning the impact of the terminals.
- The review of the implementation of half-fare systems.
- The review of the terminal needs and selection processes and the establishment of new guidelines or criteria for future facilities.

D. STUDY APPROACH

To accomplish the aforementioned objectives, the following work program was established. It should be noted that the analysis of the terminals included the Caguas Transportation Center, the Mayaguez Public Transportation Terminal, and Bayamón's two terminal buildings: the Kuilan and Guardarrama Terminals.

Task 1 Data Collection

This task involved the recopilation of all basic data that were previously used and considered for the terminal project approval and construction. This included documents, studies, and field data available for each of the municipalities.

In order to complete the basis for analysis, it was necessary to undertake a series of surveys at each Municipality, covering such factors as:

1. Inventory of existing publico-car and bus routes (including any available taxi services),
2. Current publico-car passenger and vehicle movements,
3. A limited analysis of the existing urban street system,
4. A survey to determine the current publico-car user's characteristics and their perceived observations concerning the terminals and their operations,
5. A survey of the publico operators to determine the acceptance (or reservations) of the terminal(s) including benefits received and problems observed,
6. A limited survey of the area business in order to obtain reactions concerning real and/or perceived impacts caused by the relocation of the curbside terminals and the influence caused by the terminals in the immediate areas.
7. A review of the land use for comparison of land activities both before and after the terminals and their implications with respect to overall CBD planning and development.

8. An overview of the internal terminal facilities such as commercial establishments, amenities (including sanitary facilities), and maintenance.

The methodology utilized in the field survey to determine passenger and vehicle volumes consisted of the selection of various control points throughout the peripheral of each Municipality's terminal and/or CBD. At these points, specially trained and highly dependable field personnel recorded each publico-car as to the time the vehicle passed the control point, its license plate number, its route identification number, and the number of passengers in that vehicle. This process was done for both inbound and outbound traffic at each control point. The field work itself was undertaken during a 12 hour continuous period.

Task 2 Evaluation of Terminal Planning and Operations

This task included review of the planning procedures conducted for each terminal facility. This included preliminary studies (particularly those involving alternatives analyses) and plans, the preparation for funding, design and implementation.

Also included was the evaluation of each terminal facility with respect to internal vehicular and pedestrian movements, accesses, location of restrooms and concessionaries, passenger loading and drop-off areas, vehicular holding areas, roadway (ramp) geometrics, etc.

Task 3 Review of Elderly and Handicapped Fare System

As one of the conditions for the obtainment of funding, UMTA requires that an effort be made to implement a special half fare system for the elderly and handicapped of the area being benefitted. This task consisted of the review and the evaluation of the impacts of the special fare programs as originally implemented by the municipalities including opinions concerning its use and acceptance and administrative procedures employed.

Task 4 Economic Evaluation

Originally, this task was envisioned as a general costs evaluation of any necessary improvements that would had resulted from the previous tasks. These costs would had included, but not limited to, such items as passenger concourse reconfiguration, remodeling, increased maintenance efforts, expansions, addition or elimination of concessionaires, etc.

During the process of the study, however, it was found that there were no significant improvements (other than a complete reconstruction) that were merited. Nevertheless, an evaluation of the terminal's perceived cost effectiveness was made based upon its general cost, the number of spaces available and the maximum accumulation of vehicles (or maximum utilization).

Task 5 Conclusions and Recommendations

This task involved the conglomeration of all of the outputs of the previous tasks, based on each Municipality, into a set of recommendations. These recommendations address improvements in terminal planning procedure, traffic and parking problems and controls, impact upon public routes, terminal capacity, interaction with publico operators and the public in general, promotional procedures, municipal and commonwealth agency responsibilities, terminal maintenance and operations, improvement costs, etc.

E. STUDY PRESENTATION

Chapters 2, 3 and 4 provide a general description of the publico services and terminals in the Municipalities of Bayamón, Caguas and Mayaguez, respectively. Also included in these chapters are observations and evaluations of some of the impacts resulting from the construction of the terminals. Chapter 5 presents a series of observations, conclusions and recommendations concerning terminal planning, design and operations. Chapter 6 provides a recommended procedure for the development of publico-car terminals in Puerto Rico.