COASTAL TRANSIT OPTIONS AND POLICY

CALIFORNIA SEA GRANT PROGRAM

FINAL REPORT

J. H. Banks
Department of Civil Engineering

F. P. Stutz
Department of Geography

I. Jabbari
Sea Grant Trainee

C. De Cerbo
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January 1983

CENTER FOR MARINE STUDIES
San Diego State University
SAN DIEGO, CA 92182

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INTRODUCTION

In recent years, there has been considerable interest in the provision of transit services in coastal recreation areas, especially at heavily-used beaches or in surrounding commercial development. Such interest has been expressed by the National Park Service; various state park systems; agencies involved in coastal zone management (including the California Coastal Commission); state departments of transportation; and numerous local governments, planning agencies, and transit operators.

Reasons for interest in transit access at coastal sites vary from agency to agency. In the case of the National Park Service, some state park agencies (including the California Department of Parks and Recreation), and many local governments and planning agencies, the primary concern is to make coastal recreation sites accessible to transit dependents (that is, individuals who do not have access to automobiles). Both the National Park Service and the California Department of Parks and Recreation have recently produced documents [1, 2] dealing with this issue, and the National Park Service has funded a limited experimental access program called the Visitor Access Transportation System (VATS). Although neither the California Department of Parks and Recreation nor the National Park Service is solely concerned with coastal sites in their efforts to increase transit access, coastal sites do tend to be emphasized due to their high rates of visitation and their proximity (in some cases) to large cities with well-established transit systems.

Agencies involved in coastal zone management often have a somewhat broader interest in coastal transit services. They are concerned with the overall question of public access to the coastal zone and with the relationship between land development and transportation demand, especially in areas immediately adjacent to the shore. In addition, coastal zone planners and managers are concerned about the environmental impacts of various development patterns and access systems. Important issues include the limitation of public access which results from traffic and parking congestion at some coastal sites, the adequacy of transportation systems connecting the coastal zone to inland areas, and competition between transportation-related land uses (especially parking) and other forms of development in the immediate vicinity of the shore. In these contexts, transit services are often considered as substitutes for or supplements to the highway system. Also, provision of transit services may be an important issue in the evaluation of proposed development. In the case of California, for instance, state law declares that "the location and amount of new [coastal] development should maintain and enhance public access to the shore by (1) facilitating the provision or extension of transit service...[and] (4) providing adequate parking facilities or providing substitute means of serving the development with public transportation...." [3]. The California Coastal Commission has taken this mandate seriously, and has in the past sometimes required provision of transit service as a condition for approving development.

Some local governments and planning agencies are also interested in the potential of transit services to either relieve congestion or increase the overall accessibility of particular sites. Most commonly, the primary focus is on improving the overall attractiveness of economically-important coastal development by enhancing access to it or circulation within it. In other cases, there is concern about the adequacy of existing street and parking facilities to

handle peak recreation travel demands without undue disruption of local traffic. In still other cases, there is concern about the impact of on-street parking in coastal residential areas. In all these cases, the primary focus is on using transit to substitute for or supplement the highway system.

This widespread and diverse interest in coastal transit services has led to considerable experimentation in the provision of specially-designed services. Despite this interest and experimental activity, however, there has been little systematic study of the role of transit in coastal areas. Although there have been a number of planning studies which have dealt with transit access to coastal areas [4, 5] and a few studies related to demand for transit services at specific sites [6-10], there has been no previous attempt to study the overall phenomenon of coastal transit service. As a consequence, agencies interested in providing such services are often unaware of what has been attempted elsewhere, and may have unrealistic expectations.

In an attempt to provide an overview of transit activity at coastal recreation sites in the United States, the California Sea Grant Program and the California Department of Transportation funded a study whose primary objectives are (1) to determine conditions conducive to the success of coastal transit services and (2) to develop planning guidelines for such services.

This project was carried out in two phases, each lasting roughly one year. The first phase consisted of a national survey of existing (or recently discontinued) transit services in coastal recreation areas, an analysis of major issues involved in the design and evaluation of such services, and development of a set of tentative planning guidelines based on the results of the survey and analysis of planning issues. Results of the first phase of the project were incorporated in an interim report [11], which was released for review and comment to respondents in the Coastal Transit Survey and other interested individuals. The second phase of the project involved a series of four case studies in planning for transit services at coastal sites in the San Diego area, which were intended to test the comprehensiveness and applicability of the guidelines; revision of the guidelines; and production of this report and a separate planning manual for coastal transit services [12].

This document reports the overall results of the project. It includes the results of the coastal transit survey, a discussion of the major issues involved in planning and evaluating coastal transit services, a summary of the results of the San Diego area case studies and a discussion of their impact on the planning guidelines, and a summary of the planning guidelines themselves. Also included as appendices are more detailed descriptions of the San Diego area case studies and the services reported in the coastal transit survey.

COASTAL TRANSIT SURVEY

Description

The survey of existing coastal transit services was conducted in two phases. The first phase was intended to establish the geographical distribution of coastal transit services; the second phase was intended to determine their design features and operating results, and to provide a preliminary idea of the factors contributing to their success or failure.

In the initial phase of the survey, letters were sent to approximately 125 planning agencies and transit operators representing 64 coastal areas (including the Great Lakes). Although most of these were urbanized areas, queries were also sent to several rural public transportation operators in coastal areas. In addition, members of the American Association of State Highway and Transportation Officials Standing Committee on Public Transportation and/or other state officials from 28 coastal and Great Lakes states were contacted.

Responses were received from 34 of the 64 areas contacted; in addition, state contacts reported coastal transit services in four areas that had not been directly contacted. Of the 38 coastal areas for which responses were received, 33 reported that there either were then or had previously been transit services at coastal recreation sites in the area. Subsequently, a few additional contacts were established, bringing the total number of areas involved in the second phase of the survey to 35. These 35 areas reported a total of 87 separate coastal transit services.

In the second phase of the survey, follow-up letters, telephone calls, and personal visits to transit operators, planning agencies, and local officials were used to gather additional information about the services reported in the first phase. Information sought included characteristics of recreation sites, institutional arrangements, design characteristics of services (routes, fares, schedules, etc.), and operating results (ridership, costs, and revenue).

Results

Types of Service

A number of different types of transit service were reported in the survey. These may be classified as follows:

1. Regular fixed-route services. These are year-round fixed-route services which are part of multi-purpose transit systems. Bus, rail rapid transit, and commuter rail services are included, although most such services use buses.

2. Special fixed-route services. These are usually seasonal services, and in some cases are operated by agencies other than regular transit organizations. They include access-oriented services, which provide seasonal express service between urban areas and remote recreation

sites 5 to 25 miles away, and circulation-oriented services, which provide service parallel to the shore in densely-developed resort areas.

3. Shuttles. These services connect remote parking lots or trunkline transit services with recreation sites.

4. Group services. These services, which include private tour services, cater primarily to organized groups and tend to provide tour services (for instance, guides) as well as transportation.

5. Special event services. These are temporary services designed to provide transportation to special events (fairs, festivals, sporting events, and so forth) held at coastal recreation sites.

6. Other. Other services sometimes found in coastal recreation areas include ferries, special intercity services, and dial-a-ride services.

Table 1 shows the frequency with which the various types of service were reported. Note that regular fixed-route services are by far the most common, in terms of the number of systems involved. Special fixed-route services, shuttles, and group services were reported with about equal frequency. However, most of the group services were private tour services for which little detailed information was available. Only two special-event services were reported in the survey. The "other" category includes three ferry services and four special

TABLE 1. Number of Services Reported, by Type

TYPE OF SERVICE	NUMBER REPORTED	STATUS	
		ACTIVE	TERMINATED
Regular Fixed Route	40		
Bus/Light Rail	36	36	0
Rail Rapid Transit	2	2	0
Commuter Rail	2	2	0
Special Fixed Route	15		
Access-Oriented	10	6	4
Circulation-Oriented	5	5	0
Shuttle	12	8	4
Group	9	7	2
Special Event	2	2	0
Other	9	9	0
TOTAL	87	77	10

intercity services. Ferry services are actually much more abundant than this (there are perhaps 30 coastal sites in the United States which are accessible only by ferry and a number of others for which ferries are the most convenient access), but they were generally not reported by respondents in the first part of the survey and were omitted from the second part because they tend to differ organizationally and operationally from other coastal transit services.

Geographical Distribution

Figure 1 is a map showing the locations of transit services reported in the survey. As was to be expected, positive responses were most frequent in the largest urban areas and tended to decline in frequency as urban area population declined. Table 2 shows the relationship between the population of coastal urbanized areas and the frequency with which coastal transit services were reported. Note, however, that this trend is comparatively weak. The total number of areas under consideration is small, which weakens the significance of the relationship in any case, and size does not seem to affect the rate of positive responses for urbanized areas of over 500,000 population. Also, of course, it is often not clear whether the absence of a positive response indicates the absence of coastal transit services or simply a failure to report them.

There also seem to be regional variations in the distribution of coastal transit services which are not related to urbanized area size. In order to examine these more closely, the United States coastline was divided into a number of regions, which were defined as follows:

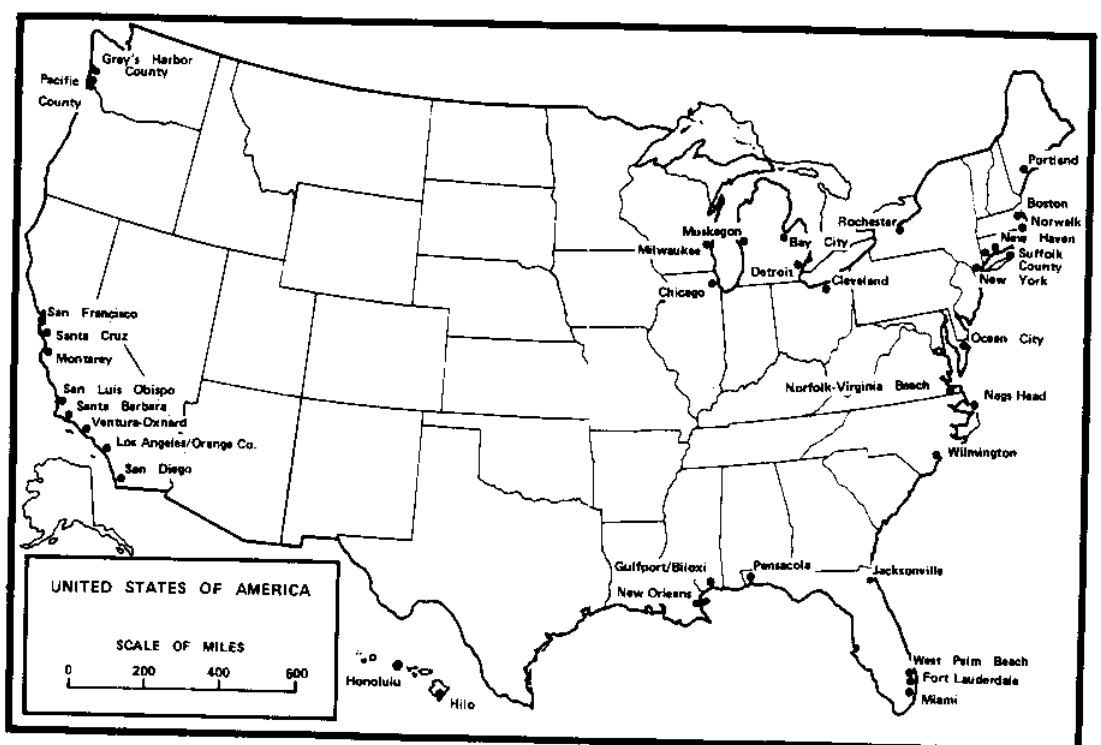

FIGURE 1: Locations of Services Reported in Coastal Tranist Survey

TABLE 2. Relationship Between Urban Area Size and Reported Availability of Coastal Transit Service

URBAN AREA POPULATION	TOTAL NUMBER OF AREAS REPORTING SERVICE	TOTAL NUMBER OF COASTAL URBAN AREAS IN POPULATION CLASS	PERCENT REPORTING SERVICE
Over 1,000,000	9	12	75
500,000 - 1,000,000	5	7	71
50,000 - 500,000	14	31	45
Less Than 50,000 (Non-Urban)	7	--	--

North Atlantic. Maine through New Jersey.

South Atlantic. Delaware through Georgia.

Florida Peninsula.

Gulf Coast. Florida Panhandle through Texas.

Southern Pacific. California from the San Francisco Bay Area south.

Northern Pacific. California north of the San Francisco Bay Area through Washington.

Hawaii.

Great Lakes.

Table 3 shows the distribution of positive responses by region and urban area size. Note that there is less activity reported in the Florida Peninsula and Gulf Coast regions than might be expected, considering the number and size of urban areas and the attractiveness of the coastal recreation sites in the region, especially those in Florida. On the other hand, regions in which the number of sites reporting services is higher than might have been expected include the Pacific Coast and the South Atlantic regions. There does not seem to be any simple explanation for these regional variations -- for instance, they do not seem to depend to any great extent on the attractiveness of beach areas or the existence of resort development -- although regional attitudes towards transit services in general may be significant.

TABLE 3. Distribution of Positive Responses by Geographical Region

REGION	URBAN AREA SIZE				
	Over 1,000,000	500,000 - 1,000,000	50,000 - 500,000	NON-URBAN	TOTAL
North Atlantic	2/2	1/1	3/9	1	7/12
South Atlantic	0/0	1/1	1/3	2	4/4
Florida Peninsula	1/1	2/3	1/4	0	4/8
Gulf Coast	0/1	0/1	2/4	0	2/6
Southern Pacific	3/3	0/0	4/4	1	8/7
Northern Pacific	0/0	0/0	0/0	2	2/0
Hawaii	0/0	0/0	1/1	0	1/1
Great Lakes	3/5	1/1	2/6	1	7/12

Site Characteristics

The survey sought information on a variety of site characteristics. These included the type of development; the predominant activities at the site; the degree of usage; the season and peaking patterns; and auto access and traffic conditions, including the availability of parking. Where appropriate, quantitative information concerning site characteristics was sought; however, this information was not readily available for most sites. Where available, the data received were by no means uniform in terms of quality, source, or format. The unfortunate result is that systematic quantitative descriptions of sites in terms of visitation rates, peaking patterns, availability of parking, and the like are not possible at present.

It is possible, however, to classify sites in qualitative terms, and to determine some rough relationships among site characteristics and the types of services typically present. The most important distinction seems to be between sites frequented primarily by overnight visitors (resort communities) and those experiencing primarily day uses. Among day-use sites, a distinction also exists between those located contiguous to urban or suburban development (such as the New York City and southern California beaches) and those located some distance away from the urbanized area.

In general, urban and suburban day-use sites are served by regular local transit operators as a routine part of their systems; more remote day-use sites are often served by specially-designed seasonal services, usually involving fixed-route express service. In both cases, service at day-use sites is primarily designed to provide access to the shore from inland areas, rather than movement along the shore.

Resort communities, on the other hand, are often characterized by dense commercial development along the shore. Overnight visitors make numerous trips within this coastal strip, which results in traffic congestion and uncertain availability of parking. Transit systems in resort communities tend to be specially-designed fixed-route systems running parallel to the shore, intended primarily to provide circulation within the coastal commercial strip.

Shuttles are of two types: those connecting trunkline transit services with recreation sites (transit shuttles) and those serving remote parking lots (park-and-ride shuttles). All the transit shuttles reported in the survey are located at remote sites near New York and Chicago, and connect with commuter rail services. Park-and-ride shuttles have been attempted at congested urban and resort sites and at a few remote sites where parking is not available in the immediate vicinity of the shore. (See Harrington Beach State Park, Wisconsin and Honolulu Case Studies in Appendix A.)

Private tour services are commonly found in resort areas. In adddition, there are at least two documented instances of experimental group services designed for transit dependents, one of which served a coastal site [13, 14].

Although quantitative information concerning beach use was not available, it is clear that there are large variations in usage at sites served by transit. In the New York City area, Heatwole and West [10] report a combined visitation of about three million per day at Coney Island and Rockaway Beach on summer holidays. In southern California, the busiest sites reported by Burke [8] and the Comprehensive Planning Organization of the San Diego Region [4] experience two to three million annual visits. Estimates are generally not available for the smaller urban/suburban sites, but visitation at such sites is probably much lower than either of these figures. For resort areas, visitation may be quoted as either annual visits or as average population during the peak month. Virginia Beach, for instance, reported about 2.5 million overnight visits per year and a combined overnight and day-use rate of about five million per year. Ocean City, Maryland reported an estimated peak month population of 200,000 and Nags Head, North Carolina, a peak month population of around 50,000.

Most of the information reported in the survey concerning beach-use peaking patterns was of a qualitative nature. Throughout the continental United States, the peak beach-use season is reported to coincide with local school vacations, which last from early- or mid-June until the beginning of September. In Hawaii, the season is reported to be year-round, but some summer peaking is still present. In most cases, beach use is also reported to peak on weekends and holidays and to peak during the middle of the day.

The usual assumption concerning peaking in coastal transit demand is that it follows the reported peaks in beach use. For urban or suburban day use sites, weekend peaking in transit demand is often assumed, and it is also assumed that flows are highly directional, with trips toward the shore peaking in the late morning and trips away from the shore peaking in the mid- to late-afternoon. Transit systems in the New York and Los Angeles areas report scheduling practices which are consistent with this reported peaking pattern, with extra service being assigned to coastal routes on summer weekends. In resort areas, on the other hand, transit demand is reported to peak at times of the day during which most visitors are not on the beach (for instance, at night or during periods of bad weather) since most trips are among the commercial establishments along the shore.

In a few cases, daily ridership figures were available for specially-designed services. These included parking shuttles and circulation-oriented services in resort areas and access-oriented services intended for local day visitors. Table 4 presents the seasonal average ridership for each day of the week for each of these services. Note that there is no evidence of weekend peaking -- if anything, Sundays are the lowest day for several of the services -- and little evidence of any peaking pattern at all within the week. The actual pattern in all cases involves large and irregular variations. Table 5, which lists means, standard deviations, and coefficients of variation for daily ridership for these services, illustrates this point, and gives some indication of the magnitude of the demand fluctuations.

Daily ridership figures were also available for regular transit routes operated by San Diego Transit Corporation in coastal portions of the San Diego area. Table 6 shows mean ridership for each day of the week for these routes. Only one of them, Route 34, shows weekend peaking; for the others, ridership on weekends is lower than on weekdays, as is typical of urban transit routes in noncoastal areas, and in two cases (Routes 27 and 30) no service at all is provided on weekends. As in the case of the specially-designed services, there are rather large and irregular variations in demand from day to day, but these do not appear to be significantly greater than those on noncoastal routes in San Diego.

TABLE 4. Variations in Mean Daily Ridership for Specially-Designed Coastal Transit Services

SERVICE	MEAN RIDERSHIP, BY DAY OF WEEK						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Rainbow, Santa Cruz, 1977	557	503	538	524	512	537	520
Rainbow, Santa Cruz, 1978	583	588	582	613	549	622	603
Sunshine Special, VA Beach, 1980							
Green Run Route	73	107	102	118	96	97	109
Great Neck Route	51	106	69	67	74	65	66
Kempsville Route	87	117	151	130	102	151	126
Haygood Route	106	167	142	123	128	162	149
Beach Bus, Nags Head, NC, 1980	107	169	145	160	148	142	135

TABLE 5. Daily Ridership Statistics for Specially-Designed Coastal Transit Services

SERVICE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	NUMBER OF OBSERVATIONS
Rainbow, Santa Cruz, 1977	528	122	.23	73
Rainbow, Santa Cruz, 1978	593	109	.18	73
Sunshine Special, VA Beach, 1980				
Green Run Route	101	40	.40	79
Great Neck Route	71	39	.55	79
Kempsville Route	123	42	.34	79
Haygood Route	140	48	.34	79
Beach Bus, Nags Head, NC, 1980	144	51	.35	93

TABLE 6. Mean Daily Ridership for San Diego Transit Corporation Coastal Routes

ROUTE	MEAN RIDERSHIP, BY DAY OF WEEK						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
9	3704	4928	5182	4953	5021	5213	4388
27	--	1514	1528	1511	1471	1470	--
30	--	1925	1983	1899	2007	2035	--
33	452	862	866	828	834	799	552
34	4608	4569	4656	4535	4584	4866	5667
35	912	2041	2099	2116	2121	2189	1528
80	520	1203	1228	1239	1259	1223	910

Institutional Arrangements

The survey sought information concerning institutional arrangements, including type of operator and financial arrangements. A variety of arrangements were reported.

Regular fixed-route services are (by definition) provided by regular multi-purpose transit systems. Actual operators may be municipal systems, special districts, or contract management firms. All the regular fixed-route systems reported in the survey are supported to some extent by fares, but none appears to cover all costs from the farebox. Coastal routes, like other routes in such systems, are supported in part by subsidies intended for the general support of transit systems.

Table 7 is a breakdown of the institutional arrangements for the specially-designed services reported in the survey. Almost all of the access-oriented fixed-route services and a majority of the shuttles were operated by regular public transit systems. Some shuttles and circulation-oriented services were operated by other public agencies -- primarily local governments -- either directly or through contracts with private firms. In addition, there are a few instances of each type of service being offered by private firms, without subsidy and presumably for profit.

As in the case of regular transit systems operating in coastal areas, most specially-designed services charge fares. The only exceptions were a number of fare-free shuttles. The most common subsidy sources were state, local, and federal transit operating assistance funds, but some services are subsidized by

TABLE 7. Institutional Arrangements for Specially-Designed Seasonal Coastal Transit Aervices

TYPE OF SERVICE	TYPE OF OPERATOR			SOURCE OF SUBSIDY		
	Regular Public Transit	Other Public Agency	Private Firm	Transportation Funds	Park or Recreation Funds	None
Access-Oriented	10	1	1	7	4	1
Circulation-Oriented	1	3	2	4	1	2
Shuttle	5	5	1	7	3	1

park and recreation agencies (for instance, those funded by the National Park System's VATS program). In most cases, however, even services promoted by park or recreation agencies have sought a major portion of their funding from traditional transportation sources. In resort areas, several systems have also been able to generate financial support from the local business community, either through substantial advertising revenues (equaling or exceeding farebox revenues in some cases) or outright contributions.

System Design and Operating Results

The survey sought rather detailed information concerning the design and operating characteristics of coastal transit services. Design characteristics for which information was sought included vehicle type, route structure, fare, and headway. Operating characteristics included ridership, costs, and revenues. Detailed information concerning the design characteristics was readily available in most cases. Information concerning operating characteristics was much less readily available, and differed a great deal from source to source in terms of format, method of collection, and apparent reliability.

The remainder of this section will discuss the design and operating characteristics of the types of coastal transit service for which sufficient information was reported. These include the regular fixed-route systems, both types of specially-designed fixed-route service, and the shuttles. Since each type of system tends to operate in a different environment, each will be discussed separately.

Regular Fixed-Route Systems. Table 8 lists regular transit systems reported in the survey and shows the type and extent of service they provide. As can be seen, bus, light rail, rail rapid transit, and commmuter rail services are all represented, although bus services are by far the most common. The systems represented vary a great deal in terms of city size and degree of involvemment in the provision of coastal services, as indicated by the number of routes serving coastal areas.

As might be expected, there are also considerable differences in the design and operating characteristics of these systems.

Route structures range from very simple -- perhaps a single line connecting a city center to a beach, as in Wilmington, North Carolina -- to the complexity of systems such as that in the coastal areas of the Los Angeles region (see Appendix A, Figure A-5).

Headways are also quite variable. Table 9 is a frequency distribution of weekday base headways for regular transit routes in coastal areas. A wide range of headways is represented, with 30-minute and 60-minute headways ranking as the most common. As might be expected, the most frequent service tends to be offered in the largest coastal cities.

Table 10 is a frequency distribution of base fares for regular transit systems operating coastal routes. Again, the data display a fairly wide range, with 50 cents being the most common fare. In general, the higher fares are charged by the larger systems; for most large systems, fares for summer, 1981 were between 75 and 85 cents.

TABLE 8. Regular Transit Services in Coastal Areas

AREA	OPERATOR	SERVICES	NO. OF COASTAL ROUTES
New York, NY	NYCTA	Bus	9
		Rail Rapid Transit	6
	MaBSTOA	Bus	2
	Green Bus Line	Bus	3
	MSBA	Bus	6
	Triboro Coach Co.	Bus	1
	LIRR	Commuter Rail	1
Los Angeles, CA	SCRTD	Bus	23
	OCTD	Bus	21
Detroit, MI	SEMTA	Bus	1
Chicago, IL	CTA	Bus	17
San Francisco, CA	Muni	Bus/Light Rail	9
	Golden Gate Transit	Bus	6
	SamsTrans	Bus	2
Boston, MA	MBTA	Bus	14
		Rail Rapid Transit	2
		Commuter Rail	1
	RTI	Bus	3
Miami, FL	Metro. Trans. Agency	Bus	21
San Diego, CA	SDTC	Bus	9
	No. County Transit	Bus	5
Norfolk, VA	TRT	Bus	1
Ft. Lauderdale, FL	Broward Co. Div. of Mass. Tr.	Bus	3
Rochester, NY	Reg. Transit Svc.	Bus	2
Jacksonville, FL	Jacksonville Trans. Auth.	Bus	2
Honolulu, HI	DOT City/County Honolulu	Bus	2
New Haven, CT	HMS Mgmt.	Bus	5
W. Palm Beach, FL	COTRAN	Bus	6
Santa Barbara, CA	S.B. Metro Trans. Dist.	Bus	5
Biloxi, MS	Miss. Coast Transp. Auth.	Bus	2
Norwalk, CT	WHEELS	Bus	3
Monterey, CA	Mon. Pen. Transit	Bus	6
Bay City, MI	Bay Co. M.T.A.	Bus	1
Santa Cruz, CA	SCMTD	Bus	4
	Capitola Transit	Bus	1
Wilmington, NC	Wilmington Transit Auth.	Bus	1
Grays Harbor Co., WA	Grays Harbor Trans. Auth.	Bus	2
Pacific County, WA	Pacific Transit System	Bus	2
Kona and Hilo, HI	Hawaii Co. Transit System	Bus	2

TABLE 9. Headways for Regular Transit Systems Operating in Coastal Areas

BASE HEADWAY, MIN.	NUMBER OF ROUTES
0 - 5	3
6 - 10	19
11 - 15	19
16 - 20	27
21 - 30	54
31 - 40	4
41 - 50	3
51 - 60	36
More than 60	9

TABLE 10. Fares for Regular Transit Systems Providing Service in Coastal Areas

FARE	NUMBER OF SYSTEMS
.25	5
.50	10
.55	1
.60	4
.70	0
.75	2
.80	2
.85	1

Information concerning the ridership, costs, and revenues of regular transit systems was sought on a route-by-route basis. In many cases, ridership figures were available for individual routes, but there was rarely any indication as to how much of the ridership was bound for coastal sites. Also, formats and methods of estimating ridership varied from system to system, so that ridership comparisons are rather crude. Estimated annual ridership for regular bus routes in coastal areas ranged from around 24,000 to 20,000,000; however, vary few routes have annual ridership of less than 100,000. These figures mean little in themselves, but they are a useful standard of comparison for specially-designed systems, which tend to have lower ridership, at least on an annual basis.

Cost and revenue figures on a route-by-route basis are less available than ridership figures, and when available tend to be even less uniformly estimated. In most cases, costs for individual routes are estimated from simple two- and three-factor formulas based on vehicle-miles, vehicle-hours, number of pullouts, or similar statistics. These formulas vary from system to system and yield only rough estimates. Estimates for costs per bus-hour were available in a few cases, and ranged from $28 per bus-hour to over $50 per bus-hour.

Another financial statistic commonly reported or easily calculated from available data was the operating ratio -- that is, the fraction of the operating cost recovered from the farebox. Operating ratios for routes in regular transit systems were mostly between 0.20 and 0.50. Again, these figures are primarily useful for comparisons with specially-designed systems.

Several operators of regular transit systems, particularly in the larger cities, reported that there are certain operational problems commonly associated

with coastal routes. These problems, which include overloading of vehicles and difficulty in controlling headways, stem from traffic congestion, demand-peaking patterns, and in a very few cases, from long and unpredictable loading times caused by carrying passengers with items such as bicycles and surfboards.

The most common approach to dealing with these operational problems is to use field supervision and assignment of extra service, usually from a system-wide pool of vehicles and labor. Given the unpredictable nature of the demand peaking, this is apparently a more satisfactory approach than permanent assignment of extra service during seasonal or weekly peaks. This is reported to be the case even in southern California, where demand is presumably less variable than elsewhere, due to more consistent weather conditions. Instabilities caused by long loading times are usually avoided by transit systems refusing to carry passengers with bulky items of equipment, even though this probably does reduce demand.

Access-Oriented Services. Table 11 lists access-oriented services reported in the survey and gives selected design features and operating results. These services are seasonal. Also, since most of the sites are somewhat remote from urban development, most operate fairly long routes. As a result, costs and fares tend to be higher than those of other coastal services, while frequency of service and ridership (especially annual ridership) are comparatively low. Financial performance is quite variable, with operating ratios ranging from 0.02 (for a service carrying senior citizens and youths at special fares) to 0.80.

TABLE 11. Access-Oriented Services

AREA	OPERATOR	SERVICE	HEADWAY	FARE $	ANNUAL RIDERSHIP	ANNUAL COST $	COST/ PASS$
Portland, ME	Greater Portland Transit Dist.	Route 16	3/Day	.75	5,000 (Est)	4,750 (Est)	.95
Providence, RI	R.I. Public Transit Auth.	South Shore Bus (6 routes)	1/Day	1.50	20,163	50,652	2.51
New York, NY	MSBA	Jones Beach (8 routes)	1/Day to 4/Day	1.00-2.00	283,325	?	?
	NYCTA	Riis Park (2 routes-weekends only)	?	.60	31,304	57,205	1.83
Virginia Beach, VA	TRT	Sunshine Special (4 routes)	75-115 Min.	.40	34,168	97,328	2.85
		Ocean Front Express (weekend only)	90 Min.	1.40	4,885	39,102	8.00
Muskegon, MI	Muskegon Area Transit System	Sunshine Express	120 Min.	.10	1,402	8,000	5.71
San Francisco, CA	Muni and Golden Gate Transit	Golden Gate Nat.Rec. Area (3 routes)	60 Min.(Muni) 2/Day-1/Day (GG Transit)	.50	34,570	74,734	2.16
Gary, IN	N.W. Indiana Reg. Planning Com.	Indiana Dunes Nat. Lakeshore	60 Min.	.50	780	24,450	31.35
Michigan City, IN	Michigan City Transit Authority	Indiana Dunes State Park	120 Min.	.25	20(?)	?	?

Circulation-Oriented Services. Table 12 lists circulation-oriented services reported in the survey and presents information about their design and operating characteristics. These systems display considerable variation in terms of headways, costs, and ridership; however, fares tend to be low and relatively uniform.

Because of their operating environment, these systems display a number of unusual features. All use vehicles that are essentially buses, but these are usually smaller than standard transit buses. Some systems also employ nonstandard body designs, such as the so-called "trolley" bodies, on the theory that they are more attractive to passengers. Although there is no real evidence that nonstandard bodies really are more attractive to passengers (the Ocean City system, by far the most successful in terms of ridership, uses mostly standard small buses), the trolley bodies may enhance advertising revenues. In addition, Virginia Beach and Ocean City operate so-called "boardwalk trains" consisting of small rubber-tired tractors pulling trailers. These services are not listed in the table, although they compete to some extent with the bus services.

Circulation-oriented services tend to be simple in terms of their design, normally consisting of a single route parallel to the shore. In some cases, routing is complicated by one-way street patterns, which force use of different streets in opposite directions. Even where two-way streets are available, some of these systems were observed to route service in opposite directions on parallel streets, despite the possibility that this may be confusing to passengers.

TABLE 12. Circulation-Oriented Systems

AREA	OPERATOR	SERVICE	HEADWAY	FARE $	ANNUAL RIDERSHIP	ANNUAL COST	COST/ PASS $
Suffolk Co, NY	Coram Bus Service	S-62	3/Day	.50	48,293	?	?
	Hampton Jitney	S-94	120 Min.	.35	2,312	?	?
Ocean City, MD	Ocean City	Ocean City Bus Service	5-10 Min.	.50	900,000 (Est)	547,183	.61
Virginia Beach, VA	Virginia Beach	Ocean Front Run	15-20 Min.	.25	154,000	195,000	1.27
Honolulu, HI	DOT City/County of Honolulu	Beach Bus (weekend only)	60 Min.	.50	85,000	90,000 (Est)	1.06
Nags Head, NC	Nags Head	Beach Bus	60 Min.	.50	13,365	39,953	2.99

Circulation-oriented systems encounter operational problems similar to those of regular transit routes in coastal areas. As in the urban case, these result from traffic congestion and unpredictable demand peaking. Although daily demand is highly variable, as in the large urban areas, there is a tendency for daily peaks to occur at different times in resort communities than at day-use sites. So far, none of the systems studied is large enough to attempt sophisticated means of counteracting the instability in headways and vehicle loads. Ocean City does employ a radio communication system, but elsewhere there seems to be comparatively little provision for dealing with operational instabilities.

Costs for such systems tend to be lower than those of regular transit systems. The Virginia Beach system reportedly costs $15 to $20 per bus-hour to operate, and the Ocean City system's costs may be as low as $10 per bus-hour. These low costs are primarily due to the use of nonunion labor at very low wage rates. Despite these low costs, operating ratios are quite variable, ranging from as low as 0.10 to as high as 0.80. This variation is primarily due to wide variations in ridership and lesser variations in fares.

Detailed breakdowns of costs were available for several of these systems. They reveal that (as might be expected, given the low wage rates) labor costs account for a comparatively small part of the total costs (around 50 percent). Maintenance costs for these systems seem to be modest (around 10 percent or less of total costs) despite commonly expressed fears about the maintenance requirements for the lightweight vehicles they use. Capital costs per vehicle tend to be low, due to the use of small vehicles; however, since the vehicles are either leased or, if owned outright, underutilized during the off-season, capital cost per vehicle-mile or vehicle-hour tends to be high.

Shuttle Services. Shuttle services connect recreation sites with remote parking areas or trunkline transit systems. Three types of shuttles may be distinguished: transit shuttles, which connect recreation sites to other transit services; park-and-ride shuttles at sites for which no parking is available to the public, and park-and-ride shuttles at sites for which parking is available, but congested, during peak periods. Table 13 lists shuttle systems reported in the survey along with their design and operating characteristics.

Of the services listed, four (the Jones Beach-Long Island Railroad shuttle, Suffolk County Route S-47, and the Indiana Dunes shuttles) serve commuter rail stations. The others are park-and-ride systems. Of these, the Hanauma Bay and Harrington State Beach systems serve areas where there is no parking in the immediate vicinity of the shore and the others serve (or attempted to serve) areas where parking is available, but crowded, during peak periods. In addition to the systems listed in Table 13, the Virginia Beach Ocean Front Run (see Table 12) serves a remote parking lot, as well as providing circulation in the ocean front commercial strip; however, its main function is to provide for movement parallel to the shore.

As can be seen from Table 13, information concerning shuttle systems is rather scanty, especially for those no longer in operation. From what information is available, it appears that transit shuttles can be successful, but that they may be fairly expensive and that there are few locations for which they would be appropriate.

TABLE 13. Shuttle Services

AREA	OPERATOR	SERVICE	HEADWAY (MIN.)	FARE $	ANNUAL RIDERSHIP	ANNUAL COST	COST/ PASS $
New York, NY	MSBA	LIRR-Jones Beach Shuttle	Irregular	0.75	90,702	?	?
Suffolk Co., NY	Suffolk Bus Corp.	S-47	60	1.00	3,555	?	?
Chicago, IL	Indiana Dunes Nat. Lake Shore	Chicago-So. Shore RR Indiana Dunes N.L. Shuttle	35	Free	5,290	9,825	2.30
	Indiana Dunes State Park	Chicago-So. Shore RR Indiana Dunes S.P. Shuttle	20	Free	8,786	25,040	2.85
Harrington St. Beach, NI	State Park System	Harrington Beach Shuttle	20	Free	?	?	?
Honolulu, HI		Hanauma Bay Shuttle	15	.50	36,000	78,000	2.17
Santa Cruz, CA	Santa Cruz Co.	Santa Cruz Beach Shuttle	20	Free	52,507	25,000	.48
	Santa Cruz Co.	Capitola Beach Shuttle	20	Free	31,400	12,000	0.38
Orange Co., CA	OCTD	Huntington Beach Shuttle*	30 (weekend only)	.25	350	4,200	12.00
Pensacola, FL	Escambia Transit System	Pensacola Beach Route*	?	?	?	?	?
Wilmington, NC	Wilmington Transit Authority	Wrightsville Beach Shuttle*	?	.25	150	2,160	14.40
Jacksonville, FL	Jacksonville Transit Authority	Beach Buggy*	60	.25	?	?	?

* Service Discontinued

Park-and-ride shuttles can clearly be successful where there is no parking in the immediate vicinity of the shore, provided the recreation site is sufficiently attractive. The Hanauma Bay situation appears to be ideal: the parking lot is at the top of a 300-foot cliff, and is located about a half mile, by road, from the beach. The Hanauma Bay shuttle is privately operated, and reportedly makes a modest profit charging fares of 50 cents one-way and 75 cents round-trip. It should be noted that the ridership figures reported in the survey (3,000 passengers per month for a 12-month season) obviously do not square with the reported revenues ($7,000 per month) at these fares. Ridership is probably much higher than that reported. As in the case of transit shuttles, there are probably few locations for which such services are appropriate; however, in the controlled environments of national and state parks, such sites can be created rather easily by eliminating close-in parking, provided there is some reason for doing so.

Where parking is available in the immediate vicinity of the shore, park-and-ride shuttles seem to have small chance of success. Of those reported, only the shuttles in Santa Cruz and Capitola have continued to operate for any length of time. In this case, although the services are usually described by their sponsors as park-and-ride shuttles, they clearly serve multiple purposes, and function as circulation-oriented systems as well as park-and-ride shuttles. The Santa Cruz system, for instance, links several parking areas, some of them located near the beach, with beach areas, commercial development, and a motel area remote from the shore. Based on a 1978 ridership survey, it appears that while recreation was the most commonly reported trip purpose, nonrecreation trips accounted for a very substantial part of the total ridership. [15]

Summary of Results

The coastal transit survey provides the basis for several general conclusions concerning coastal transit services. These include:

1. Transit service at coastal recreation sites is a fairly common phenomenon. Of the 50 coastal urbanized areas in the United States, at least 28 have some kind of transit service at one or more coastal sites; in addition, the survey uncovered 7 nonurban sites. Among the larger coastal urban areas (with populations of 500,000 or more) approximately 75 percent reported coastal transit service.

2. Regular transit systems are the most common providers of coastal transit services. Other agencies commonly involved in their provision include local governments and park and/or recreation agencies. To date, funding from sources other than regular transit subsidies has been comparatively limited.

3. The bulk of the transit access to coastal recreation sites is provided by regular transit routes in urban and suburban areas. With the exception of a few characteristic operational problems, these routes appear to be similar in design and operating results to routes in noncoastal portions of the same metropolitan areas. Indeed, most of the routes serving coastal sites also serve important noncoastal traffic generators, so that provision of coastal access may be a minor part of their overall role in the local transit system.

4. Specially-designed coastal transit services display a wide range of design and operating characteristics. This was to be expected, since many of them are experimental in nature. With the possible exception of park-and-ride shuttles in the areas in which parking is available in the immediate vicinity of the shore, all the types of service reported in the survey can be successful under the right conditions. Although the "right conditions" obviously include appropriate site characteristics, the small number of services available does not permit definite conclusions about the conditions necessary for success.

Evaluation of the Survey

The coastal transit survey was intended to identify factors contributing to the success of coastal transit services and thus to serve as a basis for planning guidelines. In those terms, it must be considered a limited success. It is possible to make some qualitative judgements about the factors which contribute to the success of coastal transit services and to identify some of the more important planning and operational issues. On the other hand, it is not possible to make generalizations about quantitative matters such as the relationship between beach use and transit ridership under any particular set of circumstances. To some extent, this is inevitable: given the variety of service designs and the limited number of sites available for study, it is unlikely that useful quantitative generalizations about such matters will ever be possible. Still, there are several areas in which the current level of available information is disappointing. These include:

1. There is a general lack of quantitative information about the use of recreation sites, including both gross statistics such as annual use, and more detailed information concerning peaking patterns and variability of demand. In many cases, this information probably does exist somewhere, but most of the operators of coastal transit services are unaware of it.

2. There is a lack of specific information about the characteristics of regular transit routes in coastal areas. In particular, there is a general lack of daily ridership statistics, which are necessary for the evaluation of variations in demand. Also, there is a lack of information about the characteristics of riders on coastal routes. Such information, which includes trip purpose and availability of alternative means of transportation, is usually collected by means of on-board surveys. Some transit systems in coastal areas have performed these surveys, and most of those who have made such surveys do preserve the data on a route-by-route basis. However, most such surveys are taken during the school year, since transit operators tend to regard the school year as more indicative of "normal" conditions than the summer. Consequently, there is little information about seasonal shifts in ridership characteristics, and little information on the composition of summer demand for service on coastal routes.

THE ISSUES

This section discusses the feasibility and significance of coastal transit systems. Two issues are involved: (1) the viability of coastal transit services; that is, their probability of success as compared with other types of transit and (2) the role of transit services in the overall coastal access system, including their ability to fulfill various access-related planning goals. Obviously, these issues are related, but not identical. It is possible, for instance, that certain coastal transit services may be financially viable and reasonably cost-effective, and yet contribute little to the overall coastal access system. At the same time, it is also possible that coastal transit services may fulfill important planning goals related to public access, and yet be prohibitively expensive.

Viability as Transit Systems

Conditions Affecting Transit System Viability

The probability that coastal transit systems will appear successful when compared with other types of transit is related to their cost-effectiveness and their financial viability. These, in turn, are related to costs, demand characteristics, and the willingness of potential passengers to pay adequate fares. Although it is not possible to definitely identify the circumstances contributing to the success of transit ventures -- the theory of transit system operation is in its infancy and actual industry practices are often poorly documented -- it is possible to identify some conditions which (all other things being equal) seem to be related to success and to compare them with conditions prevailing in the coastal environment. Among these conditions are the level of demand, the uniformity of demand, the cost of operation, and the willingness of passengers to pay adequate fares.

Level of Demand. The first condition contributing to the success of transit ventures is an adequate level of overall demand. A major tradeoff in the design of any transit service is that between frequency of service and average cost per passenger. In general, the higher the demand, the greater the frequency of service that can be provided at a given cost and, conversely, the lower the average cost for a given frequency of service. Thus, within the limits of a given transit technology, the combined average time (or inconvenience) and money costs tend to decline with increasing demand until some point is reached at which the system becomes physically congested. At very low levels of demand, there is a tendency for total time plus money costs to be very high and to decline rapidly with increasing demand; however, this relationship does involve diminishing returns, and the point of diminishing returns (at least for conventional bus systems) is reached at a comparatively modest level of demand. [16]

Uniformity of Demand. A second condition contributing to the cost-effectiveness of transit services is the uniformity of demand in time and space. Variations in demand in either time or space are apt to reduce cost-effectiveness by creating poor utilization of labor and vehicles.

Spatial variations in demand are important whenever vehicle capacity is an issue. Normally, vehicles are fully loaded at only one point on a route, known as the maximum load point. The degree to which available seating capacity can actually be used depends on the relationship between the maximum load and the average load over the entire route. This relationship, in turn, depends on the origin-destination pattern characteristic of a particular service. Origin-destination patterns may be either one-to-one (one origin and one destination), which leads to a uniform load over the route; many-to-many (many origins and many destinations, which normally leads to relatively uniform loadings except at the route ends; or many-to-one (many origins and one destination), which leads to a triangular loading pattern peaking at the destination.

Temporal variations in demand are also important to the extent that they lead to underutilization of resources or deterioration of service quality. If temporal variations in demand are not matched by variations in the frequency of service, the system will be overcrowded during periods of high demand, underutilized during periods of low demand, or both. If frequency of service is varied to match fluctuations in demand, this may lead to high unit costs stemming from uneven utilization of vehicles and labor. In the case of regular transit systems, the labor costs associated with varying schedules may be magnified by inflexible work rules.

Unit Costs. A third condition contributing to the cost-effectiveness of transit services is the relative magnitude of the unit costs -- i.e., costs per vehicle-mile or vehicle-hour. These costs vary with the operating environment, labor conditions, and the type of equipment used.

Operating environments, especially traffic conditions and the type of passengers being served, affect travel times and the ability to keep schedules. Traffic congestion will reduce speeds, creating a need for more vehicles to produce the same frequency of service, and will often create variations in running times which make schedule adherence difficult and create the need for long layovers in order to dampen headway variations. Running times will also tend to be increased and destabilized if loading times for some individual passengers become too great. Long loading times are likely to result if passengers are physically handicapped or are carrying bulky equipment.

Labor costs are usually the most important influence on unit costs, especially for bus systems, for which they commonly account for more than 50 percent of the total cost. Labor costs, in turn, are influenced by wage and benefit rates and by work rules -- in general, the more restrictive the work rules, the higher the labor cost, all other things being equal. Wage and benefit rates vary with geographic region, local economic conditions, and whether or not labor is unionized. Work rules also depend on whether or not labor is unionized, so that nonunion transit systems ordinarily enjoy a significant advantage in labor costs.

Other costs, including capital costs, maintenance, and fuel costs, depend on the type of equipment being used and on the operating environment.

Willingness to Pay. The financial viability of transit systems is affected not only by their cost-effectiveness, but also by the passenger's willingness to pay adequate fares. This willingness to pay, in turn, is determined by the value of the trip to the potential customer and by the availability and cost of

travel by competing modes. All other things being equal, transit systems carrying primarily transit dependent riders (that is, those without access to automobiles) should be able to charge higher fares than those carrying primarily choice riders, since choice riders (in theory, at least) are willing to pay no more than the difference in cost between transit and the competing mode, whereas transit dependents should be willing to pay up to their entire net value for the trip itself.

Coastal Transit Conditions

Although each coastal transit service is unique, certain conditions seem typical of the coastal transit environment. These include, for instance, traffic congestion during peak periods, large irregular demand fluctuations, and the presence of potential passengers who wish to carry bulk items of recreational equipment. The subsections which follow discuss the ways in which these conditions affect the viability of coastal transit services.

Demand Conditions. Overall demands for coastal transit services vary a great deal depending on the characteristics of the individual services. Although no quantitative relationship can be stated, the key factors probably include the degree of usage of the site; the number of transit dependents in the service area; the existence of competing sites and means of access; the fare; and the adequacy of the service offered in terms of frequency, speed, comfort, and the like.

As a general rule, the cost-effectiveness of coastal transit services will increase as the level of demand increases. In specific cases, however, this relationship will be affected significantly by variations in unit costs and the uniformity of demand. Moreover, it is impossible to state what level of demand is necessary to produce a "successful" service, since the minimum acceptable level of cost-effectiveness will vary from community to commmunity. Given these caveats, however, it appears that there are many coastal recreation sites in the United States that can generate adequate levels of transit demand during the peak season, even though the volumes of traffic involved may not be a very significant percentage of the total travel to the site. Also, in urban settings, the volume of recreation trips needed to support cost-effective service is even smaller, since it is the overall level of demand that determines the viability of the service, and coastal transit services are usually providing for a variety of trip purposes.

Among the specially-designed systems, most circulation-oriented services in densely-developed areas can generate comparatively high levels of demand -- although this may not be true of some of the smaller resort communities. The Nags Head system, for instance, is probably marginal in terms of cost-effectiveness (as measured in terms of cost per passenger) although it has so far retained the community's support. Access-oriented systems, since they are express services and often charge premium fares, seem to be reasonably cost-effective in terms of cost per passenger-mile even at low volumes. Also, since most of their customers have no choice of mode, many of them are able to achieve reasonable load factors (i.e., the percentage of seats filled) even with relatively low seasonal ridership, by offering very infrequent service. Nevertheless, there have been several failures among access-oriented systems stemming from a lack of demand. Shuttle systems, particularly park-and-ride shuttles in urban or suburban environments, seem to have considerable difficulty

in achieving an adequate level of overall demand. Of the park-and-ride shuttles reported in the coastal transit survey, the only ones achieving an adequate level of demand were those serving multiple trip types or else sites with no parking in the immediate vicinity of the shore.

Lack of uniformity of demand appears to be a major issue in the provision of coastal transit services. Unfortunately, a lack of detailed quantitative information makes it difficult to verify reported demand patterns and to assess their impact on the efficiency of coastal services.

In theory, different types of coastal services should experience very different origin-destination patterns, and hence different spatial peaking patterns. Fixed-route services providing access to urban or suburban beaches might be expected to display a many-to-one pattern, with the maximum load point at the shore, if they were in fact carrying mostly recreationists; however, since most such routes serve multiple purposes, it is not clear what spatial peaking should be expected. Park-and-ride shuttles and access-oriented express systems serving remote sites should display one-to-one origin-destination patterns and uniform loads; circulation-oriented systems should normally display many-to-many origin-destination patterns and relatively uniform loads. Unfortunately, data on actual spatial peaking patterns are almost uniformly lacking. Given the fact that spatial peaking is a major constraint on efficiency only in cases in which vehicle capacity is an issue and given the large temporal variations in demand characteristic of coastal services, however, the impact of spatial variations in demand is apt to be minor.

The impact of temporal variations in demand appears to be more serious. Reported peaking patterns include seasonal peaks, peaking on weekends, peaking within the day, and large irregular variations in daily and hourly demand.

Seasonal peaking undoubtedly occurs, but has little negative impact on transit system efficiency. Since seasonal peaks coincide with school vacations, seasonal or seasonally-augmented services are usually able to employ resources which are used for school transportation during the rest of the year and which would otherwise be idle.

The other reported peaking patterns are hard to verify. Based on the limited data available, it does not appear that weekend peaking is common. It does appear that there are large and irregular variations in demand on a daily or hourly basis; however, these may not be more important on coastal routes than elsewhere. In any event, existing coastal services rarely attempt to vary service levels to match daily or hourly fluctuations in recreation trips, and, consequently, the major impact of such fluctuations is to produce uneven utilization of available capacity. Major exceptions include systems which provide either increased or decreased service on weekends and systems in large metropolitan areas which assign extra service to routes as needed from a systemwide pool of vehicles and drivers. At this point, little information is available concerning the cost or effectiveness of such practices -- for instance, it is not known whether it is normally possible to anticipate heavy demands far enough in advance to prevent overcrowding in cases in which extra service is employed.

Cost Conditions. The coastal transit environment poses both advantages and disadvantages in terms of unit costs. On the negative side, traffic congestion

is common in coastal recreation areas, and this tends to retard transit vehicles and destabilize schedules, which, in turn, leads to higher unit costs. Also, some coastal transit services allow passengers to carry surfboards, bicycles, or other bulky equipment on board. Where such equipment is allowed, passenger loading times tend to be large and quite variable, leading to further difficulties in meeting schedules.

On the positive side, labor costs for many of the specially-designed seasonal systems are quite low, since they are not unionized and are able to draw on low-wage seasonal labor markets. Evidence concerning other costs is not conclusive, but there is no reason to believe that capital, maintenance or fuel costs are greatly different from those of other transit systems.

Financial Viability. In terms of financial viability, systems designed primarily for transit dependents do appear to have an advantage. Fares for regular transit systems in coastal areas (as elsewhere) have increased rapidly in the past few years without dramatic loss of ridership; meanwhile, some of the specially-designed express services providing access to remote day-use sites are actually able to command premium fares. On the other hand, systems which are in direct competition with the automobile, such as park-and-ride shuttles and (to a lesser extent) some of the circulation-oriented systems in resort areas, tend to charge low fares and display relatively poor financial performance.

Summary

In summary, the performance of coastal transit services may be expected to vary a great deal depending on the type of service and the exact circumstances. Recreation sites which have the potential to generate adequate levels of demand seem to be fairly common; however, the characteristic variability of demand for recreation trips in coastal areas may limit the efficiency of coastal transit systems. Inclusion of nonrecreation trips will normally be advantageous for coastal transit systems, since it will increase the overall level of demand and may decrease the relative magnitude of the demand fluctuations. Unit costs of services offered by regular transit operators in coastal areas are apt to be high, due primarily to low and variable running speeds resulting from traffic congestion. For services offered by other agencies, these high costs induced by the coastal operating environment may be more than offset by the low wage rates and simple work rules open to nonunion operators. In general, coastal transit services can be as financially viable as any others, except where they are in direct competition with the automobile for choice riders; for park-and-ride shuttles and some circulation-oriented systems in resort areas, financial viability may be undermined by the need to charge very low fares in order to attract ridership.

Role in Overall Coastal Access System

The second context for the evaluation of coastal transit systems involves their effectiveness as a part of the overall coastal access system. In general, transit services may be viewed as playing one of two roles in the provision of coastal access: either as a substitute for automobile access or merely as a means of providing access for transit dependents.

Access for Transit Dependents

Coastal transit services will usually achieve some degree of effectiveness in cases in which their primary goal is to provide access for transit dependents. In these cases, the main issues will be the quality of service and its cost. It will almost never be possible to provide a level of service comparable to that of the automobile; however, for those who truly have no alternative means of transportation, transit is better than nothing and almost always cheaper (in money and sometimes in time) than the available alternatives, such as paratransit services and taxis.

This does not necessarily mean that coastal transit services designed for transit dependents will always be successful, however. Existing systems do display a considerable range of cost per passenger. In some cases, high costs are due to design features (for instance, the distance traveled) but in others they result from low utilization. Individual cases need to be considered carefully, since the success of such systems will depend in part on the number of transit dependents in the service area and on their choice of recreation sites. Park and recreation agency planners sometimes seem to feel that they have an obligation to provide access for everyone to all sites under their jurisdiction. In practical terms, however, it is necessary to consider how attractive the various sites are likely to be to transit dependents. Actual use by transit dependents seems to concentrate at urban sites with high levels of service, even in areas where more remote sites are accessible. Compare, for instance, the use of Coney Island and Rockaway Beach in New York City with the use of the special services to Jones Beach and Jacob Riis Park. (See Table 11 and Appendix A, pages 38 and 39).

Substitute for Automobile Access

When compared with the overall coastal access system, transit often plays a relatively minor role. Although information is not available in most cases, it appears that transit dependents make up most of the ridership for transit services operating in coastal areas and that transit normally carries a comparatively small fraction of all trips at coastal recreation sites. This is not surprising, since the same might be said about the use of transit for almost any type of trip. Specific data on mode choice are lacking for most coastal recreation sites, but where they are available, it appears that the modal split for coastal recreation trips does not differ greatly from that for all trips in the same areas. In New York City, where transit usage is generally high, transit is used for 56 percent of the trips to Coney Island; in San Diego, transit carries about 4 percent of all coastal recreation trips -- which is roughly equal to transit's share of all trips in that area.

In some cases, coastal transit systems have been specially designed as an alternative to the use of automobiles. Most commonly, such systems are park-and-ride shuttles or circulation-oriented fixed-route systems. Most such systems are not intended to substitute for existing automobile access, but are rather intended to provide for continued growth in the use of sites with congested traffic and parking conditions.

Of the two, the circulation-oriented systems seem to be the more effective. These systems are not intended to prevent automobiles from being brought into the coastal area, but are rather intended to reduce the number of trips within

the coastal commercial strip. Where service frequency is adequate and availability of parking is uncertain, they seem capable of handling a significant fraction of the trips within the commercial strip. Although they display the usual operational problems of coastal transit systems, such as irregular demands and difficulty in headway control, they can achieve a high degree of cost-effectiveness, as is indicated by the performance of the Ocean City system. It should be noted, however, that they do not prevent traffic or parking congestion (although they may reduce it), and that it is virtually impossible to prove that they have any real effect in increasing visitation rates.

Park-and-ride shuttles, although frequently advocated as a means of alleviating parking and traffic congestion or enhancing the coastal environment, have been by far the least successful of the specially-designed systems, except where they provide the only vehicular access to the immediate vicinity of the shore (for instance, at Hanuama Bay in Hawaii or at Harrington Beach State Park in Wisconsin). Where park-and-ride shuttles are actually in competition with close-in parking, they are not likely to be successful in the absence of an overall parking and traffic control strategy which assures them of an adequate and fairly uniform level of demand.

The importance of such control becomes clear when one considers the choice situation faced by the shuttle user. Figure 2 is a flow chart showing the comparative time and money costs for shuttle service versus close-in parking. Normally, one would expect the vehicular travel time for the shuttle to exceed

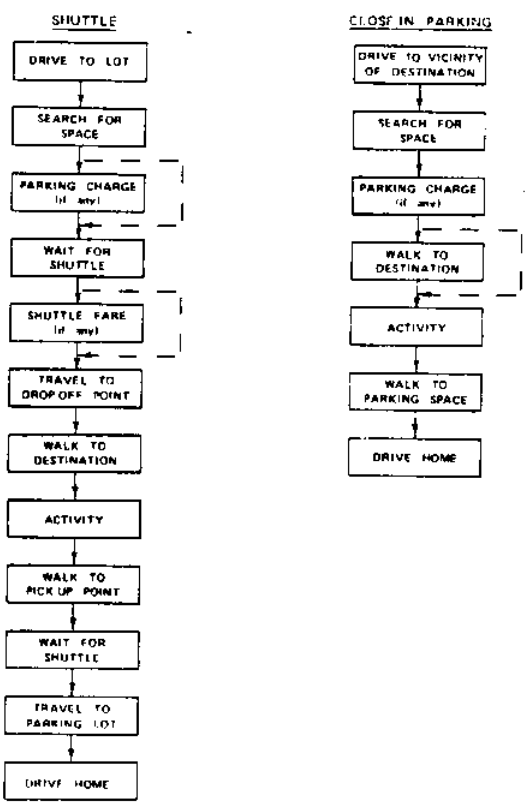

FIGURE 2: Comparison of Time and Money Costs for Shuttles and Close-In Parking

that for close-in parking, since the remote parking lot will probably not be on the most direct route to the user's ultimate destination. Moreover, there will be a time cost involved in waiting for the shuttle which could be avoided by use of the close-in parking. On the other hand, time spent searching for a parking space and walking to and from the destination should be less for the shuttle, especially during peak periods. Finally, the fare for the shuttle must be compared with the parking charge (if any) for close-in parking.

In situations in which pricing is not a factor, one would expect users to choose the shuttle only when they expect the time spent searching for a space and walking the extra distance to the destination to outweigh the extra travel time and the time spent waiting for the shuttle. This is apt to occur only at times of peak demand, which means that demand for shuttle services is apt to be low and quite variable, unless pricing or other parking control strategies offset the time disadvantage.

The time factor may also suggest that it is important for park-and-ride shuttles to provide very frequent service. Most of those reported in the survey did not -- headways ranged from 20 minutes to 60 minutes -- and this may have been a factor in their failure to attract ridership. Of course, provision of more frequent service would increase costs, so one issue of particular concern in the design of shuttles is the elasticity of demand with respect to frequency of service.

Since park-and-ride shuttles have not performed very well in the few instances in which they have been tried, coastal zone planners should consider alternatives to them which might produce the same desired results. One possibility might be location of remote parking lots along regular transit routes leading to beach areas. If properly publicized, these could provide service for persons who are willing to leave their automobiles outside the congested coastal area. Use of regular transit routes would open the service up to other trip types, providing a higher level of base demand and smoothing out demand fluctuations. Any additional peaking caused park-and-ride operation could be handled by the assignment of extra service as is already done on regular transit routes in some coastal areas.

Summary

In summary, it appears that coastal transit services can often be an effective means of providing transportation for transit dependents provided that there are enough transit dependents in the area and that transit services are concentrated at recreation sites popular with them. The likelihood that transit services will prove to be an effective substitute for auto access in coastal areas is considerably less, since most current riders appear to be transit dependents. Circulation-oriented services can probably be effective in reducing the number of auto trips in densely-developed coastal commercial strips in resort areas, although it is hard to assess their impact on visitation. Specially-designed park-and-ride shuttles have so far proved relatively ineffective in relieving cost-effectiveness; alternatives to their use should be considered in cases in which planners wish to encourage day-use visitors to park outside the immediate coastal area.

SAN DIEGO AREA CASE STUDIES

As a part of the first phase of the project, tentative planning guidelines were drawn up. These guidelines, which were based on an analysis of the results of the coastal transit survey, a review of literature related to transit system design and operation [17-20], and the analysis of major coastal transit planning issues presented in Section III, were incorporated in the project's interim report and released for review and comment to respondents in the coastal transit survey and other interested individuals. Meanwhile, the study team undertook a series of four planning case studies at coastal sites in the San Diego area in order to test the guidelines for applicability and comprehensiveness.

The San Diego area case study sites were Silver Strand State Beach, Mission Bay-Mission Beach, Del Mar, and Cardiff (see Figure 3). These were chosen because they had been previously used as case study sites by the Comprehensive Planning Organization of the San Diego Region (now known as the San Diego Association of Governments or SANDAG) in its Regional Coastal Access Study, which was published in 1978 [4]. The Regional Coastal Access Study had recommended transit access for all four sites, and, indeed, some level of transit service is currently provided at all of them.

Details of the San Diego area case studies are presented in Appendix C. In terms of their influence on the final guidelines, they served to emphasize three important points:

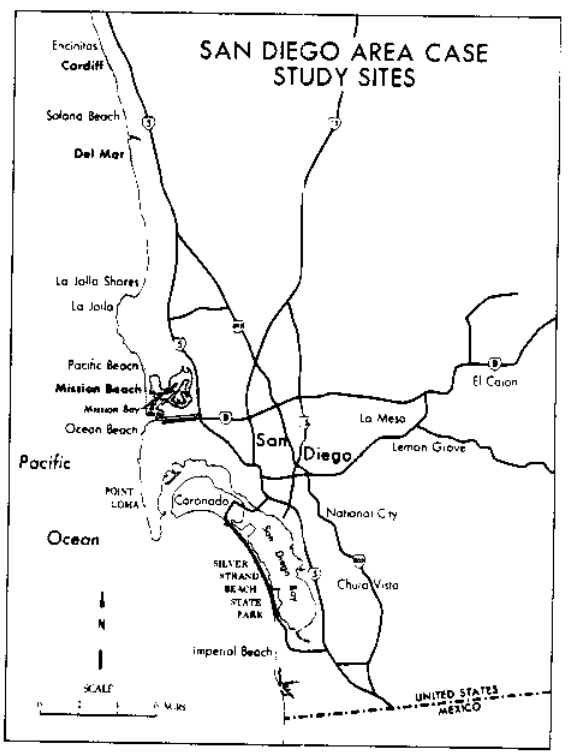

FIGURE 3

1. The need for a regional planning perspective in areas with several coastal recreation sites. Of the four sites studied, only one, (Mission Bay-Mission Beach) appears to have serious potential for further transit development. In the case of this site, however, neither long range planning issues nor current transit operating problems can be adequately addressed without considering conditions at other major coastal sites in the San Diego Metropolitan area. These sites, however, were omitted from detailed consideration in the Regional Coastal Access Study. In general, past coastal access planning in the San Diego area seems to have concentrated too much on individual sites at the expense of any real consideration of the interactions among major sites.

2. The need for careful and detailed analysis of the operating problems of existing services. San Diego Transit Corporation operates two routes (Routes 34 and 80) in the Mission Bay-Mission Beach area on weekends. Route 34 is reported to experience the usual operating problems of regular transit routes in coastal areas (as discussed in Section III), including overcrowding and poor adherence to schedules. More detailed investigation in this particular case suggests that the overcrowding may be a cause of poor schedule adherence in extreme cases, but that the variations in headway are not, in and of themselves, a major cause of the overcrowding, since variations in headways persist throughout the day, whereas overcrowding is confined to the afternoon peak period. Also, although traffic congestion is present in the immediate beach area, it does not appear to be a major factor in destablishing schedules. These findings emphasize the need for careful investigation of operating problems to separate actual causes from factors that are only apparently significant.

3. The difficulty involved in using transit services, especially parking shuttles, as substitutes for automobile access in coastal areas. The Mission Bay-Mission Beach case study involved evaluation of an experimental parking shuttle program sponsored by the City of San Diego and the California Coastal Commission. This parking shuttle, like most of those reported in the coastal transit survey, failed to attract a significant level of ridership. Although there were specific defects in the design and implementation of this particular service, including high fares, its failure serves to emphasize the point that transit services can substitute for automobile access only in very special circumstances, and that these circumstances usually are not present in urban beach areas, even when they appear congested.

SUMMARY OF PLANNING GUIDELINES

The following is a summary of planning guidelines for coastal transit services developed by the project and published as a part of a manual for coastal transit planners [12]. These guidelines are based on the coastal transit survey, the analyses of Section III, literature related to transit system design and operation, and the San Diego area case studies. They were incorporated in a tentative form in the project's interim report [11], which was circulated for review to respondents in the coastal transit survey and other interested individuals. The planning guidelines cover the role of transit services in the provision of coastal access, site types and types of services, design characteristics, institutional arrangements, marketing, and evaluation of coastal transit services.

Roles of Transit Service in Providing Access to Coastal Sites

Normally, proposals for new or improved coastal transit service will arise for one of two reasons: either a transit operator perceives an attractive market, or someone perceives an access problem at a coastal site. In either case, one of two circumstances is apt to exist: either (1) there is unfulfilled demand for access to the site on the part of transit-dependent individuals or groups (that is, those whose access to automobiles is limited) or (2) there is some problem involving automobile access to the site -- either congestion or adverse environmental impacts. Consequently, the roles most often proposed for coastal transit services are to provide access for transit dependents or to substitute for automobile access.

Access for Transit Dependents

In most coastal areas, there will be a significant fraction of the population that has limited access to automobile transportation. This group forms a large part of the market for transit, especially for non-work trips, and may be expected to provide the bulk of the market for coastal transit services. Based on experience with existing coastal transit services, it appears that services geared primarily to transit dependents can attract adequate ridership at most coastal sites, although this is not universally true.

Substitute for Automobile Access

Transit services are not likely to be successful substitutes for automobile access at coastal recreation sites except under special circumstances. These special circumstances include (1) highly controlled environments in which parking is not permitted in the immediate vicinity of the shore and (2) densely-developed resort areas in which transit services can provide circulation among recreation sites and commercial establishments.

Site Type and Type of Service

Coastal recreation sites may be categorized as having primarily day use or overnight visitation and as being located in either urban or suburban areas or remote from them.

Urban or Suburban Day-Use Sites

In most cases, the appropriate type of service for urban or suburban day use sites is regular fixed-route service. Most frequently, such services will already exist at any site which would warrant them; consequently, planning related to them is likely to involve proposals for expansion or modification of existing service rather than establishment of new services. Where fixed-route service already exists, its effectiveness should be evaluated as part of any plan for modification or expansion. Points to consider in such an evaluation include frequency of service, ease of access from known concentrations of transit dependents, unit costs (if available) and the possibility of operating problems, such as overcrowding and difficulty in adhering to schedules.

Remote Day-Use Sites

For day-use sites 5 to 25 miles from the urban area, consideration should be given to instituting seasonal express services designed to provide access for transit dependents. In determining whether the site is appropriate for this type of service, consideration should be given to the number of transit dependents in the area, the likelihood that they will engage in coastal recreation activities, and the attractiveness of this site vis-a-vis others in or near the urban area. Ease of access does seem to be important to transit dependents, so that access-oriented services at remote sites are unlikely to be well used if there are more accessible sites in the urban area. In a few cases, parking at remote sites may not exist in the immediate vicinity of the shore. In these cases, park-and-ride shuttles are appropriate. Also, transit shuttles are sometimes appropriate for linking remote sites with trunkline transit systems.

Resort Areas

Areas with high rates of overnight visitation (resort areas) should be considered for circulation-oriented fixed-route systems. Any area with a peak visitor population of 100,000 or more can probably support such a system, provided development is concentrated in a strip along the shore, distances among commercial establishments are great enough to discourage walking, and some level of parking or traffic congestion exists.

Design Characteristics

Vehicle Selection

Regular transit systems operating in coastal areas will normally use the same types of vehicles on coastal routes as elsewhere. The major exception would be cases in which street geometrics (primarily widths and turning radii) do not permit use of full-sized vehicles. Seasonal services may use a variety of vehicle sizes, which will depend on the anticipated maximum passenger loads and on street geometrics. Given the difficulty in predicting maximum passenger loads and the fact that vehicle costs are normally a small percentage of total costs, it is probably best to use the largest vehicles that are compatible with street conditions. In some cases, fears have been expressed that the smaller bus models have high maintenance costs. At present, there is little evidence

from coastal systems to confirm or refute this, but potential maintenance costs are an important consideration in decisions about vehicle type.

Some seasonal systems, particularly circulation-oriented services in resort areas, use buses with nonstandard body designs. The most popular of these is the so-called "trolley" body, which resembles an old-fashioned streetcar or cable car body. These nonstandard bodies are used in the belief that they are attractive to potential riders and that they enhance the overall "image" of the resort community. There is no real evidence that nonstandard body styles actually increase ridership -- other design features, such as frequency of service, are probably more important -- but they may be attractive to potential advertisers, and hence increase advertising revenue. One drawback involved in the use of nonstandard bodies is increased maintenance costs.

Seasonal services may either lease vehicles, own them outright, or obtain them from a private firm which is also under contract to operate the service. Systems leasing vehicles report that monthly costs are high compared with amortization costs for similar vehicles owned outright, but since the costs occur only during the summer season, annual costs may be lower. Since most seasonal services operate only during school vacations, the alternative of using school bus equipment (or contracting with a private firm providing school transportation where such arrangements are in effect) should be considered.

Route and Stop Location

Routes designed to provide access to coastal recreation sites should connect the site as directly as possible with known concentrations of transit dependents and/or central transfer points in the local transit system. As with other transit routes, consideration needs to be given to the geometric and structural adequacy of the streets involved, traffic conditions, and proximity of the route to the actual origins and destinations of riders. There will often be a conflict in coastal areas between avoiding traffic congestion and locating the route as close as possible to the destinations of the riders, since streets in the immediate vicinity of the shore are apt to be congested.

Location of routes and stops in the immediate coastal area should provide for adequate distribution of passengers to various destinations along the shore. In most cases, beach areas are rather extensive, so that several stops and some routing parallel to the shore will be appropriate. Stop locations along the shore should be reasonably frequent (a spacing of one to two blocks is common) and should include high-use sites such as parks, piers, amusement parks, or especially popular stretches of beach.

In order to increase route identification among riders, routes should be located to provide service in both directions on the same street where possible. The exception would be cases in which the streets nearest the shore are one-way. Stop locations should be clearly and conspicuously identified. This is particularly important in resort areas, where many riders may be unfamiliar with the system.

Schedules

Schedules should be designed to provide adequate frequency of service at all times. Although "adequacy" is not precisely defined in this case, it

includes prevention of overcrowding of vehicles or passing up of passengers in all cases except during the most extreme irregular demand fluctuations, and consideration of passenger waiting times and inconvenience in periods of low demand. Existing coastal routes operate with headways of up to 60 minutes for urban/suburban sites and at frequencies of service as low as one trip per day at remote sites. The most common urban/suburban headway is 30 minutes, and this is recommended as the maximum desirable headway for urban/suburban routes. Schedules should be revised periodically based on operating experience and availability of resources.

For new seasonal services, issues involved in producing the initial schedule include the length of the season and days and hours of operation, as well as frequency of service. In the absence of other considerations (for instance, known adverse weather conditions at some northern locations) the season should coincide with local school vacations. Where possible, services should operate seven days a week rather than weekends only, unless there is clear evidence of strong and consistent weekend peaking in recreation demand at the site in question. Even where recreational use does peak strongly on weekends, seven-day service may be justified on the basis of demand for nonrecreation trips, which should be accommodated along with the recreation trips where possible. Access-oriented services should normally operate at least from mid-morning (say, 9 a.m.) to sundown. Hours for circulation-oriented services should be extended to cover evening demand, which may last until midnight or later in some resort areas.

Fares

Generally speaking, coastal transit services should be able to command fares comparable to those of similar transit services in the same geographic area. Since fares have been changing rapidly with inflation, it would not be useful to recommend actual amounts. However, most regular transit systems are able to recover from 20 to 50 percent of their costs from the farebox, and coastal services, if otherwise cost-effective, should normally be able to operate in the same range. Unless it is done for social reasons, there seems to be little justification for offering discount fares on coastal systems. For systems in direct competition with the auto (for instance, park-and-ride shuttles) a coordinated set of fares and parking charges is preferable to offering free or underpriced transit service. It should also be noted that such services have rarely attracted adequate ridership, even when they have offered discount fares.

Institutional Arrangements

System Operation

Existing coastal transit services are operated under a variety of arrangements, no one of which appears to be clearly superior to the others. The most common arrangement is operation by a regular transit agency at its own initiative. Other possibilities include direct operation by a local government or by a park or recreation agency, or operation by a regular transit agency or a private firm under contract with a local government, or a park or recreation agency.

Considerations involved in determining operating arrangements in particular cases include cost, financial considerations, management experience, simplicity, and flexibility. In general, regular transit operators will be at a disadvantage in terms of cost due to union wage rates and work rules. On the other hand, they generally have considerable management experience, and may possess more operational flexibility than other operators. Also, they often have better access to general transportation subsidies than do other agencies, and this may be an important financial consideration.

Financial Arrangements

In most cases, financial arrangements will involve subsidies, either from the agency sponsoring the service or from external sources. A major source of subsidies has been regular transportation funds. Federal, local, or state funds, where available, may be sought through appropriate channels. Also, in some cases, new projects may qualify as demonstration projects under various transit funding programs. Of course, if regular transportation funds are sought for coastal projects, they will be in competition with other transit projects. Consequently, good potential cost-effectiveness (in terms of low cost per passenger or per passenger-mile) is important for projects seeking this type of funding. Services in resort areas have sometimes been able to secure substantial aid from the local business community, either from advertising revenue or from outright contributions. Where services are intended to enhance the attractiveness of coastal commercial developments, this funding source should investigated.

Marketing

Coastal transit systems employ a variety of marketing schemes. Regular transit systems operating routes in coastal areas may provide special brochures describing coastal services and may incorporate advertising geared to users of coastal recreation sites in routine advertising programs. Marketing efforts for new specially-designed services need to be fairly substantial, and should include marketing research as well as advertising. Advertising media and promotional devices which have been used include brochures; news releases; radio, television, newspaper, and magazine advertising; and special promotional campaigns involving local merchants. In the case of specially-designed services, marketing costs often amount to as much as 25 percent of total costs.

Evaluation

Coastal transit services, particularly those that are specially-designed, should be carefully evaluated to determine whether they are achieving their objectives and whether they are cost-effective when compared with alternative ways of achieving their objectives. In addition, design and operating characteristics should be carefully documented, so that future project sponsors will have a better data base from which to begin planning.

Coastal transit projects should have realistic objectives. These should be stated clearly, and in terms which allow convenient evaluation. At the least,

there should be some idea of the intended scope and cost of the project, the target population in terms of ridership, and the expected benefits. Where possible, the objectives should be quantified.

Evaluations should clearly document the design and operating characteristics of the transit service. This documentation should describe routes, schedules, vehicles, and fares. The documentation should also record results in terms of ridership, costs, revenue, and any special operating problems or procedures. Ridership information will ideally include results from ridership surveys which will establish the actual trip purposes and socio-economic characteristics of passengers and daily ridership counts which will establish the presence or absence of weekly peaking patterns. Cost data should be broken down according to the type of expenditure, and actual expenditures should be compared with budgeted amounts. Documentation of special operating problems should include studies of on-time performance, reports of overcrowding, reports of assignment of extra service, and the like.

GLOSSARY

base fare--lowest standard fare in the transit system, usually for a single zone during off-peak periods.

choice riders--individuals who have access to automobiles for their travel, and who ride public transit by choice.

circulation-oriented service--transit service parallel to the shore in densely-developed resort areas.

coefficient of variation--a standardized measure of the degree of fluctuation of transit riders (standard deviation divided by the mean).

cost-effective system or route--transit service that achieves an acceptable proportion of operating costs from passenger fares, or provides service at an acceptable cost per passenger carried or per passenger-mile.

demand--the number of riders using the transit system over a specific time period. Demand varies with level of service, availability of alternative modes, etc.

fixed-route service--public transit operating with predetermined routes and schedules. Regular fixed-route service implies year-round service provided as part of a general-purpose transit system.

group services--services, including private tour services, which cater primarily to organized groups and tend to provide tour services as well as transportation.

many-to-many origin-destination pattern--service or demand characteristics of dispersed trip origins or loading points and dispersed passenger destinations or unloading points resulting in relatively uniform loads, except at the route ends.

many-to-one origin-destination pattern--service or demand characterized by dispersed trip origins and a single passenger destination, resulting in peaking at the destination.

maximum load point--the place on a transit route where the vehicle has the most riders.

multipurpose transit systems--regular transit systems operating a number of fixed route catering to all trip purposes.

on-board-survey--questionnaires administered to transit riders to gather information about trip purpose, origin and destination of the trip, socio-economic characteristics of the trip maker, etc.

one-to-one pattern origin-destination--service characterized by one principal origin and one principal destination resulting in relatively even loads over the route.

operating characteristics--operational aspects of transit service which are normally under the control of the operator including fare charged, types of vehicles used, frequency of service provided, etc.

operating environments--operational aspects of transit services which are normally not under the control of the operator, including traffic conditions, weather conditions, type of riders, etc.

operating ratio--the proportion of operating costs recovered from passenger fares.

origin-destination pattern--spatial arrangement of the beginning points and ending points of passenger trips.

park-and-ride shuttles--shuttles connecting remote parking lots and recreation areas.

passenger-miles--a gross measure of total demand, consisting of the number of riders multiplied by the average trip length.

shuttles--transit services connecting remote parking lots or trunk line transit services with recreation sites.

seasonal mean--number of transit riders for a particular time period (say, a particular day of the week) averaged over the entire summer season.

special event services--temporary services designed to provide transportation to special events held at coastal recreation sites.

special fixed-route services--fixed-route services which are seasonal, are operated by agencies other than regular transit systems, or both.

standard deviation--a statistical measure of the degree of fluctuation of a variable (in this case, transit patronage).

transit dependents--individuals who do not have access to automobiles and are thus dependent on public transit (also referred to as dependent riders).

transit shuttles--shuttles connecting trunkline transit services to recreational sites.

unit costs--total costs per vehicle-mile or per vehicle-hour including driver, maintenance, fuel, depreciation, and other overhead.

VATS--the Visitor Access Transportation System of the National Park Service, which is an experimental access program.

vehicle-hours--a gross measure of transit service, consisting of the sum of the number of hours of operation during a specified time period for all vehicles operating on a particular route or set of routes.

vehicle-miles--a gross measure of transit service, consisting of the sum of the distance (in miles) operated by all vehicle operating on a particular route or set of routes.

APPENDIX A. CASE STUDIES

North Atlantic

The North Atlantic region contains the major metropolitan areas of New York and Boston, as well as a number of smaller urban areas. Most beach use in the region is by local residents (except in eastern Long Island) and most coastal transit consists of regular fixed-route service or access-oriented seasonal services. In addition, transit shuttles connect the Long Island Railroad with beaches at several locations on Long Island.

Portland, Maine

Summer service is operated between downtown Portland and Crescent Beach State Park, a distance of about 10 miles, by the Greater Portland Transit District (METRO). This service is operated between late June and mid-August. It involves three trips per day in each direction. Base fare is $0.75 (considered a premium fare by METRO). Ridership in 1980 was around 5,000 one-way trips. Estimated deficit for 1981, based on 5,000 trips and the $0.75 fare, is $1,000, which implies a deficit of around $0.20 per passenger and a cost of $0.95 per passenger.

(Sources: Greater Portland Transit District and Greater Portland Council of Governments)

Boston, Massachusetts

Most beaches in the Boston metropolitan area are accessible by regular transit services. More remote areas, such as Cape Cod, Martha's Vinyard, Nantucket, etc. are accessible by private bus and ferry services. In addition, several islands in Boston Harbor are accessible by ferry or water taxi. A complete listing of transit services in Massachusetts is provided in the booklet Car-Free in Boston, published by the Association for Public Transportation. [21]

Transit service in Boston area is provided by the Massachusetts Bay Transportation Authority (MBTA) and a number of regional authorities and private firms. MBTA services include bus, rail rapid transit, and commuter rail. MBTA serves coastal sites by means of approximately 11 bus routes, two rapid transit lines, and one commuter rail line. In addition, Winthrop Beach is served by three bus routes operated by Rapid Transit Lines, a private operator. Base headways for bus routes serving beaches in the Boston area range from 15 to 60 minutes; the two rapid transit lines serving beach areas have base headways of seven to eight minutes. Base fare is 25 cents.

No specific information was available concerning ridership, costs, or revenues on these routes.

(Source: Massachusetts Bay Transportation Authority)

Providence, Rhode Island

The Rhode Island Public Transit Authority (RIPTA) operates summer beach

buses between several points in the metropolitan area and three state beaches in Narragansett, about 25 to 30 miles south of Providence. This service is operated Wednesday through Sunday during school vacation, from late June to the first of September.

Six routes are operated, from Providence, Cranston, North Providence, Central Falls, Pawtuckett, and Woonsocket. Each operates from a single pickup point, except the Woonsocket route, which has two pickup points, and each operates one round trip per day. 1981 fare is $3.00 round-trip.

Ridership in 1980 was 20,163 one-way trips. Cost was $50,652 and revenue (at $2.00 per round-trip) was $20,880. Thus, cost per one-way passenger was about $2.51 and the operating ratio was 0.41.

At present, the South Shore bus service is subsidized by RIPTA as a normal part of its system. Prior to 1980, however, the service was subsidized by the State Department of Environmental Management.

(Sources: Rhode Island Statewide Planning Program and Rhode Island Public Transit Authority)

New Haven, Connecticut

Transit service in the New Haven area is provided by the New Haven Division of Connecticut Transit. Regular fixed-route service is provided to a number of local beaches.

Five routes are involved. The most important of these is the G-1 Lighthouse Park Route, which operates with 20-minute base headways, but employes an additional bus during summer months. Other coastal routes include the J-2 and Z-2 Routes serving Savin Rock (30 and 35-minute base headways, respectively), the U-1 Milford Route serving West Haven, Woodmont, and Milford (30 minute base headways) and the S-Clinton Route serving Hammonasset State Park (approximately two-hour headways on weekdays and four trips per day on Saturdays). Base fare is 50 cents, with zone fares charged on the U-1 and S Routes.

No specific ridership, cost, or revenue data were available for these routes; however, Connecticut Transit reports that ridership to the coastal area does peak in the summer months, especially on the Lighthouse Park Route.

(Sources: Connecticut Transit and Greater New Haven Transit Authority)

Norwalk, Connecticut

Transit service in Norwalk is provided by the Norwalk Transit District (WHEELS). Four routes serve shorefront areas, but only one of them (Route 8) directly serves a public beach. All routes operate at 30-minute headways in a radial timed-transfer system centered on the Norwalk Mall. Base fare is 50 cents.

Route-level ridership information is obtained by random sample and is not considered adequate to establish peaking patterns with a high degree of

statistical reliability; however, the Norwalk Transit District reports that ridership on Route 8 does appear to peak in July and August.

(Source: Norwalk Transit District)

New York City and Long Island, New York

A number of different transit services are provided at coastal recreation sites in New York City and in Nassau and Suffolk Counties, which lie east of New York City on Long Island.

Sites in New York City proper include the beaches managed by the city itself and units of the Gateway National Recreation Area. These are primarily day-use sites; they vary a great deal in terms of intensity of use, probably as a result of differences in accessibility. According to figures supplied by beach managers and published by Heatwole and West [10] weekday use varies from 600,000 at Rockaway and 400,000 at Coney island to a few thousand at beaches on Staten Island. For peak holidays, Coney Island and Rockaway are estimated to experience 1,500,000 visits each. Nassau County also contains a number of day-use sites. These include a number of local beaches, and Jones Beach, which is a state park. Suffolk County, on the other hand, contains summer resort areas, particularly in the Hampton area on the South Fork, which experience considerable overnight visitation. Suffolk County also contains Robert Moses, Wildwood, and Hither Hills State Parks and Fire Island National Seashore.

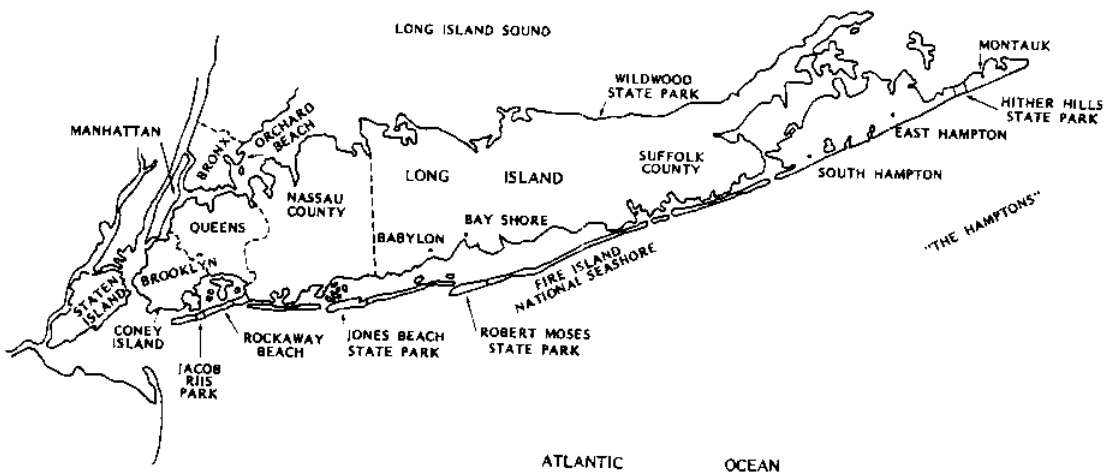

FIGURE A-1: New York City and Long Island

New York City. Transit services at the New York City beaches are provided by two operating authorities of the New York Metropolitan Authority (MTA), the New York City Transit Authority (NYCTA) and the Manhatten and Bronx Surface Transit Operating Authority (MaBSTOA). In addition, two private firms, Green Bus Line and Triboro Coach Company, serve the Rockaway area. NYCTA regular services include subway lines to Coney Island (four lines) and Rockaway Beach (two lines) and bus routes in the Coney Island-Brighton Beach-Manhatten Beach areas in Brooklyn (six routes) and at several beaches on Staten Island (three routes). In addition, NYCTA provides special weekend-only bus service during the summer to Jacob Riis Park, which is a part of the Gateway National Recreation Area. This service, which involves extension of two routes, is provided under contract and is subsidized by the National Park Service. MaBSTOA operates two bus routes to Orchard Beach in the Bronx. In the Rockaway Area, Green Bus Line operates three bus routes and Triboro Coach Company operates one. Table A-1 summarizes base headways for the New York City routes, where these were reported. Current fares are 75 cents for all routes.

Ridership, costs, and revenues were not available on a route-by-route or station-by-station basis for regular services. Even if they had been, it would not be possible to separate out the trips bound for coastal recreation areas. It is clear, however, that transit use is very substantial at the major New York City beaches. According to Heatwole and West [10], 49 percent of Coney Island users arrive by subway and an additional seven percent by bus, for a combined transit share of 56 percent. At Orchard Beach, they report that 29 percent arrive by bus and four percent by subway (presumably, these latter are combination subway-bus trips, since Orchard Beach is not directly served by subway).

TABLE A-1. Regular Bus Routes Serving New York City Beaches

BOROUGH	OPERATOR	ROUTE	BASE HEADWAY (MIN.)
Brooklyn	NYCTA	36	8
		74	12
		64	13
		68	8
		1	12
		49	8
Queens	Green Bus Lines	35	?
		21	?
		22	?
	Triboro Coach Co.	53	?
Bronx	MaBSTOA	52	35
		12	4
Staten Is.	NYCTA	2	20
		103	20
		S103	20

MTA officials also report that there is heavy demand peaking in beach areas which correponds with beach use, and that there are sometimes problems in supplying enough capacity in these areas, particularly in moving people away from the beach at the end of the day. Since demand varies sharply and irregularly (due, for instance, to the weather), the normal procedure is to provide a fairly light base schedule, to use field dispatchers, and to supplement the base schedule as the need arises. Normally, extra service comes from a system-wide pool of vehicles and drivers, but in case of emergency, vehicles are actually diverted from other routes.

Limited rideship and cost data are available for the special NYCTA service to Jacob Riis Park. 1980 ridership was 31,304. Cost was $57,205, implying a cost of $1.83 per passenger.

Nassau County. Transit services in Nassau County are provided by the Metropolitan Suburban Bus Authority (MSBA), an operating authority of the New York MTA. In addition to operating seven regular routes to various local beaches and the South Shore (Atlantic) and North Shore (Long Island Sound), MSBA offers special daily service during the summer months to Jones Beach and shuttles connecting Jones Beach with the Long Island Railroad (LIRR) at Freeport and Wantagh Stations.

Regular MSBA routes serving coastal areas have base headways ranging from 18 to 60 minutes. Fares for regular routes depend on route length and may be either 60 cents or 50 cents. MSBA also operates eight special routes to Jones Beach from various points in Nassau County and the Borough of Queens. These routes operate weekends only from Memorial Day to mid-June and daily from mid-June to Labor Day. Frequency of service varies from one trip per day to four trips per day, and fares vary from $1.00 to $2.00, based on distance. The Jones Beach-LIRR shuttles operate irregular schedules (presumably coordinated with the arrival of trains) and have a fare of 75 cents. Bus/rail combination tickets are also available.

No information about ridership, costs, or revenues was available on a route-by-route basis. MSBA's regular routes are reported to be multipurpose routes with comparatively little beach use. MSBA also reported that the Jones Beach bus services carried 283,326 riders in 1980, with an additional 90,702 riders using the combination rail-bus service. No costs or revenues were reported for either of these special services.

Suffolk County. Suffolk County transit services consist of commuter rail service provided by the Long Island Railroad, local bus service (both year-round and seasonal) provided by a number of private firms, commuter bus service by a number of private firms, and ferry services providing access to Fire Island National Seashore. Commuter bus and rail services provide access to specific recreation sites. Three of the local routes are of particular importance. These are S-47, a seasonal shuttle service between Babylon Station on the Long Island Railroad and Robert Moses State Park, operated by the Suffolk Bus Corporation; S-62, a year-round service serving Wildwood State Park on the North Shore, operated by Coram Bus Services, Inc.; and S-94, a seasonal route (July 1-August 30) serving the Hamptons and Hither Hills State Park, operated by Hampton Jitney, Inc. In addition, a seasonal express service, similar to the S-47 Route, is being offered during the summer of 1981 between South Shore Mall in Bay Shore and Robert Moses State Park.

Base headways are 60 minutes on S-47 and 120 minutes on S-94. S-62 operates three trips per day. Fares for S-47 are $1.00; for S-62, fares vary from 50 cents to $1.50, based on distance; and fares for S-94 are also distance-based, 35 cents per village.

Ridership and revenue for the three local routes are given in Table A-2. Costs were not reported, but presumably they are less than revenues, since these services do not not receive public subsidies. It should also be noted that ridership for all these routes declined from 1979 to 1980, probably indicating considerable sensitivity to gasoline availability.

In addition to the services mentioned, there have been other proposals and experiments in transit service in coastal areas of Suffolk County which are not now in operation. At one time, there was an attempt to introduce a connecting bus line between the Bay Shore Station on the LIRR and a ferry slip to Fire Island, but this was terminated after vigorous protests by local taxi companies. Also, there was an attempt to establish a summer van operation between Hampton Bays and the village of Quoque in 1978 and 1980, but this was discontinued due to low ridership.

(Sources: New York Metropolitan Transportation Authority; Metropolitan Suburban Bus Authority; and Suffolk County, New York, Department of Planning, Transportation Division)

TABLE A-2. Ridership and Revenue for Local Routes Serving Coastal Areas in Suffolk Co., New York

ROUTE	1980 RIDERSHIP	1980 REVENUE, $
S-47	3,555	1,965
S-62	48,293	12,136
S-94	2,312	N.A. (3,640 in 1979)

South Atlantic

There are few large cities located directly on the coast in the South Atlantic region; however, there are several important resort communities. All the coastal transit services reported in this area are located in resort communities (although Virginia Beach is heavily used by local residents as well) and most of them are special circulation-oriented services designed primarily for out-of-town visitors.

Ocean City, Maryland

Ocean City is a major summer resort community, drawing large numbers of day and overnight visitors from Washington, Baltimore, Philadelphia, and surrounding areas. Permanent population is quite small, around 5000; average total population during the peak month of August, however, is about 200,000. Activity is concentrated in a densely-developed commercial strip about 10 miles long and two to four blocks wide. This strip is located on a barrier iisland and is physically isolated from the mainland by a series of bays. For most of the length of the island, there are only two north-south streets.

Bus services are provided by the Town of Ocean City without state or federal subsidy. The bus fleet consists mostly of gasoline-powered vehicles with passenger capacities of 26 to 35. Services are provided year-round, but are greatly augmented in the summer. Summer service consists of four routes on the island and one connecting the island to an airport on the mainland. The island routes are operated as branch routes: all terminate at the southern end of the island, but their northern terminals are located at different points. The main route extends the entire length of Ocean City (to the Delaware state line) and operates with 10-minute headways. The three shorter routes operate on 30 to 40 minute headways, which means that average headways for the four routes combined are about five minutes at the southern tip of the island. Because of traffic congestion and irregular demand patterns, however, vehicles tend to bunch, and actual headways are irregular. Fare for 1981 is 50 cents, up from 40 cents in 1980. In addition to the bus service, Ocean City also operates a so-called "boardwalk train", consisting of a rubber-tired tractor and trailers, in the southern part of the island. Fare for the boardwalk train is 75 cents.

1980 ridership for the bus system, (estimated from farebox revenue) was around 900,000. Revenue was $378,870, with operating costs amounting to $466,449 and total costs to $547,183. These imply a total cost per trip of around $0.61 and an operating ratio of 0.80. Table A-3 shows a breakdown of 1980 operating costs for the Ocean City bus system. Costs per bus hour are unknown, since no statistics are available on the number of hours operated; however, costs are probably in the neighborhood of $10 per bus-hour, as compared with up to $60 per bus-hour for some large transit operators. These low costs are largely due to the availability of low-wage seasonal labor.

(Sources: Town of Ocean City and Maryland Department of Transportation)

Virginia Beach, Virginia

Virginia Beach combines the characteristics of a major resort community with those of a day-use site in a medium-sized metropolitan area. The present-day City of Virginia Beach consists (as is common in Virginia) of what

TABLE A-3. Breakdown of 1980 Operating Costs for Ocean City Bus System

CATEGORY	COST	PCT. OF TOTAL
Vehicle Maintenance	43,365	9
Tires/Tubes	10,573	2
Fuel/Lubricants	125,825	27
Salaries/Wages	233,447	50
Insurance	51,877	11
Interest	1,361	-
TOTAL	466,448	100

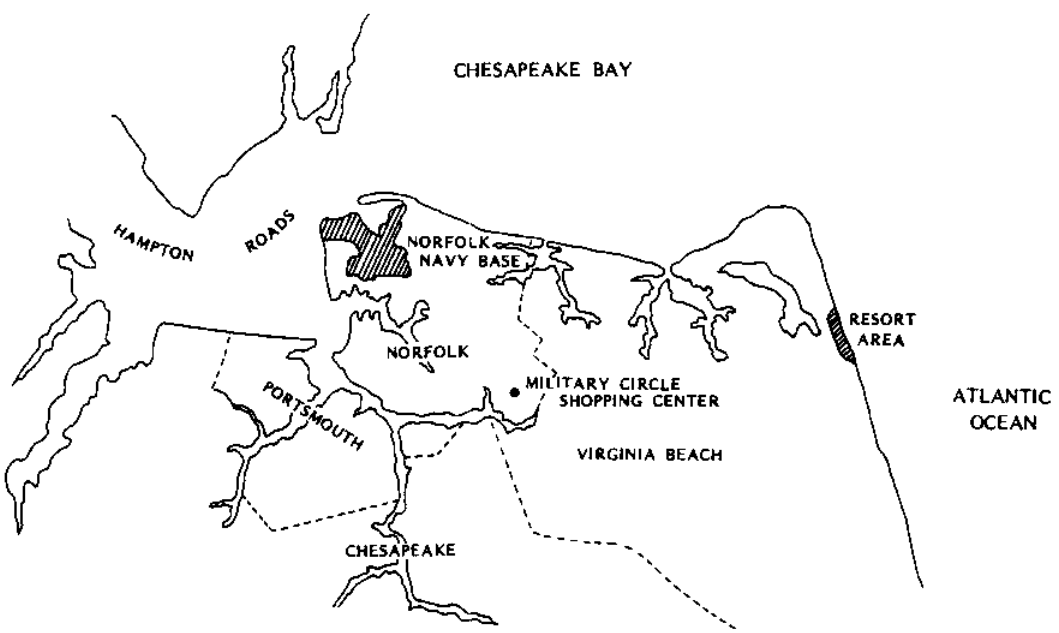

FIGURE A—2: Norfolk-Virginia Beach Area

was formerly an entire county. Much of the area is still agricultural. A band of low-density residential development (in effect, a suburb of Norfolk) stretches across the northern portion of the city. At the eastern end of this developed area lies the old "borough" of Virginia Beach, a densely-developed resort area along the ocean front. Most of the resort development is concentrated in an area along the ocean front about two blocks wide and three miles long. Virginia Beach receives about 2.5 million overnight visits per year, and probably an equal number of day visits. Overnight visitation is increasing fairly rapidly, having doubled since 1972.

Transit services in the Norfolk-Virginia Beach area are provided under the auspices of the Tidewater Transportation District Commission (TTDC) through a variety of contractural arrangements. Regular transit services are provided by ATE Management and Service Company, a national transit management firm, known locally as Tidewater Regional Transit (TRT). In addition, the City of Virginia Beach provides special services, using its own vehicles and drivers, under a contract with TTDC which permits use of federal operating assistance.

The primary regular TRT route serving the borough area of Virginia Beach is Route 20. It operates with base headways of 20 minutes and a 60 cent fare. Annual ridership for the Virginia Beach portion is about 547,000 and annual cost is about $865,000. Revenue is about $315,650, which results in a cost per passenger of $1.58 and an operating ratio of 0.36. There is no specific information on use of this route for recreational trips, but use for this purpose seems to be comparatively minor; for instance, there is little or no seasonal peaking.

Special services have been provided in recent years by both TRT and the City of Virginia Beach. In 1980, TRT operated a service called the Oceanfront Express, which connected the Norfolk Naval Station with the ocean front at Virginia Beach via the Military Circle Shopping Center. This service operated on weekends only from June 15 through September 1 at 90-minute headways. The fare was $1.40 for the complete trip from the Naval Station to the ocean front. Ridership was 4,885. The cost was $39,102, with revenue of $4,971, resulting in a cost per passenger of $8.00 and an operating ratio of 0.13. Due to the low ridership, service was discontinued after the 1980 season. TRT continues to offer special service between the Naval Station and Virginia Beach, however. For 1981, TRT is providing unscheduled service. Personnel who are normally used in a van pooling program (which is less active in the summer) are used to provide liaison with the Navy, and to arrange for service when ships are in port. The 1981 fare for the trip from the Naval Station to the ocean front is $3.00.

A second special service in the Virginia Beach area is the Sunshine Special Service, which was operated by TRT in the summer of 1980 and the City of Virginia Beach in 1981. This service connects residential areas in Virginia Beach with the ocean front, and is primarily intended to provide service for young people. In 1980, TRT operated four routes with headways varying from 75 to 130 minutes from June 15 through September 1. Base fare for all routes was 40 cents one-way. There were two zone points with an additional charge of 15 cents each, making the maximum fare 70 cents. Vehicles on these routes were equipped to handle surfboards and bicycles.

All four Sunshine Special routes had a combined ridership of 34,168. Total cost for the service was $97,328 and total revenue was $17,882. Cost per passenger was thus $2.85 and the combined operating ratio was 0.18. Daily ridership figures are available. They reveal wide variations, but no systematic peaking pattern within the week. (See the Main Report, Table 4) Also, operational problems were noted. These resulted from handling surfboards and bicycles. Because of unpredictable demand and the long loading times required by these items, it was difficult to keep schedules.

1981 Sunshine Special Service is being operated by the Transit Division of Virginia Beach Parks and Recreation Department. The same routes are operated as in 1980, but only two vehicles are assigned to them, as opposed to the four vehicles plus one spare assigned by TRT in 1980. This results in four trips per day on one route and three trips per day on each of the others. The vehicles used by the City of Virginia Beach are so-called "trolleys" -- actually small buses with bodies designed to look like old-fashioned trolley cars. Base fare for 1981 is 50 cents with 20 cent zone charges. 1981 ridership, as of mid-July, was reported to be about 200 per day.

The Virginia Beach Parks and Recreation Department also operates "trolleys" and a boardwalk train in the resort area. The boardwalk train (similar to that in Ocean City) is intended mainly as a tourist attraction. It has a fare of 50 cents and makes a modest profit. One problem noted by the City of Virginia Beach was a drop in revenue from the boardwalk train when bus service was instituted in 1980. In response, fares for the boardwalk train were reduced from 75 to 50 cents and hours of operation were reduced.

The City of Virginia Beach began provision of the trolley services in the resort area as a part of its strategy to build up the tourist industry, which is a large part of the economy. In an effort to extend the tourist season beyond the summer months, Virginia Beach began to try to attract convention business. A major part of this effort was construction of the Virginia Beach Arts and Conference Center (known locally as the Pavillion), located about 3/4 mile inland. The trolleys were originally acquired to provide shuttle service between the Pavillion and the hotels along the ocean front during conventions.

Since the resort area also suffers from traffic congestion and inadequate parking during the summer months, it was decided to provide the service during the summer as well as the convention season. The principal route, the Ocean Front Run, provides circulation along the ocean front and shuttle service between the resort area and the large parking lots at the Pavillion, despite the fact that the combination of these purposes results in somewhat circuitous routing (since northbound vehicles must deviate 3/4 miles from this ocean front to serve the parking lots). Average headways are approximately 15 minutes; however, due to traffic congestion and irregular demand, headway control is relatively poor and overloading is a problem. The fare is 25 cents. As part of the city's promotion scheme for conventions, conventions are offered blocks of free tickets for their members; also, souvenir tokens are sold to local businesses to give out to their customers as a promotional device.

Ridership for the 1980 Ocean Front Run was around 154,000. Cost was $195,000 or about $15 to $20 per bus-hour. As in the case of Ocean City, the low per-hour costs are largely due to low wage rates. Farebox revenue was about $45,000; in addition, there was advertising revenue of about $50,000 and charter

revenue of about $10,000. Cost per passenger was about $1.27 and the operating ratio was about 0.23.

Since only farebox revenue is counted in determining the deficit use in calculating federal operating subsidies, the advertising and charter revenue is very important from the city's point of view. Under the agreement between Virginia Beach and TTDC, 50 percent of the "deficit" is funded by federal operating assistance and 50 percent by the city. The city, however, is able to offset most of its share of the subsidy with the advertising and charter revenues.

In 1980, the Virginia Beach trolley fleet consisted of four vehicles, all of which were used on the Ocean Front Run. Expansion of the fleet to nine vehicles in 1981 permitted the city to take over the Sunshine Special service and to add the South Beach Run, connecting the resort area with a golf course, tennis complex, and camping area to the south.

(Sources: Tidewater Regional Transit; Transit Division, City of Virginia Beach Department of Parks and Recreation; and Tourist Development Division, City of Virginia Beach Department of Economic Development)

Nags Head, North Carolina

Nags Head is a relatively isolated resort community located on the Outer Banks of North Carolina. The area in question actually consists of several

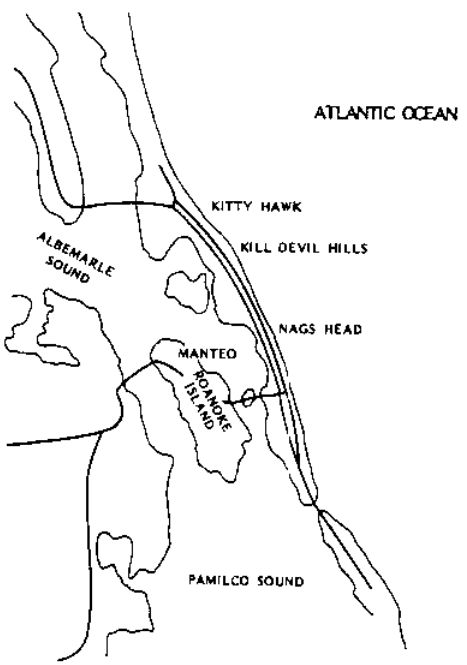

FIGURE A–3: Nags Head and Vicinity

small towns in Dare County, including Kitty Hawk, Kill Devil Hills, South Nags Head, and Manteo, as well as Nags Head itself. In addition to the beach, the area contains two well-known historic sites, the Wright Brothers Memorial and the site of the "Lost Colony" on Roanoke Island. The Dare County Chamber of Commerce estimates peak concentrations of 10,000 day visitors and 47,300 overnight visitors in the entire county in 1980. Town of Nags Head officials report peak populations in the Nags Head vicinity to be 40,000 to 50,000.

The Town of Nags Head sponsors a special service known as the Beach Bus, which began in 1980 and continued in 1981. The main motive for providing the service is to try to relieve traffic congestion. The Nags Head-Kill Devil Hills-Kitty Hawk strip is located on a narrow barrier island and has only two north-south roadways, both of which are two-lane, two-way roads. In addition to existing congestion on these roadways, the area is expecting a major influx of visitors in the near future for a celebration of the 400th anniversary of the founding of the Lost Colony. Nags Head officials hope that by offering the bus service in advance of the celebration, they will condition their "regulars" to use it and thus reduce congestion during the celebration.

The Nags Head service is subsidized by federal rural transit operating assistance grants (Section 18 grants), administered by the North Carolina Department of Transportation. The 1980 service was operated as a demonstration project, while the 1981 service is operated under a regular Section 18 grant requiring financial participation by the town.

The 1980 service consisted of a single route from South Nags Head to Kitty Hawk, which operated every day from June 1 to September 1 on 60-minute headways. The vehicle fleet consisted of leased full-sized buses. 1980 fares were 25 cents. Ridership was 13,365. Total cost was $39,953 and revenue was $5,262. (It is not clear whether this is farebox revenue or total revenue). Cost per passenger was thus $2.99 and the operating ratio was about 0.13.

The 1981 service is provided by a private contractor using 19-passenger Mercedes buses leased from Tidewater Regional Transit of Norfolk. Two routes are operated: the "By-the-Sea" route operated in 1980 and a route connecting Nags Head with Manteo on Roanoke Island. Headways, as in 1980, are about 60 minutes, but fares have been raised to 50 cents.

Another special service in the Outer Banks area is a publicly-subsidized intercity route connecting Manteo with Elizabeth City, via the Nags Head region. This route, which is operated by the Virginia Dare Transportation Company under a purchase-of-service agreement with the State of North Carolina, provides transportation for low-income residents of southern Currituck County (on the mainland opposite the Nags Head-Kitty Hawk area) who work in tourist related businesses in Dare County.

(Sources: Town of Nags Head, Dare County Chamber of Commerce, and North Carolina Department of Transportation)

Wilmington, North Carolina

Transit service in Wilmington is provided by the Wilmington Transit Authority (WTA). A single year-round route is operated weekdays only between downtown Wilmington and the coastal resort community of Wrightsville Beach, 13

miles form Wilmington. Three trips per day are operated. Fare from Wilmington to Wrightsville Beach is 55 cents.

Ridership for this route was 15,806 for fiscal year 1980-81. Operating costs were $30,227, resulting in an operating ratio of 0.23 and a cost per passenger of $1.91. Survey information indicates that this route is used primarily by transit dependents for work trips; however, the survey was taken in March and thus does not reflect conditions during the summer beach-use season.

In 1979, WTA operated a beach shuttle between a designated parking area just inside the Wrightsville Beach city limits and the beach front area. The shuttle operated weekends only between July 7 and August 25 from 10:00 a.m. to 6:00 p.m. One 19-passenger minibus was used to provide continuous service (the resulting headways were not reported). Operating costs were $2,160; ridership was 150 and revenue $56.09, resulting in an operating ratio of 0.03 and a cost per passenger of $14.40. In addition to the operating costs listed above, the city of Wrightsville Beach spent $1,000 on radio advertising for the shuttle. The service was discontinued due to the low ridership.

(Source: City of Wilmington Planning Department)

Florida Peninsula

The Florida Peninsula is characterized by large coastal cities and extensive resort development. Despite these seemingly favorable conditions, comparatively little coastal transit service was reported. The bulk of what was reported consists of regular fixed-route service; although there are numerous routes serving coastal areas in several cases these were reported to receive comparatively little use by recreationists.

Jacksonville, Florida

Jacksonville is a city of about 600,000 in northeastern Florida. Although Jacksonville recently incorporated all of Duvall County, and now includes some 25 miles of beach, the old city of Jacksonville was located about 10 miles inland. Major coastal recreation areas include Jacksonville Beach; Neptune Beach; Atlantic Beach; and K. A. Hannah State Park, a major oceanfront camping and recreational facility.

Transit service is provided by the Jacksonville Transportation Authority and the Jacksonville Planning Department. Regular fixed-route service to coastal recreation sites includes two east-west routes operating on 60-minute headways that connect the Jacksonville central business district with the beaches. In addition, north-south service is provided between Atlantic Beach and the county line to the south by Route 51A. Finally, Route 60 connects the Mayport Naval Station with Jacksonville Beach. This route also serves K. A. Hannah State Park and major oceanfront hotels. Base fare from the Jacksonville central business district to the beaches is $1.00; fares within the beach area are 50 cents. Route-by-route ridership and financial data are unavailable.

In 1977, an experimental service known as the Beach Buggy operated in the beach area. This route served the oceanfront hotels, K. A. Hannah State Park,

the public golf course and tennis courts at Jacksonville Beach, the fishing pier, and other coastal recreation sites. Headways were 60 minutes; fares were 25 cents per ride or $5 per week, which also included admission to K. A. Hannah State Park. In spite of a large marketing effort and good visibility, ridership never approached anticipated levels and the service was discontinued after Labor Day, 1977.

(Source: Jacksonville Transportation Authority)

West Palm Beach, Florida

West Palm Beach has six regular transit routes which serve coastal recreation sites. Headways range from 30 to 90 minutes; the base fare is 60 cents. Ridership ranges from over one million passengers per year on Routes 1 and 4 along the coast to around 100,000 on Routes 6 and 9 to around 25,000 on Routes 10 and 12. Information about costs and revenue for specific routes was unavailable.

(Sources: West Palm Beach Transit Authority and Palm Beach County Transportation Authority)

Fort Lauderdale, Florida

Transit service in Fort Lauderdale is provided by the Broward County Division of Mass Transit. Three routes provide service in coastal areas. Routes 10 and 95 provide service on 20-minute headways; the beach buggy route provides service on 30-minute headways. Fares are 50 cents. Information on ridership and costs is not available on a route-by-route basis.

(Source: Broward County Division of Mass Transit)

Miami, Florida

The Miami metropolitan area is well-known as a coastal resort area. Major beach areas include Miami Beach and Key Biscayne. Transit service is provided by the Miami-Dade County Transportation Administration. The Miami Beach area is particularly well-served by regular bus routes; at least 10 routes connect Miami Beach with areas to the north and west. Headways on these routes vary from 10 to 30 minutes; fares are 60 cents. Ridership and cost information is not available on a route-by-route basis; however, most patrons on these routes are reported to be transit dependents (many of them elderly people) who live in Miami Beach. Recreational use of Miami Beach by residents of other parts of the Miami area is reported to be low, and consequently, these routes play a minor role in providing beach access for local transit dependents.

Other coastal services include three "shuttles" (actually, low frequency, low-fare fixed-route services, not shutttles in the sense used elsewhere in this report). These include the Key Biscayne Shuttle and the North Miami Shuttle, which operate on 60 minute headways, and Route 39X, which connects Key Biscayyne with areas south of Miami such as Homestead and Homestead Beach, and operates one trip per day. Fare on shuttle routes is 35 cents. As in the case of the Miami Beach routes, use of these services for recreation trips is reported to be fairly minor.

In addition to the public services described above, private tour services provide transportation to outlying recreational areas such as the Florida Keys and the Everglades.

(Source: Metropolitan Dade County Transportation Administration)

Gulf Coast

The Gulf Coast, although less heavily developed than the Florida Peninsula, contains several large urban areas and a number of resort communities. Nevertheless, very few coastal transit services were reported in this region.

Pensacola, Florida

Pensacola is located on Pensacola Bay, about six miles from the Gulf of Mexico. Several attempts have been made to provide special transit service to Pensacola Beach, which is located across the bay on the shore of the Gulf. This service required one hour to cover the 12-mile round trip and charged a fare of $1.00. Actual ridership figures are unavailable; however, patronage was disappointing, and the service was discontinued.

(Source: County Administrators Office, Escambia County, Florida)

Biloxi-Gulfport, Mississippi

Transit service in the Biloxi-Gulfport area is provided by the Mississippi Coast Transportation Authority. One regular route is operated between Gulfport and Biloxi on U.S. 90, which runs along the beach front. This route serves a majority of the hotel/motel establishments, the coliseum-convention center, and most of the tourist-oriented facilities. Actual ridership is not available, but use by visitors is reported to be limited.

In addition to this route, the Transportation Authority provides charter service for conventions and special interest groups. Also, there are two privately-owned, rubber-tired tour trains operating in the area, one in Gulfport and the other in Biloxi.

(Source: Gulf Regional Planning Commission)

New Orleans, Louisiana

New Orleans is not located directly on the Gulf of Mexico and hence has little coastal transit service. One special intercity service was reported. This operates between New Orleans and Grand Isle, which is located 60 miles south of New Orleans. Three round trips per day are provided at a round-trip fare of $2.00. No information on costs or ridership was available.

(Source: Louisiana Department of Transportation and Development, Office of Aviation and Public Transportation)

Southern Pacific

The Southern Pacific region (the California coast from the San Francisco Bay Area south) is characterized by very large coastal urbanized areas, abundant beaches, and a number of small communities oriented toward tourism (although less purely resorts than similar communities on the Atlantic Coast). Coastal transit services, both regular fixed-route services and a variety of experimental services, are common throughout the region.

San Diego, California

Coastal recreation sites in the San Diego area include numerous public beaches. In addition, important historical and sightseeing attractions, such as the Cabrillo National Monument and La Jolla, are located in coastal areas. Annual visitation at individual sites ranges from 2.75 million at Mission Beach to less than 100,000; overall there are around 10 sites with annual visitation rates of over one million. Although tourism is quite important to the local economy, most use of coastal recreation sites appears to be by local day visitors.

Transit service in coastal portions of the southern part of San Diego County (which includes the cities of San Diego, Coronado, and Imperial Beach) is provided by the San Diego Transit Corporation (SDTC). SDTC provides service on nine routes serving coastal sites. Service characteristics and operating results for these routes for fiscal year 1980 are summarized in Table A-4. Current base fares are 80 cents for local routes and $1.00 for express routes. Extra service is provided on coastal routes during peak periods.

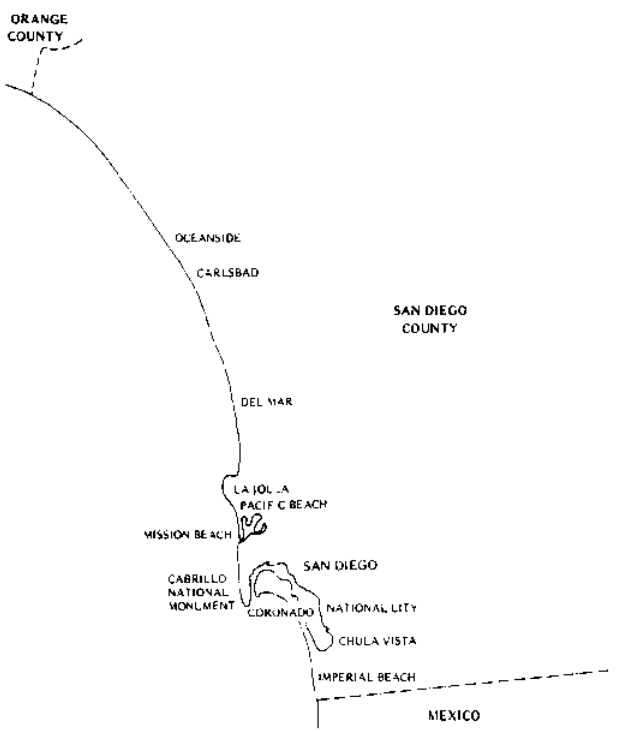

FIGURE A-4: Coastal Portions of San Diego County

TABLE A-4. Characteristics of San Diego Transit Corporation Coastal Routes

ROUTE	TYPE	BASE HEADWAY	ANNUAL RIDERSHIP	OPERATING RATIO
6	Local	30 Min.	904,483	.32
9	Local	30 Min.	1,808,979	.48
27	Local	30 Min.*	560,082	.25
30	Express	30 Min.*	259,320	.46
33	Local	30 Min.	128,143	.21
34	Local	30 Min.	912,461	.39
35	Local	30 Min.	423,716	.38
41	Local	30 Min.	591,451	.27
80	Express	30 Min.	197,801	.29

* No Weekend Service

Transit services in coastal portions of San Diego County north of the city of San Diego are provided by North County Transit District (NCTD). Service to sites in the immediate vicinity of the coast is provided by six routes, whose characteristics are summarized in Table A-5. Base fares are 65 cents for local routes.

Daily ridership counts are available for all SDTC and NCTD routes. In addition, on-board survey data taken on both weekdays and weekends during the summer of 1977 is available for selected coastal routes in the two systems. Daily ridership counts for SDTC are analyzed in the main body of this report (see Table 6). Major results of this analysis are that most routes in coastal areas do not experience patronage peaks on weekends even during the summer, and that variations in daily ridership, although large and irregular, are not noticably different from those on STDC's noncoastal routes. The on-board survey data, however, establish that there is a shift towards greater use of the coastal routes for recreation trips during the summer, especially on weekends. On summer weekends, recreation trips account for 27 percent of the ridership on coastal routes, as opposed to 14 percent on summer weekdays and six percent on autumn weekdays. Apparently, the lack of weekend peaking is due to the fact that, for coastal routes serving multiple purposes, the increases in recreation trips on weekends fail to balance the reductions in other types of trips.

In addition to publicly-provided transit services already described, there is a privately-operated service known as "The Bus That Goes in Circles," which caters primarily to the tourist traffic. This service operates a single loop route connecting hotels with major tourist attractions, including Mission Bay Park and Mission Beach. Headways are 140 minutes. Adult fares are $6.00 for a ticket which is good for an entire day. Ridership is around 4,000 per month;

TABLE A-5. Characteristics of North County Transit District Coastal Routes

ROUTE	HEADWAY	ANNUAL RIDERSHIP
301	30 Min.	708,040
308	60 Min.	95,841
312	60 Min.	103,496
321	60 Min.*	68,911
361	60 Min.	104,056

*Operates During Morning and Evening Peaks Only.

major sources of business are conventions and package tours. Financially, the route is reported to be "only breaking even." The same firm also operates a service known as the Strand Streaker. This is a fixed-route service connecting the cities of Imperial Beach and Coronado, and is provided under a contract with these cities. Headways are 30 minutes on weekdays and 80 minutes on weekends; base fare is $1.00. Ridership totals about 120,000 per year; however, work trips to North Island Naval Air Station in Coronado account for many of these.

(Source: San Diego Association of Governments, San Diego Transit Corporation, North County Transit District, and The Bus That Goes In Circles, Inc.)

Los Angeles, California

The Los Angeles metropolitan area contains numerous public beaches, most of which are day-use sites. Intensity of use varies, depending in part on accessibility, and ranges downward from three million visits per year at Santa Monica.

Regional-scale transit services are provided by the Southern California Rapid Transit District (SCRTD) and the Orange County Transit District (OCTD). In addition, municipal systems in Santa Monica, Long Beach, and Laguna Beach supply service in coastal areas.

For the most part, transit service at coastal recreation sites in the Los Angeles area is supplied by regular transit routes. Figure A-5 shows SCRTD routes in coastal portions of Los Angeles County. Note the complexity of this route pattern, which involves about 23 routes. These include radial and crosstown routes terminating at the shore as well as routes running parallel to

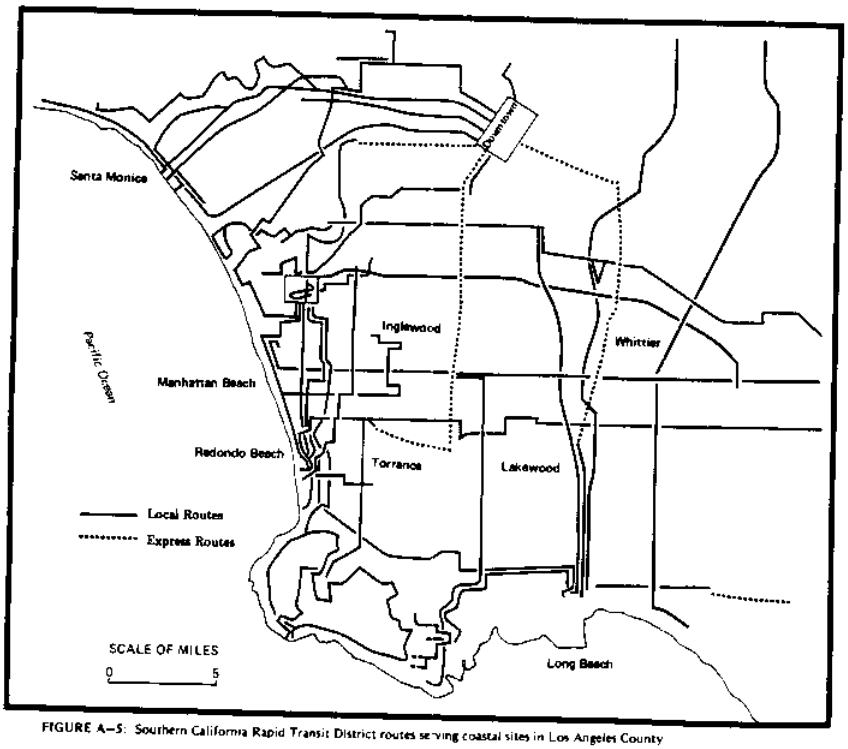

FIGURE A-5: Southern California Rapid Transit District routes serving coastal sites in Los Angeles County

portions of the shore. Also, both local and express routes are involved. Among these routes are some of the busiest in the SCRTD system, particularly the Wilshire Boulevard and Santa Monica Boulevard routes, which terminate at Santa Monica. Base headways on these routes range from 7 to 60 minutes, with 30- and 60-minute headways being most common. The fare for all local routes is 85 cents. Fares for express routes vary between $1.25 and $2.05.

Ridership and costs are also quite variable. The Wilshire Boulevard route serves up to 20 million trips per year; however, most of these are not recreation trips. Other routes in coastal areas serve as few as 150,000 annual passengers. Costs per vehicle-hour (as estimated by the two-factor formula used by SCRTD) range from around $40 to almost $60. Operating ratios range between 0.20 and 0.49.

SCRTD reports that there is weekend peaking on routes in the coastal area, and that several of these require extra service on summer weekends. Routes requiring extra service include Route 4 (Santa Monica Boulevard), Route 75 (Venice Boulevard), and Route 83 (Wilshire Boulevard), all terminating in the Santa Monica area. In addition, special summer schedules and extra service are provided on Route 88, an express route connecting the San Fernando Valley with routes leading to Santa Monica, and Route 829, which serves the Seal Beach area, just south of the Los Angeles-Orange County Line.

In Orange County, major beach areas include Seal Beach, Huntington Beach, Newport Beach, and Laguna Beach. Transit service is provided by OCTD, which operates what is essentially a grid system. Since most of the grid runs east-west and north-south and the coast runs northwest-southeast, many routes (both north-south and east-west) terminate in shore areas. In addition, OCTD

operates one route (Route 1) parallel to the shore from one end of the county to the other. In all, some 21 OCTD routes serve beach areas. Headways range from 15 to 60 minutes, with 30-minute headways being most common. OCTD employs time varying fares. Base fares are 60 cents; however, fares during work-trip peaks are 75 cents.

Ridership for OCTD coastal routes (based on 1980 daily counts) ranged from about 300,000 annual passengers to 1,500,000 annual passengers.

OCTD has survey information on trip purposes available on a route-by-route basis. It shows that recreation trips accounted for from 0.6 percent to 8.6 percent of trips on coastal routes. The survey was taken in October, however, so these figures do not reflect peak beach use. OCTD estimates that there is an overall increase in patronage on beach routes of about 10 percent in the summer. Since this increase occurs at a time when school trips are not being made, beach trips may actually account for around 20 percent of summer ridership on coastal routes. The most recent financial data available are for 1978-79. They reveal hourly costs of about $25 to $35 for OCTD coastal routes, and operating ratios of 0.11 to 0.23. However, due to rapid changes in costs, fares, and service levels, these figures are poor indicators of current conditions.

OCTD does experience summer peaking on routes serving beach areas. In the past, this was counteracted by assigning extra vehicles to specific routes for the summer. Current practice is to assign extra service as needed from a system-wide pool; however, planning for seasonal service includes tentative assignments of extra service to specific routes.

In 1980, OCTD operated a park-and-ride shuttle service in Huntington Beach between parking lots at Golden West College and Huntington City Beach. The shuttle, which operated weekends only, was intended to provide beach visitors with an alternative to use of congested parking and traffic facilities. Headways were 30 minutes and fares were 25 cents. The experiment was discontinued after about six weeks due to low ridership. Ridership for the first seven days of operation totaled 186, or about 27 per day. Expansion of these ridership figures to the full period of operation results in an estimated ridership of about 350 at a cost in excess of $4,200, or $12 per passenger.

The City of Laguna Beach also operates special services during a six-week art festival season in July and August. These services include two "trams" which provide circulation among the art festivals and the beach and commercial areas and a van which connects a park-and-ride lot with the festival area and the tram system. Details of ridership, costs, and revenue are not available.

(Sources: Southern California Rapid Transit District, Orange County Transit District, and City of Laguna Beach)

Ventura-Oxnard, California

The Ventura-Oxnard area contains a number of coastal recreation sites, including San Buenaventura State Beach, Mandalay Beach park, McGrath State Beach, and municipal marina facilities in Oxnard and Ventura. Transit services are provided by South Coast Area Transit (SCAT). Despite the abundance of coastal recreation sites, SCAT provides services only to the two municipal marinas. During past years, several special beach-oriented transit lines were

initiated on a trial basis, but were terminated due to low patronage. Detailed information concerning these experimental services is not available.

(Source: South Coast Area Transit)

Santa Barbara, California

Transit service in the Santa Barbara area is provided by the Santa Barbara Metropolitan Transit District. Five routes provide direct access to coastal recreation sites. Base fares are 50 cents; other route characteristics are summarized in Table A-6. Use of these routes for recreation trips is reported to be fairly high; this is particularly true of Route 21.

(Source: Santa Barbara Metropolitan Transit District)

San Luis Obispo, California

A special intercity service is operated along California Route 1 from San Louis Obispo to Monterey by Coast Lines, a private firm created with the encouragement of local governments in the area and subsidized by the California Department of Transportation. This service provides access to a number of small tourist-oriented communities and state beaches located along this relatively isolated portion of the California coast. Service began in November 1980, with one round-trip per day. Zone fares are charged; there are 15 zones with a fare

TABLE A-6. Characteristics of Santa Barbara Metropolitan Transit District Coastal Routes

ROUTE	RECREATION SITE	BASE HEADWAY	APPROXIMATE ANNUAL RIDERSHIP
5	Arroyo Burro Beach	30 Min.	300,000
9	Goleta Beach	30 Min.	170,000
11	Goleta Beach	30 Min.	1,100,000
15	Shoreline Park/ West Beach	60 Min.*	100,000
21	East Beach/West Beach	30 Min.	315,000

* No Weekend Service

of $1.00 each. Ridership began at around 300 passengers per month, and had increased to nearly 600 passengers per month by July 1981. A second trip was added in October 1981.

Other coastal transit services in San Luis Obispo County include summer weekend service between San Luis Obispo and Avila Beach, regular transit in the Pismo Beach/Grover City/Oceano Area, and service provided by the County between the beach communities of Morro Bay, Cambria, and Cayucos.

The San Luis Obispo-Avila Beach service is provided by San Luis Transit, Inc., a private firm. Four round-trips per day are operated at a one-way fare of $1.00 per trip. Patronage for the summer of 1981 averaged about 18 persons per weekend day.

Regular transit service in the Pismo Beach area provides access to the beach at several points. Two routes, an express route and a local route, are operated, each at a headway of one hour. During the summer of 1981, Saturday service on the "express route" was initiated specifically to provide beach service; however, it is reported to have been "not an overwhelming success."

The county-operated services connecting Morro Bay, Cayucos, and Cambria operates three trips per day on weekends only. Fares are 25 cents within a single community and 75 cents for the entire route. This service is reported to carry approximately 50 passengers per day.

(Source: San Luis Obispo County Area Council of Governments)

Monterey, California

Monterey County is located immediately south of Santa Cruz County. Coastal communities in the county include Monterey, Marina, Ford Ord, Seaside, Del Rey Oaks, Pacific Grove, and Carmel. The Monterey Peninsula area is a major tourist attraction; most of the sites popular with visitors are located on or near the coast, although the usual beach activities such as swimming and sunbathing are of relatively minor importance.

Transit service in the Monterey area is provided by Monterey Peninsula Transit (MPT). Coastal areas are served by eight regular routes, operating on headways of 60 to 120 minutes (depending on route, time of day and day of the week) and charging fares of 50 cents. In addition, MPT operates a route to Big Sur, south of Monterey. This route has a frequency of two trips per day and a zone-fare system charging 50 cents per zone. Also, a new special intercity service, provided by Coast Lines, connects Monterey with coastal communities to the south. (See the section on San Luis Obispo for a description of this service).

(Source: Association of Monterey Bay Area Governments)

Santa Cruz, California

Santa Cruz is located about 50 miles south of San Francisco on Monterey Bay. There are a number of beaches in the area, which are used by both local residents and visitors. Nonlocal use of the beaches in the Santa Cruz area tends to be higher than elsewhere in northern California, in part because summer

weather here is more reliable than elsewhere in northern California. Most of the beaches in Santa Cruz County are accessible by either regular transit routes or special shuttle services.

Regular transit service in Santa Cruz County is provided by the Santa Cruz Metropolitan Transit District (SCMTD). Coastal sites in Santa Cruz are served by four routes and those in the neighboring town of Capitola by three routes. Base headways for these routes are 30 to 60 minutes and base fares are 25 cents. Ridership and revenue statistics are not available on a route-by-route basis.

Santa Cruz, Santa Cruz County, and SCMTD also operate seasonal fare-free beach shuttles. This program began in the summer of 1976 and has since evolved into several different services. The oldest and best established of these operates on 20-minute headways between the Santa Cruz central business district, a motel district on Ocean Avenue, and the beach (see Figure A-6). In 1979, an additional shuttle route, also operating on a 20-minute headway, was instituted in the neighboring town of Capitola, and a second route in Capitola was added in 1981. 1980 ridership for the Santa Cruz shuttle was around 52,500; 1980 ridership for the Capitola shuttle was around 31,400. Costs were around $25,000 and $12,000, respectively. A third shuttle project in the Santa Cruz area involves a combination of shuttle service with a parking management scheme. This project is intended to reduce nonresident traffic and parking during the summer in the East Cliff residential area. This project, which was originally proposed to the Urban Mass Transit Administration in 1979 as a demonstration project, was finally implemented in the summer of 1981.

(Source: Santa Cruz Metropolitan Transit District)

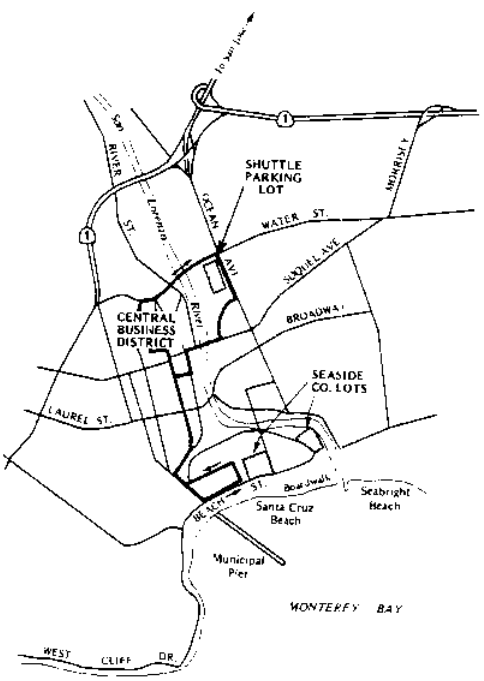

FIGURE A-6 Route of Santa Cruz Beach Shuttle

San Francisco, California

Coastal recreation sites in the San Francisco Bay area include the Golden Gate National Recreation Area (GGNRA) in San Francisco and southern Marin County, Point Reyes National Seashore in northern Marin County, and a series of state beaches in San Mateo County. These areas, especially the GGNRA, include a variety of recreational resources other than those usually thought of as coastal. Meanwhile, most beaches in the area (with the exception of Ocean Beach in San Francisco) are relatively small and isolated. Use for normal beach-related activities is also inhibited by the summer climate in the area, which is usually cool and foggy in the immediate vicinity of the shore. Nevertheless, three beaches in the area, Ocean Beach, Stinson Beach in Marin County, and Half Moon Bay State Beach in San Mateo County, each experience more than one million visitors per year.

A number coastal transit services are provided. Transit operators in coastal parts of the area include the Golden Gate Bridge, Highway and Transportation District (GGBHTD), which operates bus and ferry service to and within Marin County; the San Francisco Municipal Railway (Muni) which provides bus and light rail service in San Francisco, with limited bus service to portions of the GGNRA in southern Marin County; and the San Mateo County Transit District (SamTrans) which provides express bus service between San Francisco and San Mateo County and local bus service within San Mateo County.

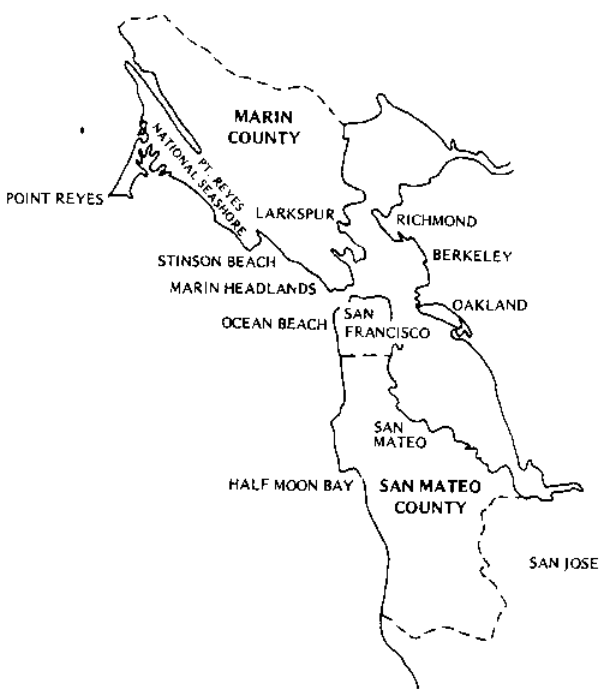

FIGURE A-7: Coastal Portions of the San Francisco Bay Area

In Marin County, GGBHTD provides both weekday commuter services and weekend services intended for recreationists. The former include Route 62, which links Bolinas and Stinson Beach with San Francisco, and Route 64, which links San Francisco with Point Reyes Station. Weekend service includes Routes 60 and 612, which serve Muir Woods (part of GGNRA, although not really a coastal site); Route 63, which connects Marin City with Stinson Beach; and a modification of service on Route 64, which operates on weekends between Point Reyes and the San Francisco Zoo, rather than the San Francisco central business district, as on weekdays. In 1979, GGBHTD also operated a seasonal weekend service between Point Reyes and the Larkspur Ferry Terminal. Table A-7 summarizes the design and operational characteristics of the GGBHTD coastal routes. Fares are omitted from the table because GGBHTD employs a complicated zone fare system. Weekend service on Routes 63 and 64 is partially subsidized by the National Park Service. In addition to the GGBHTD services, Muni provides weekend and holiday services to the Marin Headlands portion of GGNRA through its Route 76, which is partially subsidized by the National Park Service.

In San Francisco, access to Ocean Beach (now part of GGNRA) is provided by a number of regular Muni routes. These include bus Routes 5, 31, 38, and 71 and light rail Route N. Bus Routes 18 and 28 provide service in coastal areas of the Presidio of San Francisco and Lincoln Park, also parts of GGNRA. Bus Routes 10, 18, and light rail Routes L and M provide service to the San Francisco Zoo, located on the coast in Lake Merced Park in southwest San Francisco. Table A-8 summarizes design and operating characteristics of Muni routes in coastal areas; however, it should be noted that most of these routes are serving multiple purposes, and that coastal recreation trips may constitute a comparatively minor part of their ridership.

TABLE A-7. Characteristics of Golden Gate Bridge, Highway, and Transportation District Bus Routes Serving Coastal Sites in Marin County

ROUTE	TYPE	ROUND TRIPS PER DAY (FY 79/80)	RIDERSHIP (FY 79/80)	OPERATING RATIO (FY 79/80)
60	Weekend	3	5,100	.31
61	Weekend	4	500*	?*
62	Commute	1	17,700	.27
63	Weekend	11	25,300	.11
64	Commute	1	19,600	.37
	Weekend	2	13,000	.13
65	Weekend	3	718*	.007*

* FY 79/80 Performance for these Routes, which Serve the Larkspur Ferry Terminal, was affected by a Ferry Strike.

TABLE A-8. Characteristics of San Francisco Municipal Railway Coastal Routes

ROUTE	BASE HEADWAY (Min)	FARE	ANNUAL RIDERSHIP
5	7	.50	4,000,000
10	10	.50	5,200,000
18	15	.50	1,200,000
28	10	.50	3,800,000
31	8	.50	3,500,000
38	6	.50	12,700,000
71	15	.50	4,300,000
N	6	.50	5,000,000
L/M	6	.50	10,600,000

SamTrans offers comparatively little transit service in the coastal portions of San Mateo County. Half Moon Bay is served by two routes. Routes 1A and 1H (actually branches on the same route) provide six trips per day on weekdays, four trips on Saturdays and three trips on Sundays between Daly City Bay Area Rapid Transit station and Half Moon Bay. Route 90H offers hourly service on weekdays and Saturdays between San Mateo and Half Moon Bay. SamTrans uses a zone fare system. Regular fares on Route 1A and 1H from Daly City to Half Moon Bay are 55 cents and fares on Route 90H from San Mateo to Half Moon Bay are 40 cents. SamTrans reports that use of these routes for recreation trips is relatively low.

(Sources: San Francisco Municipal Railway; Golden Gate Bridge, Highway, and Transportation District; San Mateo County Transit District)

Northern Pacific

Coastal areas north of the San Francisco area are almost entirely rural. Only two coastal transit systems were reported, both small rural systems located in southwestern Washington.

Pacific County, Washington

Pacific County is a mostly-rural area located about 120 miles southwest of Seattle and 145 miles northwest of Portland. Although most economic activity in the county is related to forest products, several small towns along the coast

provide services related to sportfishing and tourism. Transit services are provided by the Pacific Transit System, which is currently contracting with Sun West Stage Lines, a private firm, to provide service. Two routes are operated in coastal areas. Route 24 serves Ilwaco with two trips per day; Route 20 serves Ilwaco, Long Beach, and Ocean Park with 120-minute headways. Fares are 25 cents. Route-level ridership statistics are not available for summer months; however, average monthly ridership for the period January-May, 1981 was 1,092 for Route 20 and 379 for Route 24.

(Source: Pacific Transit System)

Grays Harbor County, Washington

Grays Harbor County is located in southwestern Washington, immediately north of Pacific County. The major population center of the county is located at the head of Grays Harbor and includes the small industrial cities of Aberdeen and Hoquiam. A number of small communities are located along the shore north and south of the mouth of Grays Harbor.

Coastal transit service is provided by Grays Harbor Transit, which operates fixed-route, paratransit, and ferry service. Regular fixed-route service from Aberdeen to Westport and Grayland (south of Grays Harbor) is provided by Route 55. Route 55 operates seven trips per day on irregular headways. Paratransit Route 56 supplements this service. Route 50 provides regular fixed-route service between Aberdeen and Ocean Shores (north of Grays Harbor). This route operates nine trips per day on an irregular schedule, with some trips extending north along the shore as far as Taholah, about 20 miles north of Ocean Shores. Regular service in this area is supplemented by paratransit Route 51. Fares for these services are 25 cents. During the summer, passenger ferry service is operated across the mouth of Grays Harbor, between Westport and Ocean Shores. This ferry service employs a 49-passenger vessel and makes five round-trips per day on weekdays and six round-trips per day on weekends and holidays. Fare is $1.00. Patronage for the 1980 season (May-September) totaled 30,623.

(Source: Grays Harbor Transportation Authority)

Hawaii

Hawaii is characterized by intense resort development, especially in the Honolulu area. A variety of coastal transit services are operated in the vicinity of Honolulu. In addition, some coastal transit service exists in and around Kona and Hilo, on the island of Hawaii.

Honolulu, Hawaii

The Honolulu region is characterized by tropical climate, numerous coastal recreation sites, and intense resort development, particularly in the Waikiki area. As a result, there are a number of coastal transit services operating in the area.

The regular services in Honolulu are provided by MLT, Inc. under contract with the City and County of Honolulu. Regular transit routes serving coastal

recreation areas include Routes 2 and 88, which connect Waikiki with the Honolulu central business district; Route 52, a circular route connecting the northern and eastern parts of Oahu with Honolulu; and Route 57, a circular route in the southeastern part of the island. In addition, the transit system provides a special weekend service known as the Beach Bus, which runs along the shore from Waikiki to Waimanalo, serving several of the more popular rural beaches.

Routes 2 and 8 operate on 10-minute headways; Routes 52 and 57 on 30-minute headways, and the Beach Bus on 60-minute headways. Fares for all regular transit routes in Honolulu are 50 cents. Ridership on Routes 2 and 8 is on the order of 10 million annual passengers for each route; however, these routes are reported to serve mostly work trips rather than recreation trips. Ridership for Route 52 is around six million passengers per year and that for Route 57 is around three million per year. Patronage for the Beach Bus averages 2500 per weekend day or about 260,000 per year.

In addition to the services provided by the regular Honolulu transit system, the Honolulu Department of Parks and Recreation sponsors a park-and-ride shuttle system at Hanauma Bay, southeast of Honolulu. This service is operated at a profit by a private concessionaire who pays the City and County a monthly fee. The shuttle system employs minibuses with "trolley" bodies to connect the beach with a parking area located on top of a 300-foot cliff about one-half mile form the beach. Year-round service is provided on 15-minute headways at fares of 50 cents one-way and 75 cents round-trip. Ridership is reported to be 3,000 per month or about 36,000 per year. Costs are reported to be about $6,500 per month ($78,000 per year) and revenues to be around $7,000 per month ($84,000 per year). Note that these revenue figures are not consistent with the reported ridership and fares; in all likelihood, ridership is much greater than that reported.

(Sources: City and County of Honolulu Department of Transportation)

Kona and Hilo, Hawaii

Kona and Hilo are resort towns located on the island of Hawaii. Both offer public transit services along the shore to outlying beaches and hotels. Both routes operate on 60-minute headways and charge fares of 25 cents. Ridership in both cases is around 100 per day or 36,000 per year.

(Source: Transit Coordinator, City of Hilo)

Great Lakes

The Great Lakes region is characterized by a number of very large urbanized areas. Most lakefront beaches serve local users; consequently, most coastal transit consists of regular transit routes or access-oriented seasonal services. In addition, there are transit shuttles in the Chicago area, and a park-and-ride shuttle system at Harrington Beach State Park in Wisconsin.

Rochester, New York

Rochester is located in the northwestern part of New York State, about five miles south of Lake Ontario. Recreation sites on the lake include public beaches, a park, and an amusement park. Transit services are provided by the Rochester-Genessee Regional Transportation Authority. Two regular transit routes serve lakeshore sites. Route 1 connects the Rochester central business district with Ontario Beach and Buck Pond State Park; Route 10 serves Seabreeze Park. Both have 30 minute headways and fares of 50 cents.

Also, within the past five years, so-called "Fun Tours" were offered on weekends. These were special services connecting Rochester with beach parks 20 miles away. Fare included admission to the parks. These services proved unpopular and were discontinued.

(Source: Rochester-Genessee Regional Transportation Authority)

Cleveland, Ohio

Cleveland is located directly on the shore of Lake Erie; however, recreational use of the lake is limited due to pollution, industrial development along the lakefront, and a lakefront expressway which separates the shore from the rest of the city. The Greater Cleveland Regional Transit Authority does provide regular service on a small number of routes which pass by municipal parks situated along the lakefront; however, use of these routes for recreation trips is minor. Also, the transit authority provides special service to Cleveland Municipal Stadium, which is located on the lakefront. Although this service is oriented towards recreation trips, it can be considered "coastal" only in the sense that the stadium happens to be located on the lake.

(Source: Greater Cleveland Regional Transit Authority)

Detroit, Michigan

Coastal recreation sites in the Detroit area are located on the shores of Lake St. Clair, which is situated between Lake Huron and Lake Erie. Transit service is provided by the Southeastern Michigan Transportation Authority (SEMTA). One regular route is operated in coastal areas, but it is not used much for recreation trips except in the Grosse Point area.

In 1976 and 1977, SEMTA and the Detroit Department of Transportation (D-DOT) operated an experimental seasonal service designed to provide access to several units of the Detroit Metroparks system (a regional park system), including Metropolitan Beach Metropark on Lake St. Clair. This service, which was designed by SEMTA, D-DOT, the Michigan Department of State Highways and Transportation, the Bureau of Urban and Public Transportation, and the Huron/Clinton Metropolitan Authority (operator of the Metropark system), was intended to provide access to the Metroparks for Southeastern Michigan residents who lack access to automobiles.

Service provided in 1976 consisted of a combination of group and fixed-route service. Service was provided along routes connecting social service and municipal agencies with a metropark. Service was provided seven days per week from mid-June through Labor Day. Service per route consisted of

three morning trips to the park and two afternoon trips from the park at a fare of 60 cents. Ridership in 1976 totaled 4,100 riders, of which 80 percent were members of groups and 20 percent were individuals. Average ridership was only three persons per trip; average subsidy per passenger was $14.00.

Service offered in 1977 incorporated a number of revisions which were based on an evaluation of the 1976 service. The 1977 service was again a combination of group and fixed-route service, but this time the emphasis was on the group component. The fixed-route component consisted of a fare discount for Metropark users on regular routes of SEMTA and Tower Bus Lines, Inc. The group component was originally planned to be a charter operation; however, it had to be modified because SEMTA is not legally authorized to provide such service. The final design involved a "planned demand" service, similar to a dial-a-ride operation, in which individuals could call to reserve a place on a bus and would be grouped together by SEMTA. 1977 fares were $1.00 per round-trip for fixed-route service; for group service, round-trip fares were $1.10 in advance or $1.25 cash fare on the day of the trip. 1977 ridership totaled 4,450; however, costs were only $16,000 and revenue was $5,000, resulting in a subsidy of about $2.55 per passenger. Despite this greatly improved performance, the State ceased to fund the project, and it was discontinued.

(Source: Southeast Michigan Council of Governments)

Bay City, Michigan

Bay City is a small urban area (population approximately 80,000) located in northeastern Michigan, about three miles from Saginaw Bay, an inlet of Lake Huron. Transit service is provided by the Bay County Metropolitan Transportation Authority. Route 7-Bangor serves Bay City State Park, Jennison Nature Center, and Tobico Marsh Game Preserve, all located about five miles north of Bay City on Saginaw Bay. Service is provided on a year-round basis, with 30-minute headways and a fare of 40 cents. 1980 ridership was 65,000 (with an increase to 81,000 in 1981), which makes this route one of the busiest in the Bay City system. Ridership is reported to be especially heavy during the spring and summer when the bay is not frozen over and swimming is possible.

(Source: Bay County Metropolitan Transportation Authority)

Muskegon, Michigan

Muskegon is a small industrial city located on the shore of Lake Michigan in the southwestern part of the state. In 1980, the Muskegon Area Transit System operated a small-scale summer bus service called the Sunshine Express to Hoffmaster State park, located 12 miles south of downtown Muskegon. This service, which was intended primarily as a social service for senior citizens and youths, operated on 120-minute headways and charged a fare of 10 cents. Ridership, which was adversely affected by bad weather and a seven-day transit strike in August, totaled 1,402. Costs were $8,000 with farebox revenue of only $140. Although the service was intended to be heavily subsidized, this performance was disappointing, and the service was discontinued.

(Sources: Muskegon Area Transit System and Michigan Department of Transportation)

Chicago, Illinois and Northwestern Indiana

Major coastal recreation sites in the Chicago area include city parks located along the shore of Lake Michigan within the city of Chicago itself and Indiana Dunes State Park and Indiana Dunes National Lakeshore in northwestern Indiana.

Most of the Chicago lakefront is public park land managed by the Chicago Park District. There are extensive public beaches with bath house accomodations as well as marinas and other park facilities. The Chicago Transit Authority (CTA), which provides bus and rail transit service within the city of Chicago, serves these parks with a number of bus routes. Although information on summer recreation trips is not available on a route-by-route basis, CTA reports that there are some 17 east-west bus routes which terminate near lakefront parks and which experience heavy demand for recreation trips. Base headways on these routes range from three minutes to 15 minutes. Regular fares are 80 cents; however, CTA also sells Sunday and holiday passes for $1.20.

The Indiana Dunes area of northwest Indiana contains two major parks, Indiana Dunes National Lakeshore and Indiana Dunes State Park. These are located about 10 miles apart and are separated by a residential area. A number of special seasonal transit services have been employed in the Indiana Dunes area, some of them under the sponsorship of the National Park Service.

Free transit shuttles provide service between the Chicago Southshore Railroad, a commuter line connecting Chicago with South Bend, Indiana, and both the State Park and the National Lakeshore. In addition, special fixed-route service has been operated on an experimental basis between Gary, Indiana and the Indiana Dunes National Lakeshore and Michigan City, Indiana and Indiana Dunes State Park. These special transportation programs were integrated with a program for providing nature hikes led by park rangers.

The shuttle service connecting the Southshore Railroad with Indiana Dunes National Lakeshore employs 15-passenger vans to provide fare-free service at 35-minute headways. 1980 ridership was 5,290; total cost for 1980 was $9,825, which results in a cost of $2.30 per passenger.

The shuttle service connecting the Southshore Railroad with Indiana Dunes state park provides fare-free service on 20-minute headways. 1980 ridership for this service was 8,786; total cost in 1980 was $25,000 which results in a cost of $2.85 per passenger.

The special service from Gary, Indiana to Indiana Dunes National Lakeshore was operated in 1980 by the Northwestern Indiana Regional Planning Commission, primarily as a youth development program. This service used full-sized transit buses to provide service on 60-minute headways at a fare of 50 cents. Ridership was 780; total cost was $24,450 or about $30 per passenger. Due to its low cost-effectiveness, this program was terminated.

The Michigan City service employed a van operating on two-hour headways. Fares were 25 cents. 1979 ridership was reported to be only 20.

(Sources: Chicago Transit Authority, Northwestern Indiana Regional Planning Commission, Indiana Dunes National Lakeshore, Regional Transportation Authority of Chicago, and Michigan City (Indiana) Transit Authority)

Harrington Beach State Park, Wisconsin

Harrington Beach State Park is located on Lake Michigan, 45 miles north of Milwaukee. The state park system operates a shuttle system linking inland parking areas within the park to the swimming beach. This service operates on summer weekends from 11 a.m. to 7 p.m. The shuttle operates on 20-minute headways and is free; however, there is a beach-use fee of $2.00 per day or $10.00 per year which includes use of the shuttle. Although no actual figures were available, ridership is reported to be fairly heavy.

(Source: Southeastern Regional Planning Commission of Wisconsin)

APPENDIX B: INFORMATION REQUEST FORMS

Information Requested

Fixed-Route Services

1. Overall Description of Site(s) Served
   (a) Location
   (b) Type of development
   (c) Predominant activities
   (d) Degree of usage (numbers, if known)
   (e) Season and peaking pattern (if known)
   (f) Auto access and traffic conditions (including availability of parking)
   (g) Other

2. Status
   (a) Active
   (b) Terminated (why?)

3. Design Criteria
   (a) Frequency
   (b) Routes (map)
   (c) Transfer points
   (d) Stop locations (map)
   (e) Fare
   (g) Marketing (any special efforts aimed at recreational users)

4. Institutional
   (a) Operator
   (b) Financial arrangements
   (c) Project status (regular route, demo project, etc.)

5. Results
   (a) Ridership (as much detail as possible -- compare with system as a whole)
   (b) Costs (as much detail as possible -- compare with system as a whole)
      1. Capital
      2. Operating
         (a) Labor
         (b) Maintenance
         (c) Fuel
         (d) Marketing
         (e) Miscellaneous
   (c) Farebox revenue-operating ratio

Information Requested

Shuttle Services

1. Overall Description of Site(s) Served
   (a) Location
   (b) Type of development
   (c) Predominant activities
   (d) Degree of usage (numbers, if known)
   (e) Season and peaking pattern (if known)
   (f) Auto access and traffic conditions (including availability of parking)
   (g) Other

2. Status
   (a) Active
   (b) Terminated (why?)

3. Design Criteria
   (a) Frequency
   (b) Routes (map)
   (c) Vehicles (and why chosen)
   (d) Shuttle lot location and size
   (e) Stop locations (map)
   (f) Parking management measures, if any
   (g) Fares, if any
   (h) Season and hours of operation
   (i) Operator and how chosen
   (j) Marketing
   (k) Other

4. Institutional
   (a) Sponsoring agency
   (b) Financial arrangements
   (c) Type of project (demonstration project, etc.)
   (d) Coordination with other agencies (planning, traffic engineering, police, other operators, etc.)

5. Results
   (a) Ridership (as much detail as possible)
   (b) Costs (as much detail as possible)
      1. Capital
      2. Operating
         (a) Labor
         (b) Maintenance
         (c) Fuel
         (d) Marketing
         (e) Miscellaneous

   (c) Revenue
      1. Fares
      2. Parking fees
      3. Other (please specify)

Information Requested

Special Event Services

1. Description of Event(s)
   (a) Type of event
   (b) Location
   (c) Number attending
   (d) Dates (or season)
   (e) Auto access and traffic conditions (including availability of parking)
   (f) Other

2. Design Criteria
   (a) Type of transit service (fixed route, shuttle, etc.)
   (b) Routes (map)
   (c) Stop locations (map)
   (d) Fare
   (e) Vehicle Type
   (f) Marketing
   (g) Other

3. Institutional
   (a) Operator
   (b) Financial arrangements

4. Results
   (a) Ridership (as much detail as possible)
   (b) Costs (as much detail as possible)
       1. Capital (if any)
       2. Operating
          (a) Labor
          (b) Maintenance
          (c) Fuel
          (d) Marketing
          (e) Miscellaneous

APPENDIX C. SAN DIEGO AREA PLANNING CASE STUDIES

The study team undertook a series of four case studies in planning for coastal transit services in order to test the comprehensiveness and applicability of the tentative planning guidelines presented in the project's interim report (see Sections IV and V of the main report). The four case study sites, which had previously been used as such by the Comprehensive Planning Organization of the San Diego Region in its Regional Coastal Access Study, were Silver Strand State Beach, Mission Bay-Mission Beach, Del Mar, and Cardiff. This Appendix presents a description of existing conditions and services at these sites, an analysis of the potential of each site for improved transit service, and more detailed analyses and recommendations for the Mission Bay-Mission Beach area. In addition, an evaluation of an experimental parking shuttle program operated in the Mission Bay-Mission Beach area during the summer of 1982 is presented separately as Appendix D.

Existing Conditions and Services

Silver Strand State Beach

Silver Strand State Beach is located on a narrow sand spit west of San Diego Bay between the cities of Coronado and Imperial Beach. Annual usage in 1976 was 360,000 (comparatively low for the San Diego Area). Access is primarily by automobile. Parking consists of 2,700 spaces in a fee lot (the daily use fee amounts to $3.00). Because of the large amount of parking space available, this site is especially popular for users of recreational vehicles who often camp overnight. Transit service at present consists of a single route known as the "Strand Streaker." This route, which is operated by The Bus That Goes in Circles, Inc. under contract with the cities of Coronado and Imperial Beach, provides service between Imperial Beach and North Island Naval Air Station in Coronado. It operates on 30-minute headways during the week and 80-minute headways on weekends at a base fare of $1.00. Silver Strand State Beach is served by a single stop on Silver Strand Highway, located at the main entrance to the State Beach.

Mission Bay-Mission Beach

The Mission Bay-Mission Beach complex is a major recreation area in the City of San Diego. It consists of Mission Beach, the most heavily used beach in the region, with 2,750,000 visits in 1976, and Mission Bay Park. Mission Bay Park contains picnic areas, beach and water sport facilities on Mission Bay, a number of major hotels and other commercial activities, and Sea World, a major theme park. Visitation to Mission Bay Park (excluding Sea World) totaled about 2,500,000 in 1976; Sea World accounted for an additional 2,162,000 visits. Automobile access and parking facilities in Mission Bay Park are reasonably adequate; Mission Beach, on the other hand, is reported to be the scene of serious traffic and parking congestion.

Transit accessibility in the Mission Bay-Mission Beach area is high compared with that at other coastal sites in the region. Mission Beach is served by San Diego Transit Corporation (SDTC) Routes 34 and 80; other areas of

Mission Bay Park are served by SDTC Route 9. In addition to the SDTC routes, hotels and tourist attractions in the vicinity are served by The Bus That Goes in Circles, a private operation. In the summer of 1982, the City of San Diego, in conjunction with the California Coastal Commission, sponsored an experimental parking shuttle system connecting the east side of Mission Bay Park with Mission Beach and Pacific Beach (located immediately to the north of Mission Beach) Transit services in the Mission Beach area tend to be heavily utilized during recreation use peaks, and are reported to experience overcrowding and difficulty in keeping schedules. In an attempt to alleviate these problems, SDTC assigns extra vehicles to Route 34 on summer weekends.

Del Mar

Del Mar is located just north of the City of San Diego. Although "coastal" in the sense that it is located along the shore, Del Mar is not extensively used for traditional coastal recreation activities. The major attraction in the area is the Del Mar Fairgrounds, which is the site of a major race track and the annual Southern California Exposition. Both the racing season and the Exposition take place in the summer season, and hence create potential conflicts with access to the beach areas.

Beach areas in Del Mar are relatively inaccessible by both automobile and transit. Off-street parking is not generally available in the beach area. Transit services consist of a single route, North County Transit District (NCTD) Route 301, which runs parallel to the coast from Del Mar to Oceanside. The Del Mar Beach area is served by several stops. Headways are 30 minutes and base fare is 65 cents.

Cardiff

Cardiff is located about 4.5 miles north of Del Mar. It is the site of two state beaches: San Elijo State Beach, which is located in a cliff area, and which caters primarily to overnight campers, and Cardiff State Beach, which is primarily a day-use site. Annual visitation in 1976 amounted to around 364,000 at San Elijo State Beach and 97,000 at Cardiff State Beach.

On-site parking for day use is limited to 80 spaces at San Elijo State Beach and 275 spaces at Cardiff State Beach. Overflow parking occurs along Pacific Coast Highway, which at this point is a four-lane undivided roadway with a 55 MPH speed limit. Parking is a major limitation on use of these sites, and the combination of overflow parking, non-signalized entrances and exits to the designated parking areas, and high speeds on Pacific Coast Highway lead to safety concerns. Transit access is provided by North County Transit District Route 301 on Pacific Coast Highway. As at Del Mar, this route operates on 30-minute headways at a local base fare of 65 cents. Both overflow parking and transit access from areas immediately inland from the site are restricted by the fact that in this vicinity, Pacific Coast Highway is isolated from inland areas by the Santa Fe Railroad tracks. Additional transit service is provided on San Elijo Avenue, immediately east of the railroad tracks, but pedestrian access from this point to the beach is almost nonexistent.

Evaluation of Transit Potential

All four of the sites considered are primarily oriented to serving local day visitors. Overnight use is present, of course, especially in the form of camping at San Elijo State Beach and Silver Strand State Beach; however, it is unlikely that provision or improvement of transit service would have any effect on this type of use. Also, in the case of the Mission Bay-Mission Beach area, there is substantial tourist activity, but in terms of sheer numbers of visitors, this is overwhelmed by the intense local use of the site. Consequently, the major thrust of this section is to concentrate on the potential at each site of using transit to provide access for local residents. In the case of Mission Bay-Mission Beach, however, the analysis must also consider the possibility that overnight visitation is great enough to support services typical of "resort communities" in other parts of the country.

Of the four sites, only Mission Bay-Mission Beach seems to have serious potential for extensive transit use. The other three sites have comparatively low levels of visitation, and, from a regional standpoint, are not logical points to concentrate services designed for transit dependents.

In the case of Silver Strand, the Regional Coastal Access Study suggests that the site is underutilized, compared with other sites in the metropolitan area, and that increased transit access would help correct the imbalance. In the study team's opinion, it is highly unlikely that increased transit access would have a noticeable effect on use of this site. Although Silver Strand State Beach is relatively close to central San Diego areas which have high transit trip generation rates and, presumably, high levels of transit dependency, there are other beaches that are equally attractive and even more accessible from this area. To give one example, it is actually necessary to pass Coronado Beach in order to reach Silver Strand from central San Diego. At present, there appears to be little demand for transit service at any of the beaches west of San Diego Bay. If this situation should change (for instance, as a result of overcrowding at sites such as Mission Beach) it is likely that demand by transit dependents will be concentrated at the most accessible sites and not at Silver Strand.

Del Mar was included as a case study site in the Regional Coastal Access Study because of access issues related to the Del Mar Fairgrounds, rather than the more strictly "coastal" activities in the area. All the recommendations of the Regional Coastal Access Study related to improved special event services and relocation of facilities to better serve the Fairgrounds. Of the recommended improvements, the only one likely to have any impact on beach access is the creation of a multimodal transfer facility adjacent to the Fairgrounds. If implemented, this project (known as the North Coast Multipurpose Transportation Facility or NCMTF) will involve relocation of the Del Mar Amtrak station and focusing of the local and express bus routes operated in the Del Mar area by SDTC and NCTD. Also, the facility will be served by Greyhound intercity bus service. Completion of the NCMTF will make Del Mar one of the more accessible points in the North County public transportation system, and may have some minor impact on beach access, since it will provide a convenient transfer point for trips from other parts of the region. However, both the visibility and immediate accessibility of the Del Mar beach area are low, and it is unlikely that the NCMTF will have a significant impact on their use.

In the case of Cardiff, there are clearly beach-related access problems. These are almost entirely related to the limited availablilty of parking in the area; this, in turn, is due to the physical layout of the site, which severely restricts use of on-street parking for overflow during peak periods. Unfortunately, the physical layout of the site also restricts its accessibiliy to transit sevices, and the presence of high-speed traffic on Pacific Coast Highway creates hazardous conditions for transit users as well as drivers trying to enter or exit parking areas.

The Regional Coastal Access Study had recommended that, although public transportation improvements were not a high priority item at Cardiff, consideration should be given to demonstration services, including east-west weekend services from inland areas, increased frequency of service, and "communication efforts" on existing north-south services. As in the Silver Strand case, these recommendations appear unrealistic, especially when viewed from a regional perspective. Actual beach use in the Cardiff area is rather low, if one excludes the camping activity at San Elijo State Beach. In addition, the site is not as readily accessible from North San Diego County population concentrations (either coastal or inland) as are beaches in the Oceanside-Carlsbad area. Consequently, Cardiff appears to have a very low potential for successful transit development.

In the case of Mission Bay-Mission Beach, there is no question that transit can play an important role, especially in terms of providing access for transit dependents. This site is already seved by several regular transit routes and specially-designed services. The regular transit routes are adequately patronized and, indeed, are often overcrowded during peak recreation-use periods. Meanwhile, there is no lack of transit proposals for the area -- in addition to the recommendations of the Regional Coastal Access Study, the City of San Diego has performed an access study for the Mission Bay area, including Mission Beach and Pacific Beach, which contains additional transit proposals. In the case of Mission Bay-Mission Beach, the issues appear to be:

1. What is the appropriate definition of the planning area? Should Pacific Beach be included?

2. What can be done about the existing problems of overcrowding and poor schedule adherence on regular transit routes in the area?

3. How much impact does traffic congestion in the immediate beach area have on the operation of transit routes in the ahrea? What, if anything, can be done to reduce this impact?

4. Should increased use of the site be encouraged? If so, are conditions such that transit services could successfully substitute for some of the present automobile access or for future traffic and parking facilities which would otherwise be required to accomodate the growth in use?

5. Are there attractive markets for transit service (especially among transit dependents) that are not being adequately served at present?

6. Which, if any, of the current transit proposals for the area should be implemented? Which should have the highest priority?

Given the complexity and importance of the Mission Bay-Mission Beach site relative to the other three sites and the low potential for successful transit improvements at the others, the study team decided to concentrate its attention on the Mission Bay-Mission Beach area. The remainder of this Appendix presents an analysis of the issues raised above. In addition, an analysis and critique of the experimental Mission Bay Shuttle Service sponsored by the City of San Diego and the California Coastal Commission during the summer of 1982 is included as Appendix D to this report.

Analysis and Recommendations for Mission Bay-Mission Beach

The study team performed a detailed planning analysis of the Mission Bay-Mission Beach area, including a review of previous planning documents, an evaluation of the City's experimental parking shuttle program, discussions with planners from the City of San Diego Paratransit Office and SDTC, and field observations during the summer of 1982. Major points covered in the analysis include the definition of the planning area, an analysis of existing conditions, potential short-run improvements, and long-range planning issues.

Definition of the Planning Area

The major question concerning the definition of the planning area is whether Pacific Beach should be included along with Mission Beach and Mission Bay Park, as in the City of San Diego's Mission Bay Coastal Access Study, or excluded, as in the Regional Coastal Access Study. Inasmuch as both the beach and the commercial development along Mission Boulevard are continuous in the Mission Beach-Pacific Beach area, and since both areas are served by the same transit routes on weekends, it is the view of the study team that Pacific Beach should be included in any access planning involving Mission Beach. In the analyses that follow, comments concerning Mission Beach should be construed to include Pacific Beach, unless otherwise indicated. The area included in the case study is shown by Figure C-1.

Existing Conditions

Existing conditions in the Mission Bay-Mission Beach area reportedly include parking and traffic congestion. In addition, regular SDTC transit routes in the area are reported to suffer from poor schedule adherence and overcrowding during peak periods.

Field observation confirmed that traffic congestion exists on normal summer weekends. The most severe bottleneck in the area is the intersection of Mission Boulevard with West Mission Bay Drive. Some level of congestion exists at this intersection from late morning until late afternoon on summer weekends. Although traffic conditions in the immediate Mission Bay-Mission Beach area do affect transit travel times somewhat, they do not appear to be a major source of irregularity in travel times, when compared with normal variations in boarding and alighting times.

The existence of parking congestion is somewhat less obvious. Although there appears to be a shortage of legal parking spaces in Mission Beach, illegal parking is quite common, and enforcement lax, so that there may be little or no

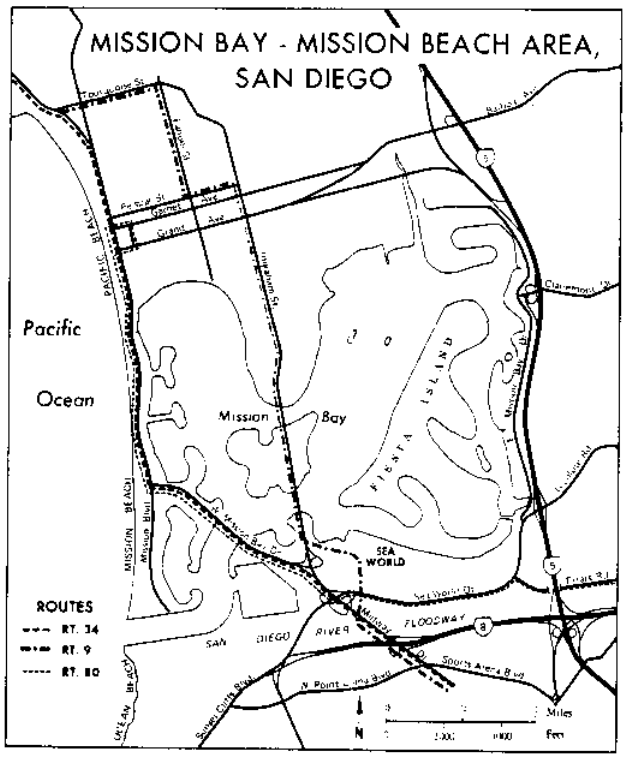

FIGURE C-1

overall shortage of parking on normal summer weekends. Meanwhile, in Pacific Beach, there is an almost unlimited supply of on-street parking to absorb overflows, provided beach users are willing to walk far enough. At present, there do not appear to parking shortages of such magnitude as to warrant use of remote lots and shuttle systems. Although the failure of the 1982 experimental shuttle program may be attributed in part to high fares and the relatively inconvenient location of the designated shuttle parking lot, the basic reason it failed to attract ridership was probably that there was no real demand for the service it provided.

Field observation confirmed the report that regular transit routes in the area experience problems with poor schedule adherence and overcrowding. Schedule adherence is relatively poor on both Route 34 and Route 80 throughout the day. Much of the irregularity in headways and inability to arrive in the area on time appears to be the result of normal variations in run time caused primarily by variations in boarding and alighting times; there appears to be little that could be done to correct this. More serious deviations from schedule (vehicles arriving 15 minutes late or more) appear to be largely associated with overcrowding, since boarding and alighting times increase dramatically as bus aisles become crowded with standees. As mentioned above, traffic congestion, at least in the immediate Mission Bay-Mission Beach area, seems to be a relatively minor factor.

Serious problems with overcrowding appear to occur regularly on southbound Route 34, roughly from 3 p.m. to 6 p.m. Within this time period, the overloading appears to be unpredictable, so that it is not possible to anticipate which specific trips will be overcrowded. In at least some cases,

buses from the La Jolla area arrive in Pacific Beach already behind schedule and overloaded, so that the source of the problem may actually lie farther north, probably in La Jolla. Some extra service is assigned to Route 34 on both Saturdays and Sundays. This service consists of up to 6 extra trips which are assigned by dispatchers as manpower permits and which, if fully assigned, reduce average headways from 30 minutes to 15 minutes. Because assignments are based on availability of manpower, they may vary from zero to six trips per day, and, when less than 6 trips are assigned, they may be inserted into the schedule at irregular intervals. Some extra service was assigned to Route 34 on 18 of the 22 weekend days between July 1 and September 15, 1982; however, SDTC does not keep records of how much was assigned on any given day.

Short-Range Improvements

The most important short-range transit-related improvements that can be made in the Mission Bay-Mission Beach area involve improvement of regular transit service. Top priority should be correction, if possible, of the overcrowding problems on southbound Route 34. Given the unpredictability of the overcrowding within the peak period, about the only thing that can be done is to provide reduced average headways throughout the peak. If this is to be done, assignment of extra service must be on a more systematic basis than is provided by SDTC's present policy of making assignments contingent on the availability of manpower. Unfortunately, it is difficult to assess the cost or even the feasibility of making more definite commitments to augmented peak service on this route in the absence of detailed records of how service was actually assigned or what the competing demands for manpower were. Also, it appears that there were some occasions on Sunday afternoons for which provision of 15-minute average headways throughout the peak was inadequate to prevent overcrowding. In these cases, an increase in the (augmented) frequency of service from 4 vehicles per hour to 5 or 6 vehicles per hour might be helpful.

A second short-run improvement that should be considered is improvement of service between local military bases and Mission Beach. Military installations represent concentrations of transit dependents, many of whom use the Mission Beach area for weekend recreation. Cursory field observation suggests that military personnel already amount to a considerable share of the market for weekend service on Route 34. At present, Route 34 provides direct service from the Marine Corps Recruit Depot (MCRD) to Mission Beach. Other important military installations in the area, such as the Naval Training Center (NTC) and the 32nd Street Naval Station, are not served directly by SDTC routes to Mission Beach, although some special service is provided by small private firms.

It is suggested that the City of San Diego Paratransit Office and SDTC conduct some sort of study to investigate the potential of this market and to determine whether it can be best served by SDTC or by private firms providing irregularly scheduled service. Points to consider in such an investigation include the number of personnel living on base; the fraction of the base population which is low ranking and/or carless; base policies concerning duty hours and weekend leaves; and, in the case of Navy installations, the extent to which base populations fluctuate due to the presence or absence of ships in port. Points to consider in determining what type of service should be provided for this market include cost, revenue potential, route configurations, and the potential for flexible scheduling to match demand fluctuations. An additional consideration is whether it would be wise for SDTC to attempt expansions of

service in the beach area so long as the overcrowding problems on Route 34 remain unresolved.

A third short-range improvement which should be considered is institution of a relatively high frequency, low-fare service along Mission Boulevard to provide circulation among recreation sites and commercial establishments in Mission Beach and Pacific Beach. In some ways, this area resembles the resort communities on the Atlantic Coast in which such services have been successful, in that there is a heavily-developed strip along the shore which includes commercial establishments, recreation sites, and short-term rental property. A major question concerning this type of service is whether the commercial activity in the area is intense enough to warrant it; in order to answer this question, an experimental service along the lines of the 1982 parking shuttle might be worthwhile, provided adequate financing can be secured. It probably would not be worthwhile to extend this service to the large hotels east of Mission Bay, however, since (1) these do not appear to have generated ridership for the 1982 parking shuttle and (2) the extension of the route to this area would involve a considerable increase in cycle times and costs.

Long-Range Planning Issues.

Long-range planning issues related to transit access in the Mission Bay-Mission Beach area include the extent to which use of the site can (or should) grow and the issue of whether transit can ever serve as a substitute for additional parking or traffic facilities in the area.

It should first be noted that, aside from decisions about access facilities, there is little that would allow planners to control beach use in the area, as opposed to residential and commercial development, which are subject to zoning controls. At present, there appears to be additional parking capacity (in the form of on-street parking several blocks from the beach) in the Pacific Beach area. Consequently, the potential exists for increased use of the area, even without major increases in access capacity.

The question of whether use can or should grow beyond the point at which this overflow parking is saturated is difficult to answer within the confines of an isolated study of the Mission Bay-Mission Beach area. It is recommended that the City of San Diego and SANDAG plan for the San Diego beach districts (especially Ocean Beach, Mission Beach, Pacific Beach, La Jolla and La Jolla Shores) as a single unit, since the relative availability of access to each site will probably affect its level of use.

If use at Mission Bay-Mission Beach grows substantially, remote parking may eventually become attractive to beach visitors. If this occurs, it is suggested that the remote lots be located in the vicinity of the intersection of Midway Drive and Sports Arena Boulevard or along Grand Avenue in Pacific Beach. These locations are readily accessible from the regional highway network, provide relatively unobstructed access routes into the beach area, and could potentially be served by regular transit routes with little or no diversion from present routing. (lots along Grand Avenue might be served by a minor extension of Route 80.) It should be emphasized, however, that remote lots are unlikely to prove attractive so long as any parking is available in the immediate vicinity of the beach on normal summer weekends, and that it would be desirable to coordinate any future plans for remote lots or shuttle services with an overall plan for control of traffic and parking in the area, including enforcement of existing parking regulations.

APPENDIX D. EVALUATION OF 1982 EXPERIMENTAL MISSION BAY BEACH SHUTTLE SERVICE

Description

The Mission Bay Beach Shuttle was an experimental parking shuttle program serving the Mission Beach, Pacific Beach, and Mission Bay Park areas of San Diego. The shuttle operated on weekends only for approximately one month (July 3 to August 1) during the summer of 1982. It was sponsored by the California Coastal Commission, which provided a $30,000 grant for planning and promotion of the shuttle, and the City of San Diego Paratransit Office. The City's contribution to the program was confined to planning and to contribution of land and minor construction services for the shuttle's designated parking lot; otherwise, the project was intended to be financially self-supporting.

General Concept

The Mission Bay Beach Shuttle was designed to connect parking areas and hotels in Mission Bay Park east of Mission Bay with Mission Beach and Pacific Beach (see Figure D-1). It was thus intended to connect areas with a large number of existing parking spaces (which are usually more than adequate to handle local demands) with areas reported to suffer from chronic traffic

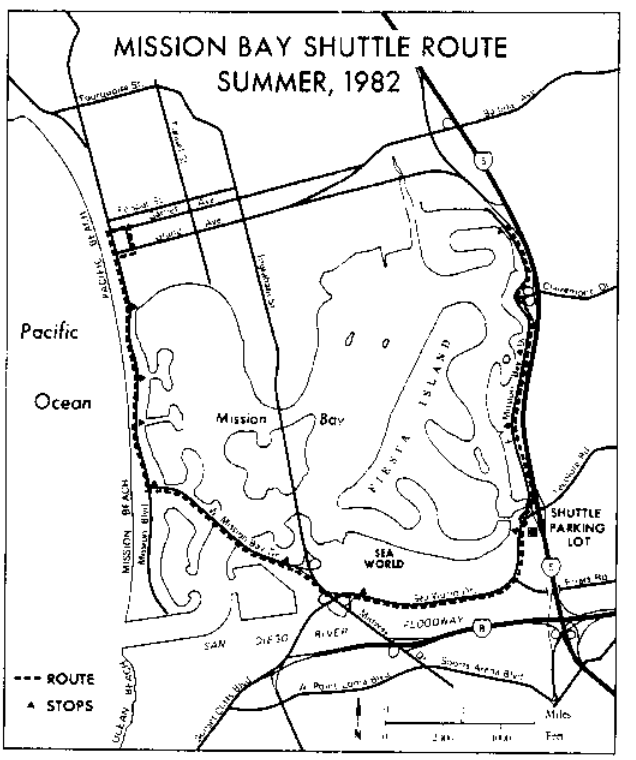

FIGURE D-1

congestion and shortages of parking spaces. In addition, the project's sponsors hoped that the service would be used by patrons of hotels in Mission Bay Park as a means of reaching beach areas on the Pacific Ocean. Although the preexisting parking areas east of Mission Bay were expected to provide much of the parking for the shuttle, reports indicated that on a few peak weekends, even these areas were overcrowded; consequently, the plan for the shuttle also included a specially-constructed lot at the intersection of Sea World Drive and East Mission Bay Drive in the southeast corner of Mission Bay Park.

Institutional and Financial Arrangements

The shuttle service was provided by five small private transit operators under contract with the City of San Diego Paratransit Office. The contracts called for provision of service in accordance with a coordinated schedule prepared by the city at a fare of $1.00 per one-way trip for adults. Financial risks (and eventual losses) were assumed by the operators, since the City provided no operating subsidy.

From its inception, the shuttle program had been expected to involve no public operating subsidy; however, the original concept had called for approximately $300,000 to be raised from private sources in order to provide three months of service during the summer of 1982 at a fare of around 25 cents. After fundraising efforts during the winter and spring of 1982 had failed to secure substantial contributions, the financial arrangements outlined above were devised as an alternative to abandoning the project altogether. As a result, the service finally offered involved very high fares compared to similar services elsewhere, and was implemented with very little lead time.

Design Characteristics

Vehicles. Since several private firms were involved in providing the service, several types of vehicle were used. Vehicles ranged from full-sized buses to vans. Also, since there was no standard color scheme or logo, the only identification for the shuttle service was a sign in the front window of each vehicle identifying it as a beach shuttle.

Routes and Stops. The route and stop locations of the Beach Shuttle are shown in Figure D-1. The route extended from the De Anza Cove parking area in the northeast portion of Mission Bay Park to the intersection of Mission Boulevard and Garnet Avenue in Pacific Beach. Stops were located at major parking areas in Mission Bay Park and at major intersections on Mission Boulevard in Mission Beach and Pacific Beach. Stops were fairly widely-spaced and were marked by small signs which were not particularly conspicuous.

Schedules. The shuttle service operated on weekends only from July 3 through August 1, 1982. Buses were scheduled to depart from the shuttle parking lot at Sea World Drive and East Mission Bay Drive from 9:00 a.m. to 6:40 p.m. Headways ranged from 10 to 20 minutes, depending on the time of day, with 15 minute headways predominating.

Fares. Fares were $1.00 per one-way trip for adults and 50 cents per one-way trip for children under 12 years of age.

Marketing. Marketing efforts for the shuttle were financed by out of the $30,000 grant provided by the California Coastal Commission and were carried out by the City of San Diego Paratransit Office. Marketing included paid radio announcements, public service announcements on radio and television, news releases, and a brochure. In all, around $12,000 was spent on publicity and the printing of the brochure, and an additional $5,000 was spent on production of the brochure, art work and maps.

Results

Ridership. Ridership for the shuttle's regular service totaled 24. On two weekends, July 10-11 and July 17-18, the regular service was unable to operate because the Over the Line Tournament, a special event held annually on Fiesta Island (see Figure C-1), preempted parking in the shuttle's designated lot. Operators of the shuttle vehicles were permitted to run between the shuttle parking lot and Fiesta Island on July 17 and 18, and carried a total of 290 passengers on that weekend.

Costs and Financial Results. The private operators' costs and financial results are not available, but it is obvious from the ridership totals that they suffered substantial losses. Actual cash losses may have been fairly limited, however, since several of the vehicles were owner operated; in these cases, the only real cash losses were for fuel, although, of course, the operators received no compensation for their time.

Evaluation

General Concept

The underlying assumption of the Mission Bay Beach Shuttle was that it would provide service that could compete with close-in parking in the congested areas of Mission Beach and Pacific Beach. This proved to be unrealistic, at least for the service design actually implemented. Given the high fares, it is not possible to conclude absolutely that any shuttle service in this area would have failed; nevertheless, there is little evidence of real demand for the service. After the service was discontinued, a survey was conducted at two sites (a shopping center and the San Diego State University Campus) to determine the impact of the marketing campaign for the beach shuttle and the reasons for its lack of ridership. Most respondents in this survey who were aware of the shuttle and who were frequent beach users indicated that they "did not need" the shuttle service or that they had other means of access to the beach. The high fare was not frequently cited as a reason for not using the shuttle. At present, it does not appear that there is enough of a deficit of parking spaces in the immediate beach area on normal weekends to make service at 15 to 20 minute headways attractive even if the service were free. In this, the Mission Bay-Mission Beach area appears to be similar to most other urban locations at which parking shuttles have been attempted. (See Table 13, page 18).

Institutional Arrangements

Even had the underlying concept of the Mission Bay-Mission Beach Shuttle

been sound, the execution of the project, especially in the area of financial arrangements, left much to be desired. A fundamental flaw of the concept from the beginning was the idea that the project would not require public subsidy. Under the circumstances, the idea that funds could be raised from privste sources was unrealistic, primarily because it was hard to show any direct benefits to business interests in the area and also because potential donors were skeptical of an "untried" service. The alternative finally chosen, to fund operating expenses from the farebox and shift the financial risk to the operators, left the shuttle at an obvious competitive disadvantage, since it was competing with private autos and free (but possibly congested) parking with a fare in excess of that charged by the regular local transit service in the area ($1.00 per one-way trip as opposed to 80 cents). The result was extremely low ridership, which meant that the operators suffered losses and terminated the service contracts.

Service Design

For the most part, the service design for the Mission Bay Beach Shuttle was reasonable, given the policy constraints imposed on the project from the beginning. These constraints included the refusal to provide public funding for operating deficits and prior decisions to concentrate on providing service for recreational trips and to locate any remote parking lots within Mission Bay Park, if possible. An evaluation of specific design features follows.

Routes. One difficulty resulting from the concept of concentrating on recreational trips and locating parking lots in Mission Bay Park was that the shuttle's route was neither as short nor as direct as it might have been. As mentioned elsewhere (see Appendix C, page 81), other possibilities exist for locating remote parking lots in the vicinity of Mission Beach and Pacific Beach. These include the Sports Arena Boulevard-Midway Drive Area (where the existing Sports Arena parking lot is an obvious possibility) or sites along Grand Avenue in Pacific Beach. These locations might have resulted in shorter cycle times and hence a requirement for fewer vehicles to provide the desired level of service. Even given that the remote lot had to be located where it was, extension of the route up the east side of Mission Bay to De Anza Cove appears to have been unnecessary.

Stops. Designated stop locations in the Mission Beach-Pacific Beach area were rather widely spaced (.25 to .50 miles). This stop spacing was probably inappropriate for a service whose one real selling point was its ability to get passengers closer to their ultimate destinations than they could park. Also, the signs marking the designated stop locations were not very conspicuous.

Schedule. The frequency of service offered (15 minute headways throughout most of the day) was a reasonable compromise between the need to provide frequent service in order to compete with close-in parking and the need to keep costs low. The hours of operation covered the daily peak adequately, although 9 a.m. may have been an unnecessarily early starting time, since parking is still readily available in the beach area then. It is not clear whether weekend only service was appropriate in terms of demand for service; however, given the institutional arrangements, it was logical, since the operators apparently did not have other opportunities for business on weekends.

Fares. The fare actually charged ($1.00 one-way for adults and 50 cents one-way for children) was clearly too high from the point of view of providing service that would be able to attract ridership. These fares were so out of line that it is not possible to say whether lower fares would have resulted in significantly greater demand.

Marketing. The beach shuttle's marketing campaign appears to have been reasonably effective in making the public aware of the service, even though it was not effective in selling it. Of the persons surveyed after the discontinuation of service, 30 to 40 percent had heard of the beach shuttle. The most effective advertising media appear to have been radio and television; roughly 70 percent of those who said they had heard of the service mentioned one of these sources.

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