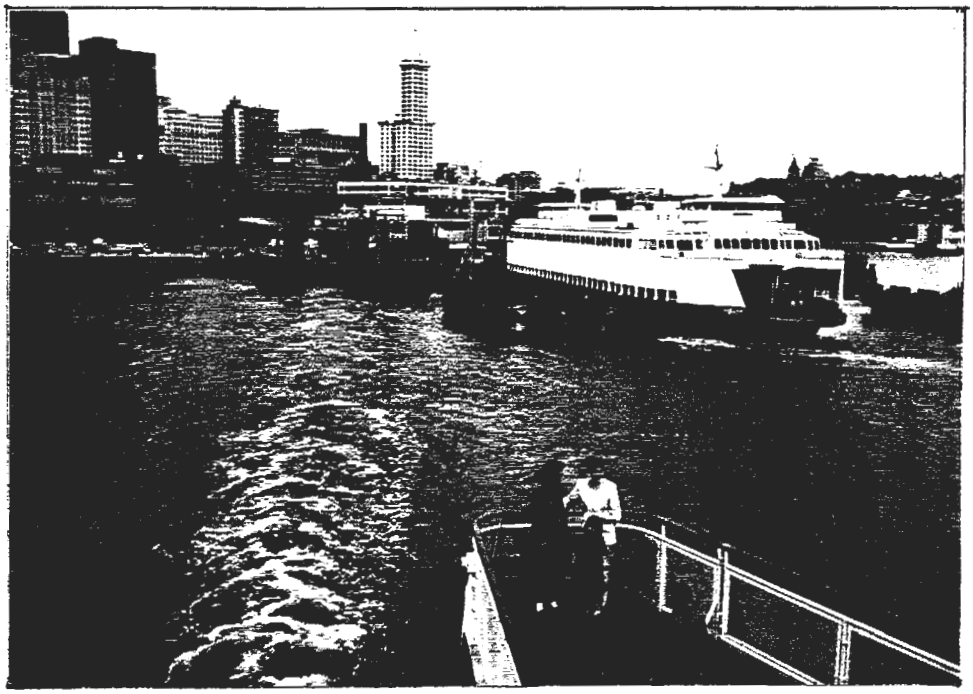
U.S. Department of Transportation
Federal Transit Administration

# ASSESSMENT OF FERRIES AS ALTERNATIVES TO LAND-BASED TRANSPORTATION:

## Phase 2: Case Studies of Five Ferry Networks

Volume III of III



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**Prepared For:** The Office of Technical Assistance and Safety
Federal Transit Administration
U.S. Department of Transportation

Final Report
May 1994

FTA-MA-06-0197-01-03

## NOTICE

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Assessment of Ferries as Alternatives to Land-based Transportation
Report in Three Volumes: 1) Phase 1 Report, 2) Phase 2 Report, 3)Executive Summary

16. Abstract

1. Purpose: To assess the current and future uses ferries as altenatives to land-based transportation modes. Phase 1 consisted of a survey of 25 routes and systems in the U.S. to identify locations where ferry services have been used to provide an alternative to bridges, tunnels, highways or rail routes or construction. From the list of 25 sytems, five representative networks were selected for Phase 2 case study analysis. Phase 2 consisted of a detailed case study analysis to determine in more the various choice factors for providing water-based alternatives as well as user preferences for selecting ferries over land-based options. The analyses consisted of document research and site visits to assess the history, context, operations, landside options and other unique factors contributing to mode development and choice.

Method: Phase 1 was conducted by document search, phone interviews and personal experience of the author. Phase 2 included detailed document search and review, site visits and interviews, data compilationand draft and final reports. Since there is little comparative or descriptive literature available on the various routes studied, the site visits and interviews proved invaluable.
(continued on following page)

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| Intermodal ferry links<br>Marine highways, Highspeed ferries, low wake/low wash, Essential/complementary/optional ferry routes. | |

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16. Abstract (Continued)

routes and systems.
5. Lower volume, essential services continue to provide important lifeline transportation functions for island communities.
6. Complementary and optional services in urban areas appear most likely to grow by relieving pressures on landside infrastructures filled to capacity.
7. Emerging new highspeed vessel technologies will provide new more competitive longer distance route options in many areas.
8. A National Ferry Policy is recommended to recognize the expanding role of ferries as key links in intermodal regional transportation systems, and to provide expanded federal assistance through emerging ISTEA programs.

# METRIC / ENGLISH CONVERSION FACTORS

## ENGLISH TO METRIC

### LENGTH (APPROXIMATE)

1 inch (in) = 2.5 centimeters (cm)
1 foot (ft) = 30 centimeters (cm)
1 yard (yd) = 0.9 meter (m)
1 mile (mi) = 1.6 kilometers (km)

### AREA (APPROXIMATE)

1 square inch (sq in, $in^2$) = 6.5 square centimeters ($cm^2$)
1 square foot (sq ft, $ft^2$) = 0.09 square meter ($m^2$)
1 square yard (sq yd, $yd^2$) = 0.8 square meter ($m^2$)
1 square mile (sq mi, $mi^2$) = 2.6 square kilometers ($km^2$)
1 acre = 0.4 hectares (he) = 4,000 square meters ($m^2$)

### MASS - WEIGHT (APPROXIMATE)

1 ounce (oz) = 28 grams (gr)
1 pound (lb) = .45 kilogram (kg)
1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)

### VOLUME (APPROXIMATE)

1 teaspoon (tsp) = 5 milliliters (ml)
1 tablespoon (tbsp) = 15 milliliters (ml)
1 fluid ounce (fl oz) = 30 milliliters (ml)
1 cup (c) = 0.24 liter (l)
1 pint (pt) = 0.47 liter (l)
1 quart (qt) = 0.96 liter (l)
1 gallon (gal) = 3.8 liters (l)
1 cubic foot (cu ft, $ft^3$) = 0.03 cubic meter ($m^3$)
1 cubic yard (cu yd, $yd^3$) = 0.76 cubic meter ($m^3$)

### TEMPERATURE (EXACT)

[(x - 32)(5/9)] °F = y °C

## METRIC TO ENGLISH

### LENGTH (APPROXIMATE)

1 millimeter (mm) = 0.04 inch (in)
1 centimeter (cm) = 0.4 inch (in)
1 meter (m) = 3.3 feet (ft)
1 meter (m) = 1.1 yards (yd)
1 kilometer (km) = 0.6 mile (mi)

### AREA (APPROXIMATE)

1 square centimeter ($cm^2$) = 0.16 square inch (sq in, $in^2$)
1 square meter ($m^2$) = 1.2 square yards (sq yd, $yd^2$)
1 square kilometer ($km^2$) = 0.4 square mile (sq mi, $mi^2$)
1 hectare (he) = 10,000 square meters ($m^2$) = 2.5 acres

### MASS - WEIGHT (APPROXIMATE)

1 gram (gr) = 0.036 ounce (oz)
1 kilogram (kg) = 2.2 pounds (lb)
1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons

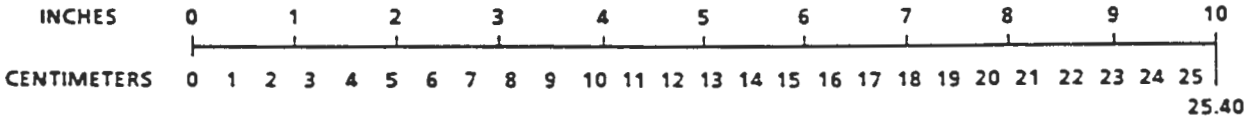
### VOLUME (APPROXIMATE)

1 milliliter (ml) = 0.03 fluid ounce (fl oz)
1 liter (l) = 2.1 pints (pt)
1 liter (l) = 1.06 quarts (qt)
1 liter (l) = 0.26 gallon (gal)
1 cubic meter ($m^3$) = 36 cubic feet (cu ft, $ft^3$)
1 cubic meter ($m^3$) = 1.3 cubic yards (cu yd, $yd^3$)

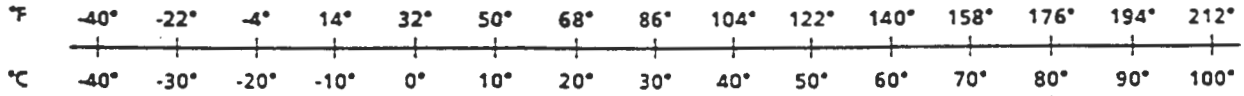
### TEMPERATURE (EXACT)

[(9/5) y + 32] °C = x °F

## QUICK INCH-CENTIMETER LENGTH CONVERSION




## QUICK FAHRENHEIT-CELCIUS TEMPERATURE CONVERSION




For more exact and/or other conversion factors, see NBS Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50. SD Catalog No. C13 10 286.

# ASSESSMENT OF FERRIES AS ALTERNATIVES TO LAND-BASED TRANSPORTATION

## Phase 2: Case Studies of Five Representative Ferry Networks

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# ASSESSMENT OF FERRIES AS ALTERNATIVES TO LAND-BASED TRANSPORTATION

# PHASE 2: CASE STUDIES OF FIVE REPRESENTATIVE FERRY SYSTEMS

## 1. INTRODUCTION: CASE STUDY ANALYSIS PROCESS

### 1.1 Case Study Selection Factors and Ferry System Characteristics

The primary focus of the two part study was to identify, and assess those decision factors which have influenced choices of water-based ferry routes versus land-based transportation options for conveyance of passengers and vehicles across or around water bodies of various types. The Phase 1 analysis, entitled Survey of Ferry System Types and Networks, considered a broad spectrum of ferry systems and their characteristics, and served as the basis for the more detailed evaluation of the five case study networks in Phase 2. It was observed in Phase 1, that many ferry systems serve multiple public and private transportation functions, often including seasonal excursion and tourism. The concentration of the research and analysis presented in the following Phase 2 report continues to focus principally on ferry networks and routes serving commuter needs and providing essential transportation connections between roadways or other points separated by water. However, the role of ferries serving multiple uses and functions which are characteristic of many contemporary routes and operations are also considered, particularly in cases where such combined services are an important economic factor in system financial decisions viability.

The Phase 2 study was organized to collect current information and impressions of the five selected systems, through site visits, interviews and data analysis. The approach was to research in detail such determining factors as historic decision points, regional transportation context, current market demands, operations, and proposed expansion plans. Common decision patterns and ferry development trends were to be identified through comparative analysis of the functionally and geographically diverse systems. As classification of those findings might then assist in understanding the future directions various types of ferry systems might take, which transportation trends were most relevant, and which planning techniques might be applicable to other locations nationally. The case study systems selected for Phase 2 include all regularly scheduled year round ferry routes operating in the following locations; 1) Seattle and Puget Sound, Washington, 2) Portland and the Casco Bay Islands, Maine, 3) San Francisco Bay, California, 4) the Mississippi River and New Orleans, Louisiana, and 5) New York Harbor, New York. The locations of the five case studies are shown in Figure 1.1 along with the broader array of systems surveyed in Phase 1.

Through the more detailed evaluation afforded by site visits, it was possible to determine more specifically which factors were dominant and have influenced local decisions on choices of one transportation mode versus another. It was also possible to identify those determinants which are most likely to influence future planning choices and system operations. The case studies included detailed historical analysis of the evolution of the systems, and descriptions of the

performance characteristics of the ferry routes related to their respective regional transportation networks. The case study systems were then compared with one another and evaluated in terms of current national and regional transportation policy objectives such as those set forth in the Intermodal Surface Transportation Efficiency Act (ISTEA).

### Summary of Phase 1 Case Study Selection Criteria

The surveys conducted in Phase 1 were useful in identifying general trends and directions water based transportation systems have taken with respect to land based alternatives in the past 40 years. The Phase 1 analysis also provided descriptive categories or typologies of ferry systems operating in the U.S. at present. They also suggested some of the recent shifts in national transportation policy, planning, techniques and operations with respect to transit and modal choice which may affect the balance between land and water based movement systems in the future.

Of the approximately 300 systems operating in the U.S. today, the surveys indicated that a small number of predominantly urban routes, estimated that less than 10%, carry more than 90% of the volume. Conversely the vast majority of systems, predominantly non-urban vehicle ferry routes, are carrying a relatively small volume of passengers. The latter tend to be waterborne routes for which there are either no landside alternatives or those that exist are lengthy or circuitous. Since both sets of systems are likely to continue to play important roles in their respective regional transportation networks, it was intended that the more detailed Phase 2 case studies include representative examples of both the higher volume urban networks and the lower volume non-urban ferry systems.

A broad range of types, characteristics and decision-making factors were considered in selecting the final case study systems including the following:

- **o High Volume Urban Commuter Routes Without Feasible Land Based Alternatives;** these systems were found in most cases to be publicly operated as part of a regional or state transportation system. Included as prime examples in this group are **Seattle** and **Portland.** In some cases the systems are operated by municipalities such as the Staten Island Ferry in **New York.**

- **o Urban High and Medium Volume Commuter Routes With Land Based Alternatives;** these systems may be operated publicly, privately, or in combination, depending on varying institutional and market demand factors. Included in this category with a variety of routes and operations are **San Francisco** and **New York.**

- **o Non-Urban or Rural Systems Without Viable Land Based Alternatives;** these are most likely to be publicly operated because of the inherent necessity of subsidy owing to high operating costs and low levels of demand. The up and down river routes along the **Mississippi River** in Louisiana operated by the state or local parishes fit this service and operation model, as do the San Juan Islands routes of the **Washington State Ferries (WSF).**

- **o Non-Urban or Rural Low Volume Highway Links;** these routes are also most likely

**Figure 1.1: Case Study Locations in the U.S.**
**Key:**

Ferry vs. Bridge or Tunnel

1. Seattle to Winslow/Bremerton/Vashon Island
3. San Diego to Coronado Bridge
4. Norfolk to Cape Charles/Bay Bridge

Ferry vs. Parallel Highway or Rail

5. Alaska Marine Highway
6. Boston to Hingham
7. San Francisco - Golden Gate Ferry
8. San Juan to Old San Juan
9. Bayshore NJ to Manhattan

Ferry to Islands

11. Cape Cod to Martha's Vineyard/Nantucket
12. Portland to Casco Bay Islands
14. San Juan Islands to Anacortes WA
19. Long Island to Shelter Island
20. Port Clinton to Put-In-Bay OH
21. Staten Island to Manhattan
23. Block Island to Pt.Judith/Newport

Ferry Plus Bridge or Tunnel

2. Norfolk to Portsmouth
10. Cross Hudson to Manhattan
13. Logan Airport to Rowes Wharf, Boston

Ferry Plus Highway or Rail

24. San Francisco to Vallejo
25. Cross Corpus Christi Bay (proposed)

Roll-on Roll-off Ferry Highway Link

15. New London to Long Island
16. Cape May to Lewes
17. North Carolina to Cape Hatteras
18. Burlington to Ft.Kent
22. Mississippi River Bridge Authority

to be publicly operated. Included would be the same two examples; the routes on the **Mississippi River** and those serving **Seattle by WSF**.

**o Regional Planning Initiatives Successfully used in Determining Water Based Choice for New Ferry Routes:** Included in recent years are examples such as the coordinated ferry planning efforts of the following; 1) the Port Authority of New York and New Jersey, the New York City DOT, and the New York Urban Development Corporation in **New York,** and 2) the precedent setting Golden Gate Ferry system, and more recently the Metropolitan Planning Commission in **San Francisco.**

**o Routes Utilizing New Vessel Technologies to Provide Cost Effective Service:** In recent years high speed catamaran or monohull services have been introduced in **New York (Bayshore, Port Imperial, and Hoboken)** ,and **San Francisco (Vallejo, Tiburon and Oakland/Alameda).**

**o Routes Influenced by Emerging Environmental Priorities:** Examples would include various routes in **New York, Seattle** and **San Francisco** in response to national and state requirements to improve air quality by reducing auto commuting.

**o Intermodal Systems Including Passenger and/or Vehicle Roll-On/Roll-Off Services:** While many systems have expanded their intermodal passenger links since ISTEA was passed, efforts have been particularly noteworthy on **Seattle, New York (Staten Island), Portland,** and the **Mississippi River (New Orleans)** routes.

**o Blended Commuter and Recreational Routes:** Increasing frequency of combining transit with recreation and tourism were in evidence in some form in **All Systems**.

**o Routes Contributing to Regional or Local Economic Development:** In various ways **All Systems** have contributed to sustaining existing or stimulating new economic development including such measures as support of job access through commuter links or encouraging growth of seasonal and year round tourism.

**o Routes, Vessels and Terminals Adapted to Unique or Unusual Geographic Locations and Water Conditions:** A wide variety of geographic settings, marine conditions and routes were characteristic **All Case Study Systems.**

Based on such decision factors and planning determinates identified in Phase 1, the five case study networks were selected. Included were considerations of the historic evolution of the systems, varying regional transportation and geographical contexts, differing vessel technologies and navigation contexts, and plans for new or expanded systems. Consideration was also given to which systems and routes might provide either prototypical or instructive case examples for other locations or jurisdictions in their water transportation planning efforts. The matrix shown in Table 1.1 compares the systems by characteristic in order to identify similarities and differences. The table includes such categories as alternative land side routes, urban or rural locations, existing and/or expanding systems, and new routes planned.

## 1.2 Analysis Objectives And Case Study Methodology

### Purpose and Objectives

The Phase 1 survey of ferry systems was useful in identifying general trends and establishing categories of water based transportation systems operational in the past 40 years. The case study analyses were organized to include historical factors related to particular routes and operations, as well as the particular types of functional uses and system contextual issues. Based on the comparative analyses following the case studies, the recent shifts in transportation policy and planning techniques were described which may influence future waterborne travel choices.

### Case Study Methodology

The case study approach and methodology were developed around the site visits and interviews. It became readily apparent from the earlier surveys that documentation of system histories, current operations, and relationships of ferry systems to land-based choices was limited. Therefore it was determined that a greater emphasis of the research would be placed on interviews with persons directly involved with local operations, planning and system management, as well as individual system users. It also seemed essential to directly visit and experience both the water routes and landside transportation alternatives in order to compare the choices and to understand the geographical contexts which may have influenced decisions. The site visits were scheduled during peak season operations to observe secondary functions of the ferry systems such as tourism and peak loading conditions. The author had previously visited all of the system locations and many of the routes, and was able to draw on his general understanding of systems and context, as well as to compare current and earlier operations. The sequence of steps consisted of the following:

1. Detailed study of available documents and list of preliminary site visit issues.
2. Preparation of site visit data sheets and interview questionnaires.
3. Schedule site visits and interviews.
4. Conduct site visits (June to November, 1993); collect new documents, conduct interviews, and ride the routes.
5. Tabulate site visit information on data sheets and review new documents.
6. Document and evaluate site visit findings.
7. Conduct comparative analysis of case studies.
8. Document findings and prepare final report.

It should be noted that all site visits and interviews were conducted directly by the author in order to maintain uniformity of data collection, and to make the best use of previous experience and knowledge of the locations and ferry systems evaluated. The author takes full responsibility for the accuracy of all factual reporting, and for all interpretations of data or interviews

**Table 1.1 - Comparative Analysis of 5 Case Study Systems by Route Similarities and Differences**

| System | Alt. Routes Yes/ No | Urban Long/ Short | Rural Long/ Short | Existing System | Expanding System | New System |
|---|---|---|---|---|---|---|
| **1.Seattle** | | | | | | |
| o Seattle | No | Med. | | • | • | |
| o NewPass | Yes | Med. | Long | • | • | • |
| o SanJuans | No | | | • | | |
| **2.San Francisco** | | | | | | |
| o Exist'g | Yes | Med. | | • | • | |
| o New | Yes | Long | | | • | • |
| **3.New York** | | | | | | |
| o StatIsl | Yes | Med. | | • | • | |
| o Exist | Yes | ShrtLng | | • | • | • |
| oNewHiSpd | Yes | MedLng | | | | • |
| **4.Portland CascoBay** | | | | | | |
| o Peaks | No | Short | | • | | |
| o Other | No | Med | | • | | |
| **5.Miss.Riv. Ferries** | | | | | | |
| o River | No | | Short | • | | |
| o NewOrlns | Yes | Short | | • | • | |

conducted. The author gratefully acknowledges the exceptional cooperation, hospitality and invaluable insights graciously provided by those interviewed, and to the many others in the case study locations who assisted and contributed to this report. The list of those interviewed is provided on the site visit data sheets found in Appendix A-1.

## 2.0 CASE STUDIES OF FIVE FERRY NETWORKS

### System Description and Evaluation Format:

The case study process revealed many useful examples of historic, current and future ferry routes and the choices made between land-based and water-based transportation in the five contrasting environments. It became readily apparent after the first few site visits how much the specific settings have influenced and shaped the ferry networks into unique transportation systems, whether they were active urban harbors such as New York and San Francisco or rural river reaches such as those surrounding New Orleans. Tracing the long traditions and histories of ferry service in each of the study areas was also fundamental to an understanding of the present day networks, and have shaped the present day institutional and operational arrangements of each system. Because of the complexity of factors and wealth of information required for an understanding of each system, the format for the case study descriptions is organized to be read from the general to the particular, and each includes the same general sequence of analytical topics:

- o A summary description of each system and the key findings relating to modal choices.
- o The history of decisions leading to the present day systems, alternatives chosen, and characteristics of the specific context.
- o A comparative description including typology and distinguishing features of the existing ferry network and individual routes, as well as proposed new or expanded routes.
- o An assessment of each system's performance and influences with respect to such factors as transportation efficiency, environmental impacts, economic development, institutional and operational models, and general cost effectiveness.
- o Detailed system findings of particular note, potential to meet future regional transportation needs, and lessons for other ferry systems.

As a result of the site visits, data research and interviews for each water transportation network, certain features seemed to require special emphasis. Particular attention was given to the historical factors in choosing between the water and land based systems for the various routes included. In the case of a particularly innovative proposed expansion of specific networks such as New York, San Francisco, or Seattle, a summary of the planning and decision process are also included. Issues of public versus private operations have been important to the evolution of many systems and appear to be of increasing importance to the future of some of the case studies such as Seattle and New York.

Since the study cases were chosen to represent a broad spectrum of ferry versus land-based choices, they are all sufficiently different that comparative cost effectiveness is often misleading and can only be measured within the specific context of each particular network's transportation regional mission and context. For example the subsidy cost per passenger on the publicly run

Casco Bay Ferry or Mississippi are difficult to compare with a private operation such as the Weehawken FerryBus in New York. Most of the systems analyzed serve multiple transportation needs, which are described in each case.

The primary focus of each case study, however, is on cross-water commuter passenger or vehicle transportation functions, with a secondary emphasis on other services which may be important because they may play an important financial support role such as the seasonal tourism functions of the Casco Bay and Washington State Ferries. With respect to primary uses, one important finding emerged during the site visit process which was used in the descriptions of transportation functions of each ferry route. It became apparent that the types of routes could be categorized as one of three basic transportation functions for passengers or passenger/vehicle services; 1) essential cross-water ferries for which there were no viable land-based alternatives, 2) complementary ferry services which have less efficient land-based alternative routes, or 3) optional ferry services for which comparable land-based alternatives exist, but which offer a useful choice. These three transportation use categories provided helpful distinctions between routes in assessing the variety of decision factors historically and for currently operating systems.

Other related issues are also addressed which have influenced water transportation demand and implementation, such as regional land use and waterfront planning of particular note in San Francisco's north bay sites, impact mitigation as is addressed by the Washington State Ferry system, and environmental factors such as the wetlands and levee which have influenced the continuation of Mississippi River routes. The increasingly important role of seasonal excursion and tourism services are also explored in each case study.

With the diversity of services offered in some of the case study locations, it is important to note the nomenclature adopted in describing each context. Individual ferry routes are the basic building block. A ferry system may consist of a collection of routes or an individual route provided by a given operator. Such a system might be extensive and publicly operated such as the Washington State Ferries, which consist of some 10 routes and 25 vessels, or by contrast might consist of a single private commuter route such as the Bayshore Ferry operated by TNT Hydrolines, which has a single route with 4 terminal locations and 2 vessels. The collection of all public and private routes serving a particular region might be described as a ferry network, such as the multiple systems, routes, and operators in San Francisco Bay or the New York City area. The report tries to be consistent in the use of these terms, but may include some ambiguities with the multitude of combinations discussed.

Comparative analyses of individual routes within each system and between systems are provided selectively where they may reveal parallels or contrasts. The case study descriptions conclude with a more detailed summary of key findings which are of relevance to the modal choices which have been identified. Each section concludes with the identification of system-wide or network related elements or specific details or innovations which may serve as models for applications to other ferry operations.

It should be noted that where interpretation of historical and current system determinants are described that the opinions and interpretations are those of the author and may or may not always coincide with those of persons interviewed. Where such discrepancies were apparent, they are so noted. It should also be noted that the information available on the large number of routes considered is quite limited or highly fragmented when in written form, and often available only as oral history. In the case of quantifiable statistics, particularly with privately

operated services, data was sometimes inconsistent and difficult to verify. As the primary intention of the study was to identify broad-based comparative trends for ferry systems, the relative statistical relationships were considered more important than precise comparisons. The author apologizes for any unintended misrepresentation of either quantitative or qualitative factors with respect to the ferry systems evaluated.

In addition to the case study descriptions for each system, a summary fact sheet for each site visit is included in the Appendix.

## 2.1 SEATTLE, WASHINGTON STATE FERRY SYSTEM

### 2.11 Network Description and Summary Findings

**Existing Routes:**

o Fauntleroy - Vashon Heights (Vashon Island) - Southworth (vehicle(v.) and passenger(p.))
o Seattle - Vashon Heights (p. only)
o Seattle - Bremerton (v. + p.)
o Seattle - Bremerton (p. only)
o Seattle - Bainbridge Island (v. + p.)
o Edmonds - Kingston (v. + p.)
o Mukilteo - Clinton (Whidbey Island), (v. + p.)

**Proposed Routes**

o Southworth - Seattle (p. only)
o Kingston - Seattle (p. only)
o Port Townsend - Seattle (p. only)
o Edmonds - Seattle (p. only)
o Mukilteo - Seattle (p. only)
o Everett - Seattle (p. only)

**Other Related Routes:**

o Anacortes - San Juan Islands - Victoria BC (v. + p.)
(operated publicly by WSF)
o Seattle - Victoria BC (p.)
(operated privately by Victoria Clipper/Clipper Navigation Inc.)

The system is the one of the older commuter ferry systems in the country which is state owned and operated. In 1951, the initial decision by the State to acquire the Puget Sound Navigation Company was based on disputes regarding fares and service, and the expectation that the operation of ferries would be temporary until a network of cross Puget Sound bridges could be built. The second critical water vs. land transportation decision occurred in 1959 when the Legislature rejected an ambitious regional plan for building the bridges, and the ferry system was designated as a permanent marine highway link. The decision for the State to continue to operate and invest in the ferry system instead of building bridges was a pragmatic determination by the state's elected officials that the cost and degree of difficulty of building bridges were excessive, and the ferry connection provided a long term solution to the two way movement of people and vehicles across the Sound. With a major work destination in Bremerton, substantial residential growth on the western peninsula, the only highway connection from west to east has been the long and increasingly congested route through Tacoma. The choice by the State of acquiring and expanding the long established privately operated ferry fleet appears in hind sight to have been an enlightened regional transportation decision.

Historical decision factors leading to the present high volume water highway link and commuter ferry service may be grouped into four periods. The early history of the Puget Sound ferry

network and the evolution of the Mosquito fleet from the turn of the century to the 1940's is particularly interesting and provides the basis for present day routes and vessel technology. The post World War II period of transition from private monopoly of the Puget Sound Navigation Company to State ownership to establishment of the Washington State Ferry System, from the 1940's to 1977, represents the era of establishing the viability of public operations and preference of the water highway over a monumental bridge building program, required by the complexity and extent of waterways along the Sound. The third period parallels the extraordinary growth in the Seattle-Tacoma region, the increased demands placed on the ferry routes, and the corresponding maturation and expansion of the WSF to its present operation, from 1977 to 1990. The fourth period represents the current and projected expansion and diversification of the system, including the addition of high speed passenger only services between specific commuter points, and the anticipated future needs for new routes and terminals, including possible new franchises for privately operated passenger services designed to parallel existing overcrowded landside commuter routes.

More recently, during the past two decades, the extraordinary growth in the Seattle/Tacoma corridor to the south, and points north of Seattle towards Edmonds and Mukilteo has effectively consumed all available highway capacity and contributed to the population growth on the western peninsula. The daily commuter demands from residential growth on the western peninsula along with increased through traffic east and west for commerce and tourism have combined to require continual adaptation and expansion of the ferry routes. The next set of decisions will revolve around how the ferry system can help relieve commuter route congestion and encourage more transit ridership.

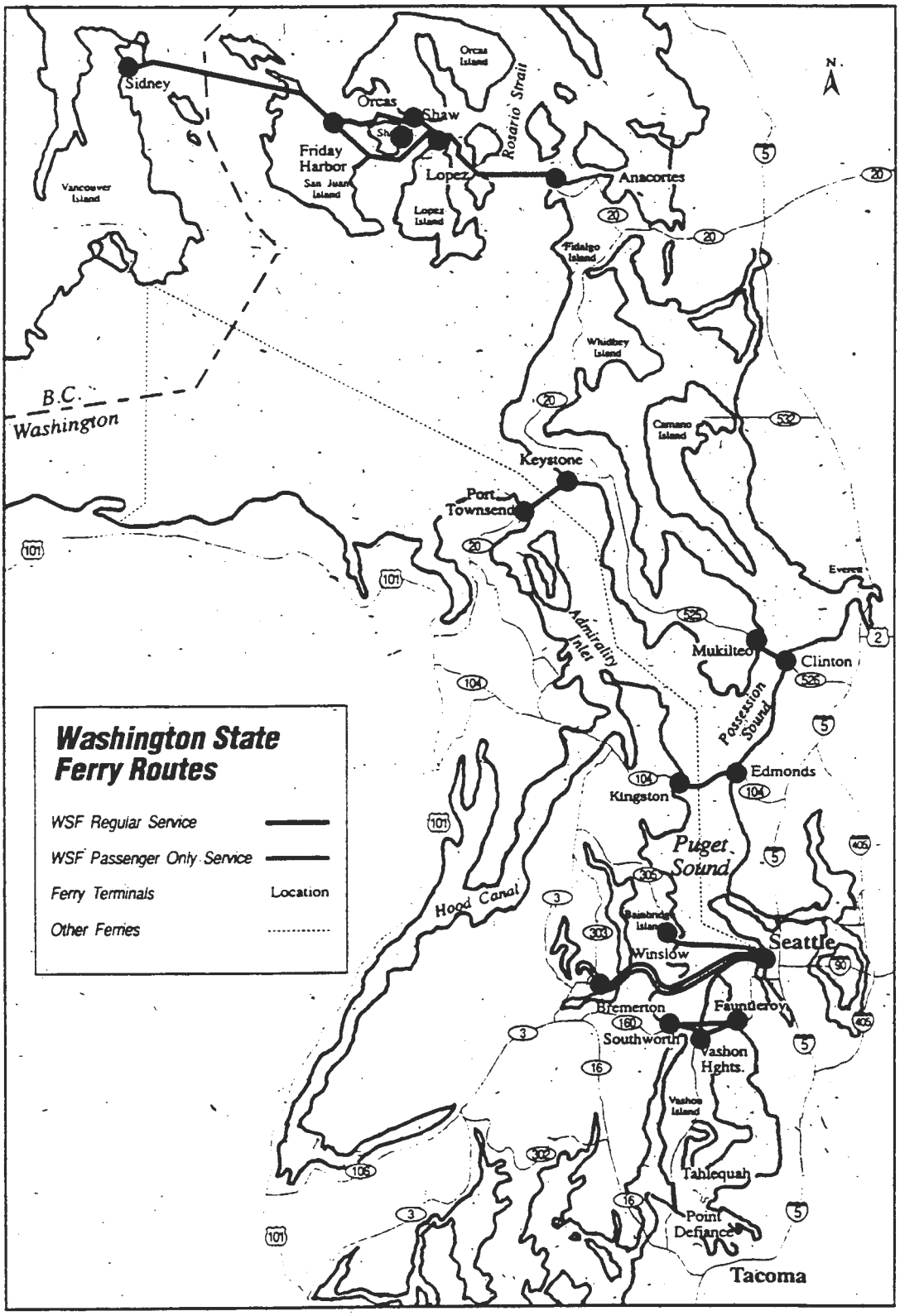
The system today represents the most efficient high volume, combined passenger and auto ferry in the U.S. The current Washington State Ferry system includes 10 routes and 20 terminals (WSF) carries the largest volume of passengers and vehicles of any network in the country with an annual passenger ridership of approximately 24 million and vehicle transport of over 10 million. The routes are experiencing continual annual growth with many operating at capacity during weekday commuter and seasonal tourism peak hours. The 10 routes and 20 terminals in the total system are served by 25 vehicles.

Its transportation functions include three important components; 1) commuter trips for passengers and vehicles, 3) highway links for through vehicle longer trips, and 3) tourism both seasonal and year round. All of these combine to allow for reasonable fares and frequent service. The Washington State Ferry System is now recognized as the primary tourist attraction in the state. It is a tribute to the Washington State Department of Transportation, Marine Division, that the system has been as innovative and well managed during its 40 years of operation. As economic factors change, however, the State is under increasing pressure to consider aspects of privatization, particularly for potential new passenger only routes, and explore the financial feasibility and cost-benefits of other operations and management approaches.

**System Types: Existing and Proposed Routes**

The case study selected those existing and proposed routes which served commuter passenger and vehicle trip needs as a focus. The existing routes included two types services; 1) high capacity, slower speed ferries providing combined passenger park-and-ride transit and vehicular highway links for commuters across Puget Sound to Seattle, and 2) higher speed, smaller ferries

**Figure 2.11: Existing Washington State Ferry System**



providing passenger only commuter service across the Sound to Seattle. The proposed routes include high speed, medium capacity ferries for passenger only commuter service both across the Sound and parallel to the Seattle shore. However, because of the financial interdependency of all routes in the WSF system the case study also considered other WSF routes. For comparison of other vessel technology and future private operations, the study also considered selected private routes currently providing recreational services. The routes analyzed included those listed above and shown in Figure 2.11.

The existing individual routes perform a variety of different transportation functions including passenger-only commuter, auto commuter, HOV commuter, through traffic vehicle highway link and passenger and vehicle tourist uses. For example Bainbridge Island to Seattle is the highest volume commuter route in the system, carries both passengers and vehicles, and operates at capacity during peak weekday periods. The longer Bremerton to Seattle route is used simultaneously by walk-on passenger and vehicle commuters and as a general through traffic vehicular highway link. In 1990 a passenger only service was initiated along the same route to provide a shorter commute time. The two Vashon Island links to east (Fauntleroy or West Seattle) and west (Southworth and the western peninsula) serve as a vehicle connection from the island to the mainland as well as meeting commuter needs. In 1990, a high speed passenger ferry service was introduced from Vashon to Seattle to shorten the commuter trip. The Edmonds and Mukilteo routes serve fewer commuters and more highway/tourism needs.

The San Juan Islands routes service the Islands year round as the essential transportation link, and provide for extensive island and international tourism during peak seasons for both passengers and vehicles. The Victoria Clipper provides a high speed seasonal passenger tourism service from Seattle to Victoria BC, which complements the other ferry connections.

The proposed passenger-only routes fall in two categories. WSF proposes to build new high speed passenger vessels to better serve the existing Vashon Island and Bremerton routes to Seattle to reduce commuter travel time, and to add new routes from Southworth and Kingston to Seattle to divert existing passenger and vehicle traffic from other western peninsula origins. The island service would be considered and essential connection and the others complementary routes with even greater time savings over the landside highway option through Tacoma than currently offered on the slower vehicle ferries. The combined purpose of these new options is to encourage increased park-and-ride passenger use of ferries across the sound, and thereby preserve greater through traffic highway link capacity on the vehicle ferries.

The second category of proposed ferries are those proposed for the corridor north of Seattle connecting waterfront residential communities to the downtown by water to relieve the over-crowded parallel landside highways and bus routes. The Mosquito Fleet ferry company proposes to establish these new routes as privately operated high speed park-and-ride passenger ferries which will provide options to the vehicular commute with amenities and some travel time savings. The four routes were in the planning and permitting stage at the time of the site visits.

**Critical Historic Decision Factors - Water vs. Land-Based Travel Modes:**

The routes serving Seattle today have evolved as part of the Washington State Ferry system based on a sequence of events and decisions at various points in the network history. The key turning points leading to the present day system and unique local conditions of operation may be

summarized as follows:

o The Rise and Fall of the "Mosquito Fleet" (1900's to 1930's): The legendary fleet of steamships established the routes across the Sound and assisted in opening the western peninsula. The fleet declined during the depression and the surviving were consolidated into a single private operation, the Puget Sound Navigation Company, in 1935.

o State Acquisition of the Ferry Monopoly (1951): After problems with service and rates, the state legislature authorized public takeover and operation of the system until such time as planned bridges could be built. Franchises acquired were protected through legislation as private competition along designated routes was precluded.

o Designation of the Ferry Systems as Marine Highway when the Planned Bridge System was Abandoned - (1959).: The legislature elected to expand the ferry system in lieu of building bridges to connect eastern and western shores. This in turn influenced an increase in eastern shore land development along the Tacoma-Seattle corridor, and postponed growth on the western peninsula.

o Legislative Funding Linkage of the WSF system to Regional Bridge Tolls and Statewide Gas and Evolving Vehicular Taxes, (1960's): These laws helped sustain the ferry system, and assisted in its role of providing essential highway links and commuter transit connections.

o Establishment of Passenger Only Ferry Service - (1990): To encourage greater transit and park-ride use of the system WSF introduced high speed passenger service on two routes; Bremerton and Vashon Island to Seattle.

o Since the Earliest Ferries, Puget Sound Climate and Waterway Conditions Have Determined the Vessel Technology: The types of large, double ended, vessels used for passenger and vehicle transfer have changed little over 75 years of operation. The temperate climate precludes winter ice conditions, and the Puget Sound waters provide for relatively smooth service and protected navigation. San Francisco and Seattle traded ferries for many years during the early days of private operations since the service needs and operating conditions were so similar.

**Key Issues and Findings - Existing and Proposed Ferry Network:**

There are a multitude of transportation issues and factors which have shaped the existing system and which will influence future expansion and growth of the Seattle routes within the larger WSF system.

**Existing System:**

o Incremental Expansion and Service Improvements - The state ferry (WSF) management has developed a highly responsive, efficient and affordable commuter system and highway link which has served as a model for other urban areas. With 10 routes, 20 terminals and a 25 vessel fleet, economies of scale have benefited the WSF operations in terms of capital costs and vessel refits..

o Ferry System as an Integral Component of a Publicly Operated State and Urban Transportation Network - The system has demonstrated how essential a combined passenger and ro-ro

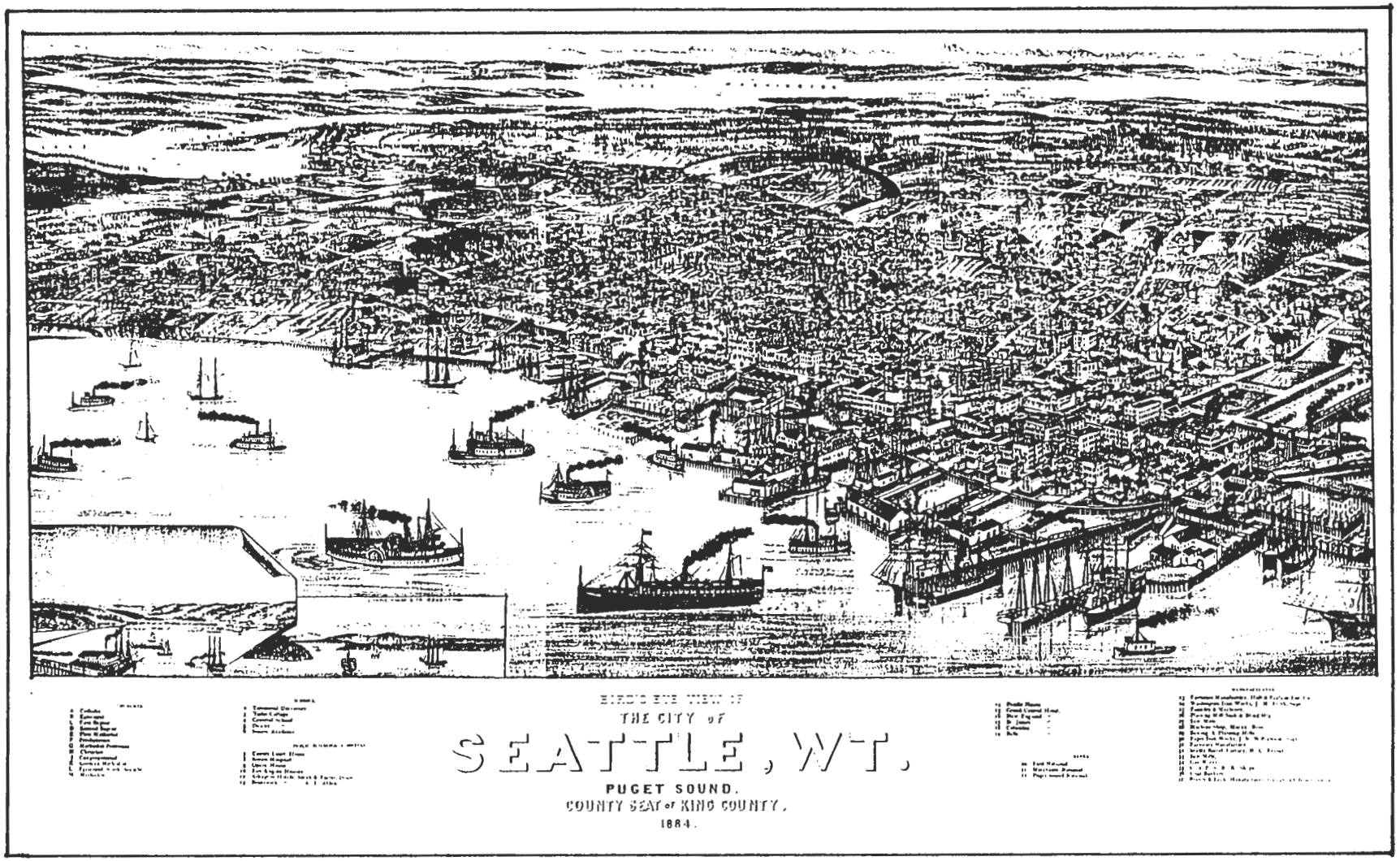



**Figure 2.12: Historic View of Seattle - 1884**

operation is to the Washington State highway network in the northwestern quadrant, and how such a system can serve as both mass transit and a highway link.

o Cross Subsidy and Economic Development Opportunities of Tourism and Recreational Uses of Ferry System as a State Commitment. Recognition of the WSF as the major state tourist attraction has allowed for system growth and popularity through maintaining of low fares, with the necessity of tax subsidy (targeted by legislation at 30% maximum). Even though the low subsidy level is remarkable compared to other public systems nationwide, pressures for privatization are increasing for some aspects of the system.

o Experimentation with Balancing Transit, HOV'S, and Single Occupant Vehicles - WSF has introduced interesting techniques to discourage single occupant vehicles by giving preference to van pooling, and through buses, offering selected high speed passenger only routes, and providing terminal transit connections. Since additional passenger capacity is far less costly than vehicle capacity, there is an incentive for such measures. The next period may require further innovation and landside planning to meet growth pressures.

o High Speed Passenger-Only Services are a Partial Success - The routes have proven there is a demand for such alternative services, but the vessel technology used has not provided a fair test. The high speed monohulls have not been reliable and have wake impacts when near shore reducing the travel time advantage. In addition, WSF finds that the incremental costs of carrying passengers on the fast ferries are much higher than on the larger vessels. The initial passenger ferries were apparently under-funded by the legislature and not as tightly specified for bidding as is needed for such vessel design and construction.

o The Legislated Biennial Accounting, Planning and Improvement Program Fits the System - The legislated two year time frame for the planning contract allows for actual improvements and changes, whereas a one year time frame would be too short for a system as large as WSF. The program also dovetails well with legislative sessions.

o Increasing Use has Increased Environmental Impacts on Residential Communities with Terminals - Towns such as Winslow, Fauntleroy, and Edmonds are finding that the dramatic increases in ferry use in the past decade are creating major traffic congestion problems, and are working with WSF to improve conditions.

**Proposed Routes:**

o Options for Future WSF Expansion to Meet Increasing Demands. The proposed WSF expansion of the ferry fleet to increase capacity on the heavily traveled commuter and through highway links is planned to be combined with additional new higher speed, passenger-only cross-Sound routes during the coming decade. The appropriate mix of public and private commuter operations is yet to be determined, but poses several interesting possibilities.

o Public vs. Private Operations - Recent pressures to consider new parallel and cross-Sound routes, and increased passenger-only services raise concerns regarding the legislated public monopoly of routes and effects of private competition. State tax payers and their legislators not in the Puget Sound area always serve as a balancing force for the public expenditures.

o Emerging Demand for New High Speed Passenger Routes Parallel to Eastern Shore - As

residential development spreads north along the shore from Seattle, there are increasing opportunities for new parallel routes from Edmonds, Mukilteo, and Whidbey Island as the highway system becomes increasingly overcrowded. Broader regional growth issues may need to be addressed in conjunction with expansion of ferry routes.

o High Speed Passenger-only Routes are Feasible Technologically but may require a Two-Tiered Fare Structure - The longer proposed runs from Kingston, Edmonds and Mukilteo to Seattle can be served by currently available 30 to 35 knot, lower wake technologies, but may require fares twice or three time as high as current routes. For private services the rates will most likely be highest. If publicly subsidized, the fares are likely to be well above current WSF rates.

o Planned New Intermodal Terminal at Edmonds to Replace Existing - The planning process for the new terminal will need to address the balance between land-based transit and highway connections, as well as opportunities for new parallel ferry routes to Seattle. The relocation of the terminal will also raise various shore related environmental issues for the first major terminal relocation in the system in many years.

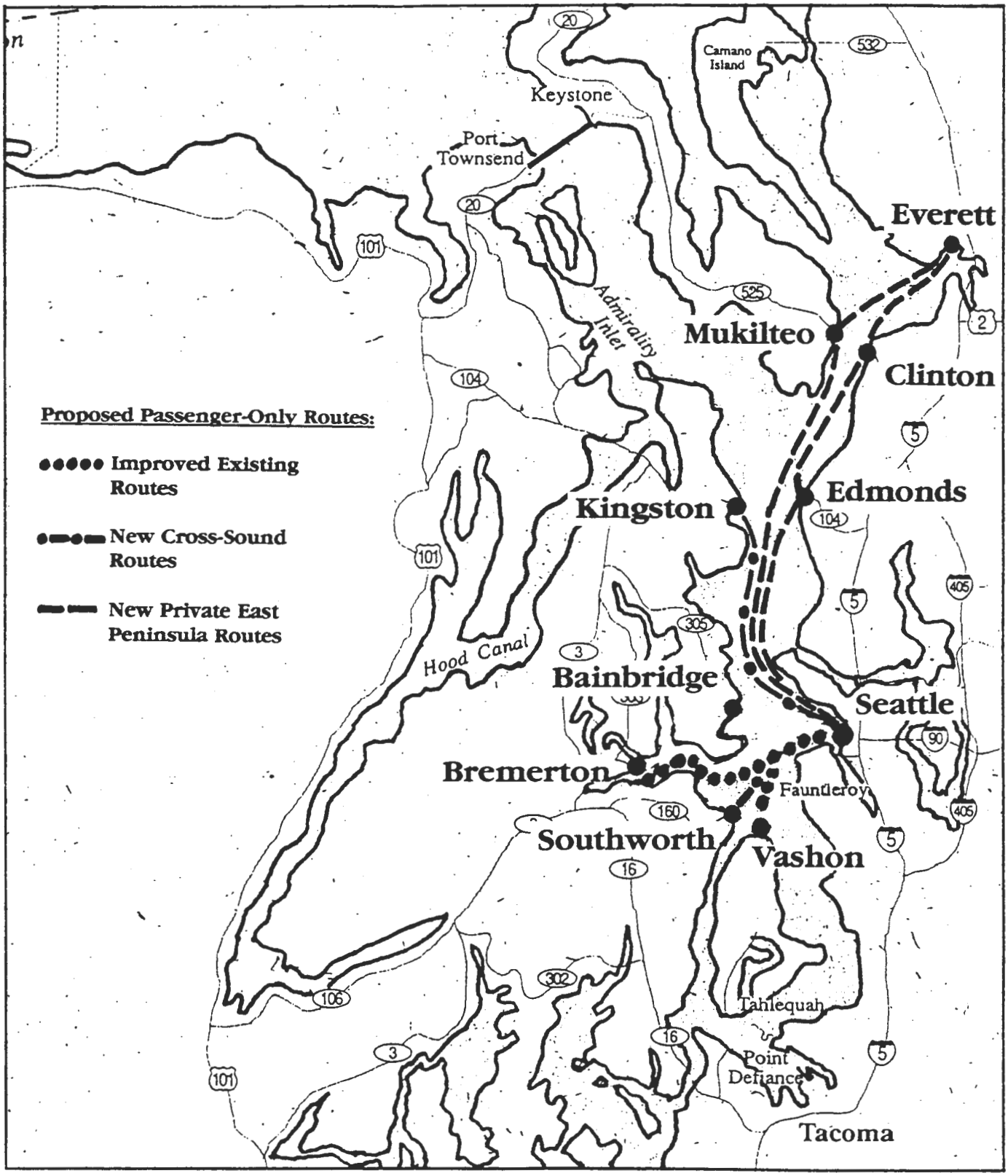
## 2.12 Network History and Decision Factors:

### History of Puget Sound Ferry Service

While the focus of this case study is on ferry routes serving central Seattle as a an urban center and employment destination, the history and development of the ferry network must be considered in the context of the evolution of the broader reaching Washington State Ferry System. Cross-Sound ferry routes date well back into the 19th century as is evidenced by the 1884 view of the Seattle harbor shown in Figure 2.12. A succinct description of 20th century ferry services is provided in the 1989/1991 Biennium Washington State Ferries Two Year Operations Report, prepared for the Washington State Department of Transportation, Marine Division, by Parsons Brinckerhoff Quade & Douglas, Inc. (March 1992), which is excerpted as follows:

> "Puget Sound ferry service originated in the early 1900's with several companies providing service to a variety of locations around the sound with small steamers known as the 'Mosquito Fleet'. By 1929, the ferry industry had consolidated into two companies: the Puget Sound Navigation Company and the Kitsap County Transportation Company. A strike in 1935 forced the Kitsap County Transportation Company out of business and left the Puget Sound Navigation Company in sole control of ferry service on Puget Sound. In 1951, after numerous battles with the State Legislature over fares and service, Puget Sound Navigation Company sold most of its assets and routes, with the exception of the Seattle – Victoria,B.C. route, to a newly created Washington Toll Bridge Authority. The Seattle-Victoria B.C. route was later moved to Port Angeles-Victoria B. C. where it still operates today.
>
> "The ferry system was originally intended to temporarily serve the public until a network of bridges could be built connecting the west and east sides of Puget Sound. In 1959, the Legislature rejected a plan to build numerous cross-sound bridges. At that time, the responsibility for managing the ferry system was shared by the Toll Bridge Authority and the State Highway Commission. The Toll Bridge Authority set the fares and controlled

Figure 2.13: Proposed New High Speed Passenger Ferry Routes



the system's finances including long term indebtedness. The operation of the ferry system was controlled by the State Highway Commission. In 1977, the two agencies were combined under the existing Washington State Department of Transportation(WSDOT). The ferry system became the Marine Division of WSDOT under the direction of the Assistant Secretary for Marine Transportation.

Following the initial State decision to acquire the ferry system from the Puget Sound Navigation Company as a holding action until bridges could be built, the pivotal historical decision which determined the development of the current system was the Legislative rejection of the cross-Sound bridge network, influenced in part by the commitment to shorter and less costly bridges connecting cities and through routes on the western peninsula, a system which is still being completed today. By committing to the on an expanded conventional vehicle ferry network as a long term highway link system the State has been able to build up a highly efficient and adaptable system.

"When the ferry system was first purchased from the Puget Sound Navigation company, it was intended to finance itself through fare box revenues. The original bonds issued by the Toll Bridge Authority in 1950 required that the system generate net revenues. The ferry routes sustained revenues in excess of operating expenses until 1960. With the financial success of the Hood Canal toll bridge overcoming the ferry system's net loss, the entire ferry/bridge system managed to stay in the black until 1974.

"Tax support of the ferry system began in 1957 when the State Legislature brought ferry system employees into the State Retirement System. In 1959, the Washington State Legislature created the "Puget Sound Reserve Account" funded by 0.25 cents per gallon of the State's gasoline sales tax to help pay debt service on revenue bonds issued by the Toll Bridge Authority if costs exceeded revenues. in 1960, the ferry system failed to meet the debt service requirements, and the Reserve Account received $672,000 to cover bond payments. Since the early 1970's, all of the debt service payments for the 1963 ferry system/Hood Canal Bridge bonds have come from motor vehicle fuel taxes, not from ferry operating revenues.

"The second major subsidy source, created in 1972, was the "Puget Sound Ferry Operations Account". This account is funded by a gasoline tax, motor vehicle registration fees and is solely dedicated to the operation and maintenance of the ferry system.

"The taxes used to fund both of these accounts have been raised over the years in order to cover growing operating and capital costs. Today, the ferry system generates revenue to cover slightly over 70% of its operating costs with the remaining approximately 30% subsidized through taxes."

The fiscal history of the system is particularly noteworthy as the operations have adapted to evolving ferry economies and demand over time, and has been able to respond to the varying levels of required subsidy. In fact the transition from private to public operation reflects the increasing operation costs of a labor intensive service inherent in a combined vehicle and passenger system. The current system is described as follows in the same report under the title of "WSF System Today".

"Washington State Ferries is the nation's largest ferry system. The System Map (Figure 2.11)...shows the 10 routes and 20 terminals served by the existing system's 25 vessels. In fiscal year 1991, WSF carried over 9 million vehicles and nearly 22 million passengers, more than any other system nationwide.

"The ferry system is an important part of Western Washington's highway network. The system provides critical links between urban areas on the east side of Puget Sound and the growing communities to the west on the Kitsap Peninsula as well as more rural destinations on the Olympic Peninsula. For the communities on Vashon Island and the San Juan Islands, WSF provides the only link for vehicles to the mainland.

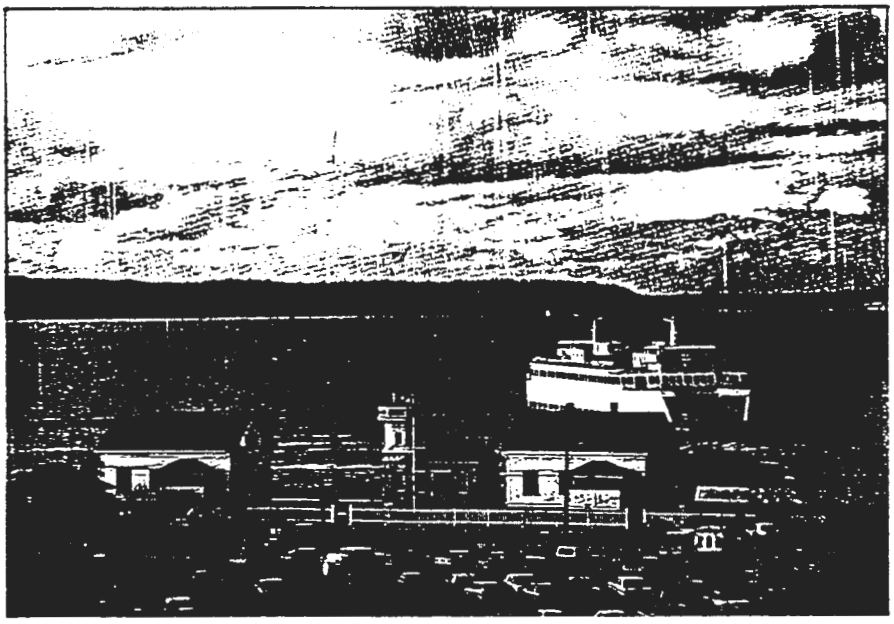
"Besides serving as an extension of the highway system, WSF can also be viewed as an environmentally sound and highly efficient means of mass transit. On average, the system carries over 17,000 walk-on passengers per day. Walk-on passengers also represent a significant portion of WSF's total ridership, comprising 29% of all passengers and drivers. Although every ferry terminal outside of the Anacortes-San Juan Islands route has connecting public transit service, the majority of walk-on passengers are found on routes serving downtown Seattle where many jobs are within walking distance of the Colman Dock Terminal.

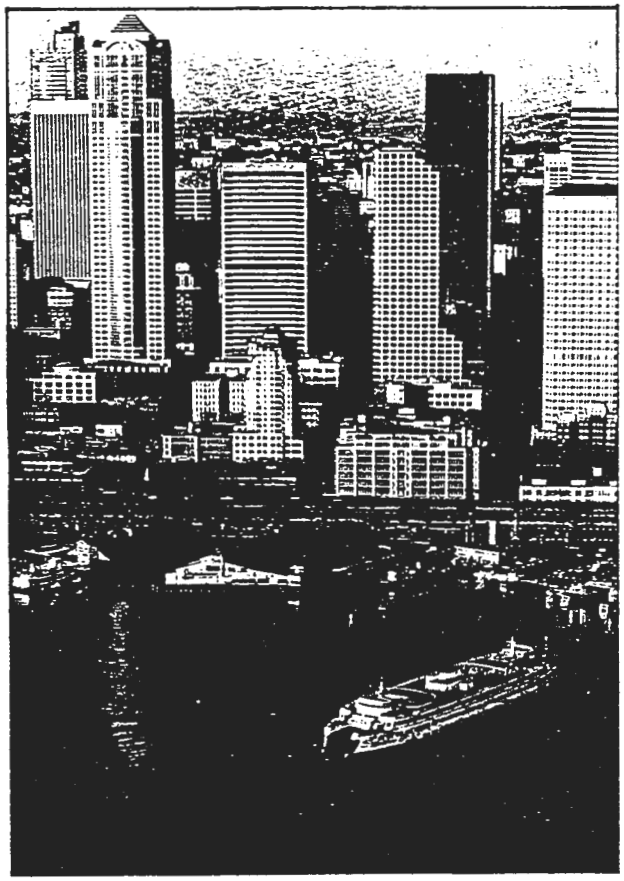
"In addition Washington State Ferries is the State's largest tourist attraction. Every year thousands of out-of-state visitors come to ride on a scenic trip through the San Juan Islands or to other destinations around Puget Sound."

It should also be noted that Washington State residents also use the system extensively for recreational and tourism purposes, thereby maintaining a broad based constituency for the system through the legislature. Since the mid-1980's, the ferry system has experienced steadily increasing demand on all routes and for all modes of travel. WSF has responded to these demands by expanding service and capacity, particularly on those key routes serving Seattle, including Bremerton, Bainbridge Island, and Southworth-Vashon, as well as Edmonds-Kingston, and Mukilteo-Clinton. WSF is currently planning to expand the fleet of Jumbo class ferries in the coming years as a primary response to increasing demand. In addition a variety of programs have been introduced to increase utilization of existing vessel capacity by offering incentive programs for car and van-pooling to increase commuter vehicle occupancy, and improve transit connections to encourage more walk-on passengers.

In addition to the primary response of increasing vehicle capacity on the traditional roll-on/roll-off (ro-ro) ferry routes, WSF also initiated the two high-speed passenger-only services. The first was started from Bremerton to downtown Seattle in 1987 utilizing a high-speed catamaran, and the second from Vashon Island to Seattle with two high-speed monohulls. While these two services have proven successful in terms of ridership and user response, WSF is proceeding cautiously with expanding passenger-only service for several reasons; 1) the cost per rider is considerably higher than the incremental cost of a walk-on on the larger, slower multimodal ferries, 2) environmental problems from wake and wash along fragile shores have reduced effective running speeds over portions of the routes, and 3) the vessel design and technology has not proven well suited to the routes, and has raised problems of reliability not experienced on the multimodal ferries. Furthermore there are limitations in the charter of the WSF system which may preclude the startup of new routes, by the private sector, because of terminal area rights.

Figure 2.14: Photos of Existing Washington State Ferry System





Notwithstanding these mixed results and technology lessons from initial passenger-only services, WSF continues to plan for alternative applications of the higher speed, lower volume alternatives. New routes proposed have been identified as Kingston to Seattle, and Southworth to Seattle, both of which are projected to intercept new walk-on park and ride markets from the western shore, and which are less constrained by wake problems. The two existing routes from Vashon and Bremerton would also be upgraded with new faster, low wake vessels. Because of the cost effectiveness of adding passengers to the expanding fleet of slower, larger vessels, the pursuit of new passenger-only routes is at the moment a lower priority.

In the meantime, with increasing demands from expanding residential settlement on the northern Kitsap peninsula as well as north of Seattle on the eastern shore, the private sector operators have secured several franchises for new routes; Victoria Clipper has vestigial rights to the Kingston-Seattle and Port Townsend-Seattle cross-Sound routes, and Mosquito Fleet has acquired rights to Edmonds-Seattle, Mukilteo-Seattle, Clinton-Seattle and Everett-Seattle. Original WSF charters and bond covenants may restrict some of these new routes because of limitations on parallel routes within range of existing terminals, restrictions on uses of State terminals by private operators, and WSF labor union restrictions on terminal use by non-union operators.

## 2.13 Route Descriptions and Comparative Analysis

**Description of Key Routes and Ridership:**

The routes selected for detailed description include those primarily serving commuter needs in the central Seattle area and secondarily serving the growing commuter needs of the north and south perimeter areas of the metro area. Since there are no viable existing or proposed cross-Puget Sound travel routes and the circuitous route by highway and bridge through Tacoma is too long and congested to be of use to the commuter or business trips, the ferry network functions as a pure marine highway link system for both vehicles and transit connections. While much of the job related commute trips are concentrated in the downtown, a significant number of commuter trips are oriented to perimeter secondary business locations as well as those manufacturing and port related jobs which tend to be more dispersed along the north and south corridors. The 40%/60% split between passenger-only/passenger walk-on and auto or van commuter trips may be explained in part by this employment distribution pattern. With respect to commuters, the ferries as marine highway links are serving the dual function of transit connector for those with a downtown Seattle work destination and as a through vehicle link for those working at scattered, more distant locations. An unanswered question from the literature reviewed is what portion of the total potential cross-Sound walk-on market is currently being captured by the downtown routes, and how could a greater percentage be attracted by existing and new services.

The following existing route descriptions are based on the 1991-1992 Biennium Report and site visits. The routes are shown in Figure 2.11.

**Fauntleroy-Vashon-Southworth:** This route serves residents of Southworth on the lower peninsula and Vashon Island, with a triangular service to Fauntleroy in west Seattle. Park and ride options are limited because of the commuter transfer required at the Fauntleroy terminal to reach dispersed work destinations. The year round population continues to increase on Vashon

Island. For non-commuters the route provides the southern-most by-pass of Tacoma across the Sound. The Southworth route saves commuters approximately 50 miles of driving. The Vashon Island route provides one of two vehicle ferry connections from the island and allows for the year round resident population.

**Vashon-Seattle (Passenger only):** This new route from Vashon Island has provided a much more direct commute to downtown Seattle and provides a new park and ride transit option, as evidenced by the overflowing lot near the island end terminal. The passenger vessel terminal was added to the existing pier and helped preserve the environmentally sensitive beach front. Since being introduced in 1990, the service has had mixed results, owing in part to three factors; 1) the "high speed" monohulls have not performed to specifications being slower than expected and requiring frequent maintenance, 2) poor wake and wash characteristics have required slower operating speed near shore, and 3) the infrequency of headway at 1 hour 15 minutes during peak times. For WSF the results have been disappointing in terms of ridership revenue, and, cost, with the passenger service taking riders from the combined service, thereby causing higher subsidies per passenger. There are currently proposals by WSF to expand and improve service from Vashon Island to Seattle by adding new, more efficient high-speed vessels to increase capacity and headway, and reduce trip time.

**Bremerton-Seattle:** The longest of the commuter routes connects downtown Seattle to the port city of Bremerton, the location of a U.S. Naval Base. At times of high military employment, this route served as a two way connector, which it does to a lesser extent today. The 60 minute crossing is time consuming for commuters but saves approximately 50 to 60 miles of driving through Tacoma. Depending on origin and destination, the Bremerton route provides auto and passenger commuters with the option from the western Kitsap peninsula. In addition it is the first available cross-Sound route for long distance highway link connections east and west, and is used actively by through traffic.

**Bremerton-Seattle (Passenger only):** Coupled with the start up of the Vashon-Seattle route, the passenger only service was introduced in 1990, and provides a parallel commuter service from Bremerton to Seattle. Originally served by a catamaran, the introduction of the high wake monohulls undercut the benefits of the higher speed route by necessitating slower operations through the approach pass to Bremerton. The trip time then became comparable to the car ferry at 50 to 60 minutes, and offered no clear benefits. The departure times are offset with those of the auto ferry and consequently offer more attractive headway times for passenger commuters. The single vessel round trip time of 2 hours limits the effectiveness of the passenger only service as distinct from the auto ferry. Similar problems of high maintenance of the vessel have also been a concern, as has the high per capita cost of trip per passenger. The service has greater transit potential since it connects the two highest density employment and residential areas of all WSF routes, Seattle and Bremerton. As with the Vashon service, WSF is currently considering replacement of the vessels with low-wake, higher speed craft to offer a faster route and more attractive option for passengers.

**Bainbridge Island-Seattle:** The most heavily used route in the system, the 7.5 nautical mile route takes 28 minutes to cross, and serves a number of residential communities on the western peninsula. The service carries 30% of the system-wide passenger volume (3.9 million in 1991) and 22% of the vehicular traffic (2 million in 1991). The route is also a popular east to west excursion for Seattle visitors, providing a dramatic crossing of Puget Sound and connecting to the attractive small port town of Winslow, for which service was formerly named. Management

**Table 2.11**

**Seattle/Washington State Ferries:**
**Comparative Analysis of Existing Individual Routes**

Key:

Type:
**1.**Ferry/Bridge or Tunnel
**2.**Ferry/Parallel to High.
**3.**Ferry to Island(s)
**4.**Ferry + Bridge or Tunnel
**5.**Ferry + High. or Rail
**6.**Ro-Ro/Highway Link

Characteristic:
**A.**Commuter/Recreation or Tour
**B.**High/Low Volume
**C.**Int'national/Int'state/Int'city
**D.**Public/Private
**E.**New or Expanding System

| **Route:** | **Type** | **Charact eristics** | **An.Vol. Pass.** | **An.Vol. Vehic's** | **Trip Dist.** (Kts) | **Trip Time** (min) | **Gen'l** |
|---|---|---|---|---|---|---|---|
| **Fauntleroy-Vashon -Southworth** | 1,3,6 | Com,Rec High V. Public | 1.4 mil | 1.6 mil | 4.4 | 16 | Skip Stop@ Vashon |
| **Seattle-Vashon** (Pass. only) | 3 | Commut Med V. New '90 | .2m | - | 9.8 | 25 | Envir'l Wake (Ves'l) |
| **Seattle-Bremerton** | 1,6 | Com,Rec High V. Public | 1.7m | .7m | 15.5 | 50 | Longest Com. Route |
| **Seattle-Bremerton** (Pass. only) | 1 | Commut Med V. New '90 | .2m (est.) | - | 15.5 | 50 | Envir'l Wake (Ves'l) |
| **Seattle-Bainbridge Island** | 1,3,6 | Com,Rec High V. Pub. | 3.9m | 2.1m | 8.6 | 28 | Highest Volume |
| **Edmonds-Kingston** | 1,6 | Com,Rec High V. Public | 1.7m | 1.7m | 5.2 | 16 | Partial Commu -ter |
| **Mukilteo-Clinton** | 1,3,6 | Com,Rec High V. Public | 1.8m | 1.9m | 2.6 | 8 | Whid'y Island |

Source: WSF Two Year Report: 1989-1991 Biennium

of growing demands for park-and-ride use remain a challenge for the terminal area, and has led to remote shuttle parking and increased transit service.

**Kingston-Edmonds:** The shortest Puget Sound crossing route north of Seattle plays an increasingly active role in commuter transportation connecting the expanded employment north of Seattle with greater residential settlement in the northern Kitsap peninsula. As with the Fauntleroy route to the south, the Edmonds and Mukilteo connections provide options for western peninsula originating auto commuters to by pass central Seattle by the ferry route. the passenger connections are similarly dispersed as employment locations are closer to the interstate corridor to the coast, and bus connections to Seattle are still equal to auto travel times. The terminal location is in the town center of Edmonds which has also grown as a residential community. With increasing weekday and recreational use of the ferry, traffic impacts on the community have become serious, and a plan for relocating the terminal as part of an intermodal center at Edmonds Point are well underway. Environmental issues with site as a former fuel pier and tank will necessitate a somewhat extended permitting and construction period. The resulting intermodal facilities are intended to provide expanded transit options in the form of light rail or busway links to Seattle and other satellite employment centers.

**Clinton-Mukilteo:** Further north from Edmonds, the Mukilteo route connects over the narrow strait between the mainland and Whidbey Island. A smaller community to the west of Everett, Mukilteo provides a weekday arrival point for Whidbey Island residents commuting to employment areas north of Seattle. It is also inundated during the summer season by tourists and weekend recreational users bound for Port Townsend or the San Juan Islands, as well as Whidbey Island itself. The terminal and approach road are heavily used on Fridays, Saturdays and Sundays for the extended visitor season. The Mukilteo ferry serves commuters to nearby Everett as well as to the other northern employment locations. The rapidly expanding usage of the Mukilteo route will require terminal and approach route improvements in the near future.

The comparative matrix in Table 2.11 shows the characteristics of the existing commuter routes to Seattle operated by WSF. The comparative matrix in Table 2.12 shows existing routes compared by transportation function and land-based alternative.

**Proposed New Routes:**

The new routes described were not in service at the time of the study, but were at varying levels of planning, commitment and implementation. With the exception of the WSF expansion of service from Vashon Island, all proposed routes will require terminal dockage at both ends, necessitating coordination with WSF, as well as relief from charter or franchise restrictions for private operators for some of the routes. The following descriptions are drawn from the interviews and some references in the literature researched. The proposed routes are shown in Figure 2.13.

**Southworth-Seattle:** WSF is currently considering a package of 6 new vessels to serve 4 passenger only routes. Southworth to Seattle would be one of two passenger only routes (along with an expanded Vashon Island service) to provide an option of direct service to downtown Seattle, and preserve vehicle and passenger capacity for growth along the Southworth-Vashon-Fauntleroy route. The new route proposed by WSF would encourage a greater capture of potential park and ride ferry transit users by providing a real time savings over current options. The approximately 10 n. mile trip would take 21 minutes at 28 knots, and save considerable time

over the current trip to downtown Seattle via Fauntleroy.

**Kingston-Seattle:** With the growth in northern Kitsap peninsula population and the increased use of the Kingston-Edmonds auto ferry for commuting trips, there appears to be a substantial captive market for a direct passenger service to central Seattle. Based on prior franchise rights passed on to the Victoria Clipper company, WSF does not have exclusive rights to operate the route. However as part of their consideration of an expanded passenger-only network, and in light of the fact that Victoria Clipper is not currently actively pursuing such a service, WSF is looking at the route as a way of relieving pressure on the Edmonds-Kingston service. The objective would be to preserve capacity by converting current Seattle bound auto commuters to park and ride passenger patrons by offering a faster and less costly total trip with the more direct route. Negotiations with the current franchise holder will be required, as well as possible Legislative changes regarding route jurisdictions. The approximately 15.5 n. mile route would take 33 minutes on a 28 knot vessel, a considerably shorter trip than travelling via Edmonds.

**Edmonds-Seattle:** Mosquito Fleet, a private operator has taken initial steps to provide commuter service from Edmonds to Seattle, a distance of 17.4 n. miles which would take approximately 40 minutes in a high speed (27 knot) vessel. The route would initially be the last leg of an Everett to Clinton to Edmonds to Seattle route, and would require dock facilities in Edmonds and Seattle. The route is projected to attract 4% of the current commuter market and is projected to draw 240 passengers each way by 1995. While a major new multi-modal terminal is funded and in planning for Edmonds, it will take 3 to 5 years for implementation and interim dock space and parking are needed for an early start-up. The route would be the first service in Seattle parallel to land-based auto and transit routes, and would need to compete in trip time and amenity level to attract patrons.

**Mukilteo-Seattle:** A second parallel route, also proposed by Mosquito Fleet, would connect Mukilteo to Seattle. As part of a multiple stop rote from Everett, the service would take 1 hour 10 minutes utilizing a 27 knot vessel to cover the 26 n. mile distance. Relatively low ridership projections of 88 passengers in 1995 would nonetheless help in aggregation of fares for the start-up 4 stop route. When and if demand builds, an express route to Seattle would be added.

**Clinton/Whidbey Island-Seattle:** Providing a new Whidbey Island to Seattle route, the Clinton-Seattle proposal by Mosquito Fleet would closely parallel the Mukilteo route in time and distance and would offer an alternative to the current combined ferry/drive commuters. Ridership is projected to be higher at 140 in 1995, and the trip would cover the 27 n. mile distance in a similar 1 hour and 10 minutes. Docks are in the planning stages.

**Everett-Seattle:** A fourth route would cover the 30 mile distance by Mosquito Fleet in 1 hour and 30 minutes with intermediate stops at the above locations, or in 1 hour as an express route. The larger service area could produce as many as 240 round trip passengers by 1995. Interim dock space has been arranged with the Port of Everett.

**Port Townsend-Seattle:** The longest of the routes recently considered for passenger only service would be 41 n. miles and would require a 35 knot vessel to cover the trip in 1 hour 15 minutes. The franchise is held by Clipper Navigation, which studied the route and felt there was not a sufficient market for the $10 to $12 fare that would be required. In addition there are not a large number of commuters to Seattle at present because of the long trip time requiring 2 ferry crossings by WSF. A seasonal excursion to Port Townsend and Friday Harbor is currently

**Table 2.12**

**Seattle/Washington State Ferries and Mosquito Fleet**
**Comparative Analysis of Proposed Individual Passenger Only Routes**

Key:

Type: **1.**Ferry/Bridge or Tunnel
**2.**Ferry/Parallel to High.
**3.**Ferry to Island(s)
**4.**Ferry + Bridge or Tunnel
**5.**Ferry + High. or Rail
**6.**Ro-Ro/Highway Link

Characteristic: **A.**Commuter/Recreation or Tour
**B.**High/Low Volume
**C.**Int'national/Int'state/Int'city
**D.**Public/Private
**E.**New or Expanding System

| **Route:** | **Type** | **Characteristics** | **Day.Vol Pass.** (Thous.) | **An.Vol. Pass.** | **Trip Dist.** (Kts) | **Trip Time** | **Gen'l** |
|---|---|---|---|---|---|---|---|
| **Southworth-Seattle** | 1 | Commut Med.V. Pub/Priv | NA | NA | 10.0 | 21 @28Kts | Prop'd WSF |
| **Kingston-Seattle** | 1 | Commut Med.V. Pub/Priv | NA | NA | 15.5 | 33 @28kts | Prop'd WSF, VC Rgts |
| **Edmonds-Seattle** | 5 | Commut Med.V. Priv. | 480k Per. | 120k | 17.4 | 31 @33kts | Prop'd Mosquit |
| **Mukilteo-Seattle** | 5 | Commut Med.V. Priv. | 45k | 180k | 26.0 | 47 @33kts | " |
| **Clinton-Seattle** | 3 | Commut Med.V. Priv. | 70k | 280k | 27.8 | 51 @33kts | " |
| **Everett-Seattle** | 5 | Commut Med. Priv. | 120k | 480k | 30.2 | 55 @33kts | " |
| **Port Townsend-Seattle** | 1 | Com,Rec Med.V. Priv. | - | - | 41.5 | 75 @33kts | VicClip Rights |

Sources: WSF Interviews, Mosquito Fleet High Capacity/High Speed Passenger Ferry Report

operated daily from May to September as a day long loop and is therefore suitable for commuter use. Clipper Navigation has its own terminal at Pier 69 at the north end of the downtown Seattle waterfront.

**Comparison of Routes:**

The comparative matrix shown in Table 2.13 includes all of the proposed passenger only routes, and describes potential operating characteristics assuming two levels of high speed operation including vessels capable of average operating speeds of 28 knots and 33 knots as noted by route. The comparative matrix shown in Table 2.14 shows the proposed routes compared by transportation function and land-based alternative.

## 2.14 System Performance and Planning Decisions:

As described above, the Washington State Ferry network and those particular routes serving Seattle as a commuter highway link and passenger transit system operate in a well organized, cost effective, and user responsive manner. The system has evolved over time into the State's greatest tourist and recreation attraction, and is a treated with great pride and respect by its operators as well as owners and users, the general public. As the system's history indicates there have been numerous important decision points which have determined the present day operations. However, there are new challenges on the horizon. Periodically various interests within the state raise what is referred to by some as the "B" (for bridge) word, and suggest that ever increasing demand for cross-Sound travel necessitates reconsideration of building a bridge to connect east to west. The future of the WSF is likely to pose a variety of decision points relating to its ability to adapt to increasing demands as well as ongoing question of the financial accountability of the service to its constituents.

**A. Market Demand - Effectiveness of Ferry Operations in Meeting Transportation Needs:** The multi-purpose WSF has adapted both on land and on water to changing demands during its 45 years of operation. Owing to the continuing dual functions of carrying vehicles and passengers, the vessel technology has not changed appreciably since the 1920's when six sister ships, all double ended, steel electric, vehicle passenger ferries were built by Southern Pacific and Northwestern Pacific Railroads to serve San Francisco and Seattle. Since the route time-distances have remained relatively short and the mode demands for highway links have continued, subsequent vessels have all been variations and incremental improvements of the earlier car ferries. Incremental shore side improvements have been made at the terminals to provide maximum amounts of parking and grade-separated pedestrian transfer bridges, to expedite loading of both people and vehicles.

The relatively recent introduction of passenger only routes by WSF was intended to offer incentives for commuters to downtown Seattle to park-and-ride thereby reserving more capacity for through traffic. Many such adaptations in operations and services have had the multiple purpose of increasing capacity and efficiency of the system, while also improving the quality of service for the patrons. Under the ever watchful scrutiny of the legislature and particularly those from non-Puget Sound districts, the system has often been obliged to carefully justify increases in capital and operating expenses. Fortunately for the WSF, the combined growth in demand for all functions and routes has tended to justify such expenditures, by creating a high utilization rate for most routes, and averaged cost efficiency for the total system. Accordingly, the system

has also been able to maintain extremely reasonable fares for passengers and vehicles, thereby making the ferries accessible to the broadest range of riders. The popularity has also allowed WSF to maintain the remarkably low 30% subsidy for operations, compared to other land or water transit systems. The continuing use of large capacity, moderate speed (12-15 knots) vessels has contributed significantly to controlling costs. The major increases in tourism over a 6 to 8 month season have also contributed by filling vessels on weekends and off-peak hours on trips which would otherwise have operated at far below capacity.

**B. Environmental Impacts:** In some respects the system has almost become too successful, resulting in long waits on some routes for the unreserved vehicle crossings, and creating strains on the infrastructure of the increasingly populous areas around the terminals. The environmental impacts have been increasing with the success and growth of the system, which has been paralleled by residential and employment growth primarily in the northeastern corridor of Seattle and secondarily by increases in year-round residential on the various peninsulas and islands of Puget Sound west of Seattle (Kitsap, Toandos, and Quimper peninsulas and Bainbridge, Vashon and Whidbey Islands). The once sleepy and relatively rural terminal locations have become intensively used daily and particularly on weekends in season as recreation areas beckon residents and tourists alike. More densely populous areas such as West Seattle are impacted by vehicle traffic in neighborhoods on the through arterial routes. Several new terminal locations are being considered to help isolate the queuing of vehicles and allow the village centers to be returned to the communities in locations such as Edmonds and Mukilteo. Colman Dock in downtown Seattle has recently successfully undergone substantial site reorganization to contain vehicle and pedestrian activity on site.

The impacts on the shoreline caused by wake and wash of the higher speed passenger vessels on the Bremerton route have resulted in slowing the speed through more fragile areas, thereby increasing trip time and lessening the attractiveness to commuters. The presence of deadheads in the Sound also creates more of a hazard to the higher speed, lighter displacement vessels, resulting in hull and engine damage, and decreased reliability. Both of these environmental constraints could be overcome technologically with different vessel designs with low wake, stronger hulls and greater engine protection.

The proposed new terminals including the intermodal facility at Edmonds, and modifications to terminals at Mukilteo, Clinton, and Kingston will all involve degrees of coastal zone impacts. The precedent set at Vashon for the passenger-only service represents a good model for overlaying new docks on already existing piers. The floating dock at Vashon, minimizes shoreline disruption by building away from an existing pier. The landside implications are the addition of parking spaces to accommodate increases in passenger-only riders. In the case of Edmonds, the proposed expanded terminal will be located approximately 1/2 mile south of the existing pier on a former industrial site, which will require extensive permitting for landside approaches and waterside piers and transfer bridges. As other boarding sites require expansion for larger vessels, and larger parking facilities for passenger commuters, similar environmental issues will have to be faced. The facts that the ferry system is clearly a water-dependent use and the transportation functions are critical highway linkages should expedite approvals.

**C. Economic Development Factors:** There are several instructive economic development issues associated with the WSF. Development of the WSF as the largest tourist attraction in the state and the associated major expansion of recreational use of the system, particularly to the San Juan Islands and other north Sound routes, has effectively provided a form of cross-subsidy for

Table 2.13

**Seattle/ Washington State Ferries: Existing Routes.**

**Comparative Analysis of Individual Routes By Transportation Function and Land-based Alternative**

| **Location and Route:** | **1.Trans. Essential Link** | **2.Trans. Compli-ment'ry** | **3.Trans. Optional** | **Land/ Alts.** | **Appro Dist.** land/wat | **Insti-tution'l** |
|---|---|---|---|---|---|---|
| **1. Fauntleroy-Vashon-Southworth** | Yes(Isl) | Yes (South.-Faunt.) | - | South. via Tacoma | 50m v. 10m | WFS |
| **2. Vashon-Seattle (Pass)** | Yes(Isl) | - | - | - | No Land v. 9m | " |
| **3. Bremerton-Seattle** | - | Yes | - | via Tacoma | 60m v. 20m | " |
| **4. Bremerton-Seattle(Pass)** | - | Yes | - | " | " | " |
| **5. Bainbridge-Seattle** | - | Yes | - | " | 90m v. 8m. | " |
| **6. Edmonds-Kingston** | - | Yes | - | " | 90m v. 25m | " |
| **7. Mukilteo-Clinton** | - | Yes | - | via An-acortes | 85m. v. 2.6m | " |

the weekday commuter and business trips. The state has also supported such use as a major regional development catalyst which has created a broad-based tourist industry along both shores of Puget Sound. By helping such formerly lightly used but essential regularly scheduled mainland-to-island links operate at capacity during the 6 month season, the added operating efficiency and revenues have helped keep the system-wide subsidy in check. While there are slightly differential rates for high-season and off-season fares and the system increased fares in 1992-3, there is probably even further elasticity to increase the fare structure for peak seasonal tourist use, as is practiced by other year-round systems such as the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority in Massachusetts. The ferry system as tourist attraction has clearly contributed immensely to the state economy by luring increasing numbers of out of state visitors, as well as by keeping Washington resident tourist dollars in state.

The WSF fleet is large enough and old enough to keep a small shipyard industry going in Winslow, which services and maintains the vessels. In addition, the annual operating budget of $93 million (1991) creates significant employment opportunities and support service multipliers to benefit the regional economy as well. Plans for expanding the fleet in 1994 by building 3 new superferries at a cost of $210 million will further assist the local economy, as the Legislature has stipulated that they must be built in-state.

Regarding regional development and land-use decisions, the reliance on a ferry system as highway link from western to eastern shores of the Sound seems to have actually been a significant benefit as a growth management tool. The major growth on the densely developed eastern shore has followed the traditional north-south highway corridor between Tacoma and Seattle, and more recently from Seattle north towards Everett and Bellingham. The more rural western Peninsula is dominated by the Olympic Mountains and extensive waterways which have limited the moderate development to several smaller coastal communities which are near the ferries. The ferry service has been able to expand enough to meet these moderate growth demands without requiring serious reconsideration of bridges or tunnels.

**D. Institutional Factors - Public versus Private Operations:** The WSF seems to be a highly evolved and responsive public transportation system, providing a toll type service for a marine highway link which could be compared to a bridge or tunnel. As such the ferries serve the full spectrum of vehicular functions with the added elements of passenger transit and recreation. The revenues are sufficient to pay for the majority of operation costs with subsidies raised by user taxes on gasoline sales and auto excise fees. Capital improvements are funded through conventional bond issues with separate gas tax accounts paying debt service.

An interesting policy dilemma has arisen with respect to the passenger-only commuter service. Increasing pressures have led to the proposals to improve passenger transit uses of the system by acquiring new high speed passenger only vessels and establish the new cross-Sound routes described from Southworth and Kingston to Seattle and also improve service from Vashon and Bremerton. These have resulted in the current WSF recommendation to legislature to build six new vessels. At the same time private operators, Mosquito Fleet, have proposed new high speed commuter services parallel to the eastern shore from Everett, Mukilteo, Whidbey Island, and Edmonds to Seattle, requesting relaxation of franchise limits and assistance with terminal use and new construction from WSF.

While both initiatives are contributing to improved commuter transit, WSF has elected to maintain operation of the cross-Sound services as part of the marine highway link (perhaps subtitled

marine transit way for passenger only services) and allowing the private sector to provide market-rate commuter transit services along routes parallel to existing eastern shore land-side routes. In this respect WSF seems to be consistent in improving cross-Sound services as a clear extension of the marine highway mandate, while on the other hand allowing a higher fare ferry system (competing with other state subsidized land-side transit) to be operated privately. Despite the finding by WSF that high speed passenger only service cannot be as economically provided per passenger as on the larger car ferries, they have proceeded with the cross-Sound routes to offer commuters a more attractive transit option. This in turn is intended to reduce cross-Sound auto commutes, preserve ferry vehicle space for other users, and ultimately slow the need for new vehicle ferries to be built.

If the initiatives by WSF for expanding passenger-only service are not ultimately successful, there may still be a justification for allowing private operation of cross-Sound routes, despite the need to address legislated limitations regarding labor and route franchises. The alternate scenario might be that the passenger-only services currently operated by WSF, and the proposed new high-speed services might be candidates for privatization for several reasons. The nature of these commuter services could be viewed as quite different than the multimodal highway link ferries, as they are providing more of a rapid transit option. In addition the technologies and operating costs contrast with the larger, slower vehicle ferries. By offering significant time savings for Seattle destined commuters, it would be reasonable to charge somewhat higher fares for those choosing the high speed routes, and as in other cities such as New York and San Francisco the private operations can divert through auto commuters. The net result for the WSF might initially appear counter productive in terms of fare revenues, as some portion of passengers might be lost. On the other hand, the privatization of the high speed service would reduce operating expenses for the least cost effective routes, and the multiple new passenger-only routes might actually reserve capacity for vehicles on the ferries. The potential diversion of commuters cross-Sound and parallel to the eastern shore from single occupant auto trips would also help meet other environmental goals such as clean air and fuel conservation. Any private passenger service will be reliant on WSF for dock rights, linkages with the park-and-ride lots, and transit connections already in place at the terminal areas. In that respect, WSF would of necessity have a continuing role in indirect public support and subsidy for such systems, and they would in effect require public-private partnering.

Aside from these speculations on the future role and operation of passenger-only service, the Washington Department of Transportation and WSF have made notable innovations in encouraging increases in passenger use through coordination of transit, encouragement of HOVs and van pooling, and the facilitation of terminal pedestrian connections with grade separated walkways.

### E. Cost Effectiveness: Economic Justification of Ferries as Alternatives to Land-Based Options

The WSF routes vary in cost effectiveness based on such factors as volume of passengers, size of vessel, length of route and utilization rate. For the most heavily used and shorter routes serving Seattle such as Bainbridge Island and Kingston-Edmonds, the cost effectiveness as measured by the farebox recovery rate is very favorable and well below the 30% subsidy rate legislatively required. For other routes which may be more heavily used seasonally such as those in the San Juan Islands, the farebox recovery rate may be less favorable and is balanced by the more heavily used systems. The two passenger-only services have proven to be the least

Table 2.14

**Seattle/ Washington State Ferries and Mosquito Fleet: Proposed Ferry New or Expanded Routes**

**Comparative Analysis of Individual Routes By Transportation Function and Land-based Alternative**

| Location and Route: | 1.Trans. Essential Link | 2.Trans. Compli-ment'ry | 3.Trans. Optional | Land/ Alts. | Appro Dist. land/wat | Insti-tution'l |
|---|---|---|---|---|---|---|
| 1. Southworth-Seattle | - | Yes | - | via Tacoma | 50m v. 10m. | WFS |
| 2. Kingston-Seattle | - | Yes | - | via Tacoma | 90m. v. 10m. | WFS |
| 3. Edmonds-Seattle | - | - | Yes | High/ Bus | 20m. v. 20m. | Mosquit |
| 4. Mukilteo-Seattle | - | - | Yes | High/ Bus | 28m v. 28m | " |
| 5. Clinton-Seattle | - | Yes | - | via An-acortes; viaWFS | 30m. v. 115m | " |
| 6. Everett-Seattle | - | - | Yes | High/ bus | 30m v. 35m | " |
| 7. Port Townsend-Seattle | - | Yes | - | via Tacoma | 50m. v. 120m. | VicClip Fran-chise |

cost effective due to the combination of low fares, high operating and maintenance costs, and peak hour utilization. WSF has found that during times of flat fares such as 1984 to 1991 that increased ridership offsets increasing costs of service up to a point and then created an imbalance necessitating fare increases to meet the mandated 30% subsidy requirement.

The relative cost-effectiveness of the system may also be attributed to the scale of operation, the lack of competition, and the steady increases in demand in both peak and off-peak periods. The four routes serving the Seattle area carry approximately 75% of the total system ridership and account for a proportionate amount of the income. The WSF system has supplemented farebox revenues from a successful array of concessions for commuters and tourists, both on vessels and at terminals. As with many publicly operated systems there are various costs which are not figured into the operations figures such as long term capital improvements, which may be funded by bond issues. Nonetheless the ability of the WSF system as a whole to meet its legislated deficit levels is notable when compared to many other public water or land based transit systems.

The interesting cost-efficiency issue for the future relates to passenger only service which is inherently more expensive to capitalize and operate per capita. The decision by WSF to pursue expansion in late 1993, indicates the system and state DOT willingness to improve transit options in order to realize other state transportation goals, such as easing Seattle traffic congestion, and reducing vehicle miles traveled (VMT's) while also preserving capacity on ferries. This policy decision may prove that in a well utilized total transit system, some routes or new modes may warrant higher subsidy levels, in order to either meet emerging transit objectives and/or realize long term economies on other routes. These objectives might be achieved for example, by subsidizing passenger-only routes to relieve pressure on full service routes, and by varying fare structures more dramatically to influence user choices. By maintaining a balance of routes and easing vessel expansion needs, the requirements for costly capital expenditures on new mega-vessels or expanding terminals might be effectively moderated.

## 2.15 Case Study Findings and Lessons for Other Systems:

**Network Potential for Meeting Future Transportation Needs:**

With regard to the recent experiences of WSF, one could say that nothing succeeds like success. The recent period of increasing demand and utilization combined with an effective maintenance and expansion program, a supportive legislature, and dedicated public. The mandated planning process on a biennial basis provides a reasonable time frame for meeting system needs as well as keeping pace with the legislature.

Specific plans include fleet expansion and routine maintenance, service improvements, terminal improvements and replacement (Edmonds) and the passenger-only service expansion. These measures represent a 4 to 6 year growth and maintenance program which seems to be consistent with current growth demands and system upkeep needs. The only factors which may slow down implementation of these plans appear to relate to new terminal development and regulatory issues. The proposed Edmonds multi-modal terminal which will replace the existing facility may require extensive environmental mitigation because of existing site conditions as well as potential impacts on the waterside in Puget Sound.

The state-wide public support for the system which has increased with WSF emergence as the

major tourist attraction, may be the system's greatest asset in the long run. In other states where the ferry systems are serving a small portion of the population of one metropolitan community, such as in Boston, it can be difficult to sustain public and agency support. In Washington State where residents from all areas visit Seattle and Puget Sound, much of the tourist use is home grown and tends to sustain the broad based support for the multi-purpose marine highway.

**Lessons from Washington State for Other Systems**

As the nation's largest ferry system in terms of annual volume of passengers and vehicles, fleet size, and general transportation importance to the region, the Washington State Ferries offer many lessons as a high-volume, state-operated, multi-purpose network. The evolution of the system through several critical decision points over nearly half a century implies that such a large scale marine highway requires a long time to achieve the financial stability and support constituents evidenced by WSF. Several key lessons which may be useful to other existing systems and new locations offering multi-functional water transportation services include the following:

o The WSF is a successful model of a state run, publicly subsidized, high volume, passenger and vehicle ferry system. Economies of scale seem to contribute to the systems relatively cost efficient operations.

o Traditional large, low technology car ferry vessels can be adapted to provide high volume marine highway alternatives to bridges or long land-side routes.

o Two-year or biennial planning cycles allow lead time for maintenance, operations and other immediate needs as well as progress on longer term projects. Legislative mandates keep pressures on to produce budgets and implementation schedules.

o Legislated performance criteria, budget targets and financial mechanisms for subsidies help keep the system focused and innovative in responding to changes.

o Blending commuter, through traffic and tourism functions on all routes has helped provide maximum utilization of scheduled services; the tourist and recreation uses fill-in at off-peak times year round and at peak season.

o Passenger-only services are planned to divert more single auto commuters from vehicle ferries for several reasons: to reduce auto trip mileage (VMT's), to create more direct high-speed commuter service to the central employment area, and to conserve the capacity for through traffic vehicle service.

o The marketing promotion and communications for WSF have successfully attracted new riders and solidified the dedication of commuters and tourists alike. The people of Washington State are proud of their ferry system.

o An emerging policy implication of state-provided complementary cross-sound service and privately provided optional service on the east peninsula, seems consistent with the legislated mandate and relative state transportation priorities.

o Acceptance of tourism functions as a justified part of a marine highway system have

been so successful, similar multiple uses should be permitted on all public systems, and endorsed by state and federal funding sources.

o If other systems could achieve the low 30% operations subsidy realized by WSF, water transit could be more easily justified as a legitimate public endeavor.

## 2.2 PORTLAND, MAINE - CASCO BAY LINES

### 2.21 Network Description and Summary Findings

**Existing Routes: Portland to Casco Bay Islands**

o Portland - Peaks Island (p. and p. + v.)
o Portland - Little Diamond Isl. (seasonal) - Great Diamond Isl. - Long Isl. - Chebeague Isl. - Cliff Isl.

The Casco Bay Lines service operating from downtown Portland to six islands is a pure example of a ferry system providing a scheduled daily transportation lifeline for year round residents, for whom there are no alternative means of travel to and from the mainland. The ferry service to Peaks Island is the longest continuously operating daily ferry route in the U.S., covering a span of over 120 years. A vehicle ferry and passenger/freight ferry provide daily service to Peaks Island, the most populous of the islands served, with a year round population in 1990 of approximately 1000. The system also provides year round daily service which includes transport of passengers, mail, freight, and vehicles for residents of the larger islands including Great Diamond, Long, Chebeague and Cliff. Seasonal service is also provided to Little Diamond Island. Since the service was initiated in 1871, there appear to have been no serious efforts to provide bridge or tunnel connections to the relatively small and sparsely populated islands, which are separated from the mainland by major shipping channels into Portland Harbor. Four of the islands served are in the City of Portland, while Chebeague Island is in Cumberland County, and Long Island, which recently seceded from Portland, now constitutes an independent township.

The system includes two year round routes and additional summer excursion routes in Casco Bay. The routes are served by The Casco Bay Lines, which operates the service under a long standing charter from the state legislature, established in 1845. The non-profit service is answerable to the board of the Casco Bay Islands Transit District (CBITD). The limited-purpose, island and city run District was formulated to represent the islands and oversee the public takeover and operation of the island ferry system in 1982, when the then private Casco Bay Lines system became unable to provide adequate services owing to bankruptcy. Since its restructuring in 1982, the Casco Bay Lines have improved the vessel fleet, terminals and level of service to the islands in response to shifting demands and funding options.

The island populations grow considerably during the short northeast summer season from June to September, and shrink to their small year round populations during the remaining eight months. The system operates at a deficit during the off-season when the islanders are most dependent on daily service, and operates at a profit during the summer tourist season when the combined island population swells to approximately 5,000. The summer profits are used to offset winter losses, as the publicly owned, non-profit system strives to operate annually at a break-even rate.

**System Type: Existing Routes**

Two similar types of service are operated to the islands. Peaks Island is served by both the

passenger/freight ferries and the recently commissioned larger vehicle ferry, the Machigonne II, which connects the new terminal facility and ferry slips with transfer bridges at the Portland terminal to the refurbished Peaks Island facility. The remaining 5 islands are served by combination passenger/mail/freight/vehicle ferries and multi-use piers currently without full scale transfer bridges. While the passenger ferries are technically transferable between routes, they are generally assigned to specific routes and schedule slots, and have somewhat differing deck and entry layouts to match the islands served.

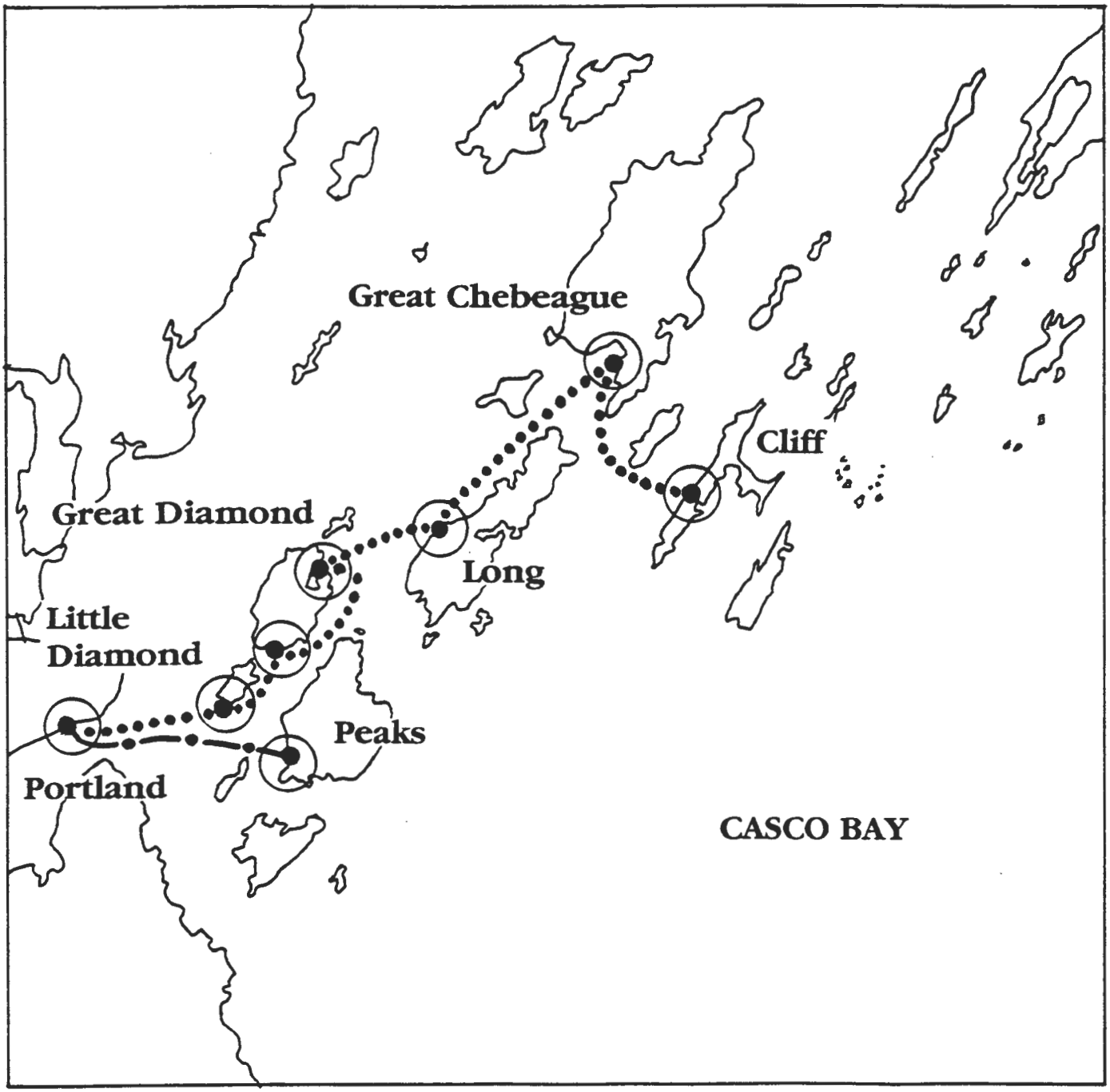
The vessels, operations and facilities themselves reflect the character of the harsh climate and the spartan needs of the independent minded islanders. The vessels are built to serve the routes daily requiring minimal maintenance and operating at fuel efficient speeds. More importantly with respect to the climate, the seasons, and the North Atlantic exposure of Casco Bay, the vessels were designed to be seaworthy and capable of operating in the occasionally fierce weather, wind, and tide conditions encountered on the routes during the course of the year. The passenger vessels are slow but sturdy. They are built to be capable of landing at a variety of exposed dock locations, in extreme weather, wind, and tide, and on the multi-island run, deliver smaller vehicles through side loading onto piers without transfer bridge facilities. The more protected Peaks Island piers are designed for frequent service by either passenger or vehicle vessel.

The recently completed Portland terminal provides a good example of an intermodal facility tailored to the needs of its users in a medium sized urban area. The terminal provides a comfortable and congenial waiting and ticketing space with covered access to the vessels: The city pier site also incorporates a bus dropoff and holding area, a taxi stand, a postal and freight handling area, a compact staging area for vehicle ferry loading, an attached parking garage which is shared with the Old Port area, a small entrance park and good pedestrian connections to the downtown, and waterfront. The narrow, protected channel along the terminal pier is shared with a variety of commercial fishing vessels. The array of intermodal options connects the islanders with the services and institutions spread throughout the Portland metropolitan area, many of which are beyond walking distance. With 4 of the 6 islands within the city limits, the system also ties the islanders to the public services such as schools and hospitals and eliminates the need to duplicate such services on the islands. Assuming the continuing year-round residential use of the islands, the operation of the ferry on a regular daily schedule is more cost efficient for the city than paying for small duplicated services on the islands. Without the frequency and reliability of the ferry system, year round communities on the islands would by now have vanished altogether, and become summer-only communities such as Cushing Island to the east of Peaks. The ferry system is backed up by all on-call, privately operated, emergency water taxi.

**Key Findings:**

State Charter for Ferries as a Transportation Lifeline for Urban Island Residents in Casco Bay: The establishment of chartered island ferry routes by the state legislation dating back to 1845, and for specific Peaks Island service in 1871 represents the oldest continuous dedication of water transportation as a public utility in the country. The early incorporation of the island communities into the city of Portland and its long term commitment to providing daily water transportation also established a municipal precedent which has endured. Today the dedicated system is all the more notable for the relatively extensive schedule of service provided for a comparatively small user population.

Figure 2.21: Existing Casco Bay Ferry System, Portland ME



The Island Ferries as Urban Marine "Avenues:" If the Seattle and Washington State Ferry are described as a marine highway, the Casco Bay Lines may be called an urban marine avenue and transit way, since its primary function is to provide commuter connections for island residents to and from their daily mainland based activities. The system connects the small island residential neighborhoods to the city as a multi-faceted transportation lifeline, as if an extension of the city street system across the bay.

Traditional Island Land-use Patterns are Sustained by the Ferry System: While the summer use of islands for vacation homes is not surprising, the centuries old inhabitation of the small harbor islands by urban commuters in this harsh northern coastal setting is certainly a unique aspect of Portland and Casco Bay. The Maine State Ferry System provides daily marine highway services to long established offshore island settlements in Penobscot Bay and points east. However, with the exception of one route, few of those islanders travel daily to and from the mainland.

Seasonal Residents, Tourism and Recreational Uses Cross-Subsidize Year Round Services: Both the Casco Bay Lines and Maine State Ferries "tolerate" and indeed cater to seasonal users who greatly expand summer and fall populations on the islands, and contribute significantly to the annual revenues. The tradition of summer visitation dates well back into Native American history as the migrant tribes set up summer camps on islands in Casco Bay to take advantage of the abundant fishing and harvesting of natural crops. The later town dwellers followed suit as was evidenced by the extensive use of the islands near Portland from the late 19th century on. While the systems still operate at a small deficit, the cross-subsidy is essential to the operation of year-round service and continuation of the traditional residential uses of the islands.

No Land-based Transportation Alternatives have been Seriously Considered: Because of the relatively small size of the islands, their low density development, and the proximity of deep water shipping channels, no serious attempts have been made to build bridges or tunnels. More recently, island residents have chosen and protected their detachment from the city and would not allow such intrusions even if they were offered. In fact Long Island, with dispersed residences and considerable open land, has recently even debated the State offer to construct a transfer bridge which would allow the vehicle ferry to operate, since it would, in their opinion, attract too many new residents and change the character of the large but sparsely populated island.

Local Graphic Conditions have Dominated Design and Operations Decisions: The vessel design, terminals, routes, and operations have all been greatly influenced by the local weather and navigation conditions, and in particular the extreme conditions which can occur in this "Down East" location. The fact that many islanders use the service 5 or 6 days a week and have jobs (adults) or school (children) in Portland which requires punctual arrival, has dictated a high level of daily reliability, not commonly required even for other Maine State services. The vessels are designed to meet the extremes which can be encountered in the generally protected but occasionally storm, tide and wind-tossed seas around the islands. The extreme cold is also a factor and has resulted in careful attention to interior design and heating of vessels and terminals, as well as the loading operations which minimize exposure. The combination of relatively short route distances, generally low volume of use, and need for reliability, have led to the continued refinement of the slow speed (8 to 10 knots), low maintenance, fuel efficient vessel technology. High tech, high speed vessels would not be cost effective except possibly during seasonal excursion activities which account for a small portion of overall operations.

## 2.22 System History and Key Decisions

### History of Casco Bay Ferries

The long history of the Casco Bay Lines can be summarized in three stages; 19th and 20th century through 1980, 1980 to 1982, and 1982 to the present. The active use of the natural harbor is shown in the historic view of 1865 as shown in Figure 2.23.

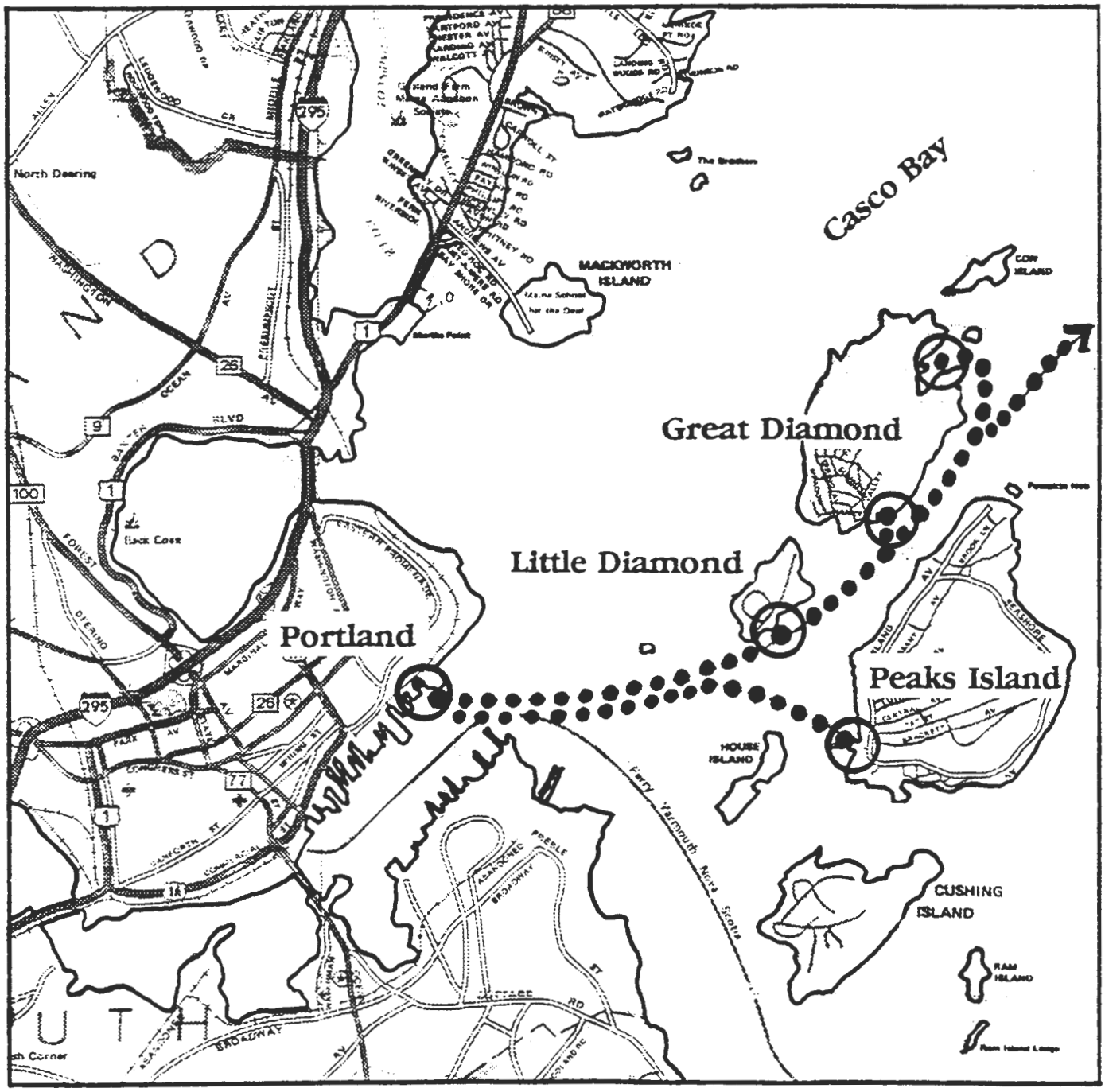
The first settlers followed the native Americans and established island communities in the semi-protected tidal waters of Casco Bay early in Maine's history. The first recorded regular ferry service was operated as early as 1822 connecting from Portland to North Yarmouth with stops at islands in Casco Bay. Chartered ferry service to the islands was created in 1845 by the state legislature. The predecessor to the current service was established in 1871 when the year round daily service to Peak's Island was started and has continued to the present day. In 1885 People's Ferry Company was incorporated and regulated as a public utility. The charter was amended at various points by state legislation in 1919, 1953, and 1963. The resulting system which was operated by Casco Bay Lines, the successor to the Peoples's Ferry Company, could be described as a qualified monopoly, holding an exclusive charter to haul passengers and freight from Portland to the six islands served at present; Peaks, Little Diamond, Great Diamond, Cheapeague and Cliff.

The Island communities have varied in character and function over their history. In the 19th Century, many islands in Casco Bay were inhabited and farmed. During the Civil war and subsequent world war periods, several of the islands served as military outposts with forts and other installations strategically placed at entrances to the active shipping channels and supply port of Portland. Until the 1960's, Great Diamond Island had an active Naval facility complete with quarters and a parade ground. At the turn of the century the two islands closest to Portland, Peaks and Cushing, served as both year round residential communities as well as seasonal recreational attractions. Peaks was the site of Greenwood Park, a popular amusement park that served the Portland area. In addition communities of summer residences and island hotels were prevalent on many of the Casco Bay islands. After 1930, the year-round populations generally declined until the 1970's and 80's, when a new interest arose in summer and year round use as evidenced by the first new residential construction in many decades.

Since the actual land areas of the islands were relatively small and little land development was possible, the building of bridges from Portland never seemed to be necessary or justified. The Casco Bay ferry lines have shifted several times between public and private operation. The service had originally been chartered as private in 1845, then established as public with the People's Ferry Company charter in 1885. The ferry lines were then operated under the private ownership of Peter McLaughlin and Norman Thomas from the 1950's to 1979.

A major turning point for the system occurred when the Casco Bay Lines were sold to Peter and Valerie Kontaratos of New York City. The new owners ran into immediate difficulty in meeting the service requirements of the original public charters. As the service deteriorated, the Island residents recognized that their transportation lifeline was being threatened, and the long held public trust in the service was being eroded. The communities banded together with support of the island-based Casco Bay Development Association (CBDA), and entered the debates on the future of the ferry system, which had declared bankruptcy in June 1980. As the still privately

Figure 2.22: Detailed Plan of Portland Harbor and Peaks Island



held Casco Bay Lines proposed a radical restructuring to subdivide the company into separate public ferry and excursion entities, the CBDA objected and enlisted support of the city, state, and courts to take control of the system as a public utility once again. In 1981 the Casco Bay Island Transit District (CBITD) was established, by special emergency state legislation, with elected board members from the island communities to look after their own vital transportation needs. The CBITD was appointed by the courts in 1981 as the receiver of the system and purchased the assets with bonds established for the takeover. In some respects the return of the system to public operation occurred at a time when the economic viability of the service as a private market rate system as beginning to be very difficult even with the best management and technology. As there was a minimum threshold level of daily service and schedule needs for the city oriented communities to survive, it became apparent that the particular private owner would not be able to respond.

Since the Casco Bay Lines were re-incarnated by the CBITD as a non-profit ferry service in 1982, the system has continually sought to maintain services and schedules deemed essential to the year round communities while responding in innovative ways to use peak season patronage to offset winter losses.

**Historic Issues and Decision Factors**

Notable system features and decision factors which characterize the Casco Bay system include the following.

**Historic Influences:**

o The Longest Continuous Daily Ferry Service in the U.S.- Chartered in 1845 the present service has been operating continuously on a daily basis since 1871, the system continues to provide the only transportation linkage for year round island communities to the mainland and the City of Portland.

o Ferry Operations have Alternated Between Private (1871) to Public Utility (1885) to Private (1950's) to Public Utility (1981) - The system has evolved institutionally and legally during its long life in response to changing demands and changing community, municipal, and State involvement. The service was established as a qualified monopoly and public utility in 1885.

o Operations Changed from Private Operation to a Public Authority in 1981 - In a court ordered response to public outcry at deteriorating service from a bankrupt private operator, the Casco Bay Island Transit District was established to better serve the needs of residents. The service to a status similar to that of the 1885 operation.

**Existing System:**

o The Ferries Provide Multi-functional and Intermodal Transportation Connections. The ferries have always served as the daily commuter transit from island residential areas to the employment locations on the mainland, but have also connected to schools, hospitals and other services not found on the small sparsely populated islands of Casco Bay. In addition the ferries haul mail, freight, supplies and construction equipment.

o Year Round Commuter and Seasonal Tourism Ferry Cross-subsidy - As with other island ferry

services in Maine and other states, the heavy seasonal use of the system by summer residents and visitors provides revenue which compensates for the relatively low ridership during the remaining 9 months of the year.

o The Primary Management Goal is to Balance Operations Costs with Revenues - When CBITD was formed City approval was gained on basis that system operations costs would not burden the tax base. Established fares and charges for service balance revenues and costs on an annualized basis as a non-profit operation.

o Multi-jurisdictional Support for Capital Components of the System - Capital cost assistance has come from Maine State DOT for vessels and Island terminal construction and repair, and from Portland for a new city-side terminal.

o Public vs.Private Competition for Limited Tourism/Recreation Market - The short season and limited market for Bay tours and charter service has led to debates about the appropriateness of a public transit monopoly having an unfair advantage over non-transit operators. Continuing to permit Casco Bay Lines to provide excursion services is essential to achieve full utilization of the fleet and therefore help maintain the lowest fare structure for year round residents without subsidy.

o Recent Vessel Acquisitions and Terminal Replacements Have Expanded Service - With new larger vehicle/passenger ferry and transfer bridges at Portland and Peaks, service levels and flexibility increased in 1990.

**Proposed System Development:**

o No New Routes are Proposed at Present - While there was some growth in year round island population during the 1970's and 1980's, at present there is no demand to increase year round service levels since the islands' populations are relatively stable and the current services have excess capacity. Similarly, there are no plans to cut back on service despite relatively light demands from the outer islands, as any less service would not allow for weekday commuting to and from the downtown.

o New Replacement Vessels are Proposed for Specific Routes and Services - Replacement vessels are designed and in construction for down island service with modified freight handling and accommodation for ADA requirements. The pattern is to gradually replace and upgrade the fleet and terminals without adding to operating costs. Hence there is no interest in higher speed or exotic technologies for the short but exposed runs.

o Current Plans are to Seek Broader Operating Funding Base and to Allow Continuing Island Habitation - Without the continuity of year round service, the islands could not support year round habitation, and would be limited to summer use. It is characteristic of the state to maintain long standing island communities with its Maine State Ferry System, thereby providing a tradition of legislative and funding support for Casco Bay Islands. Bills were before the Legislature in 1993 for operating funding support.

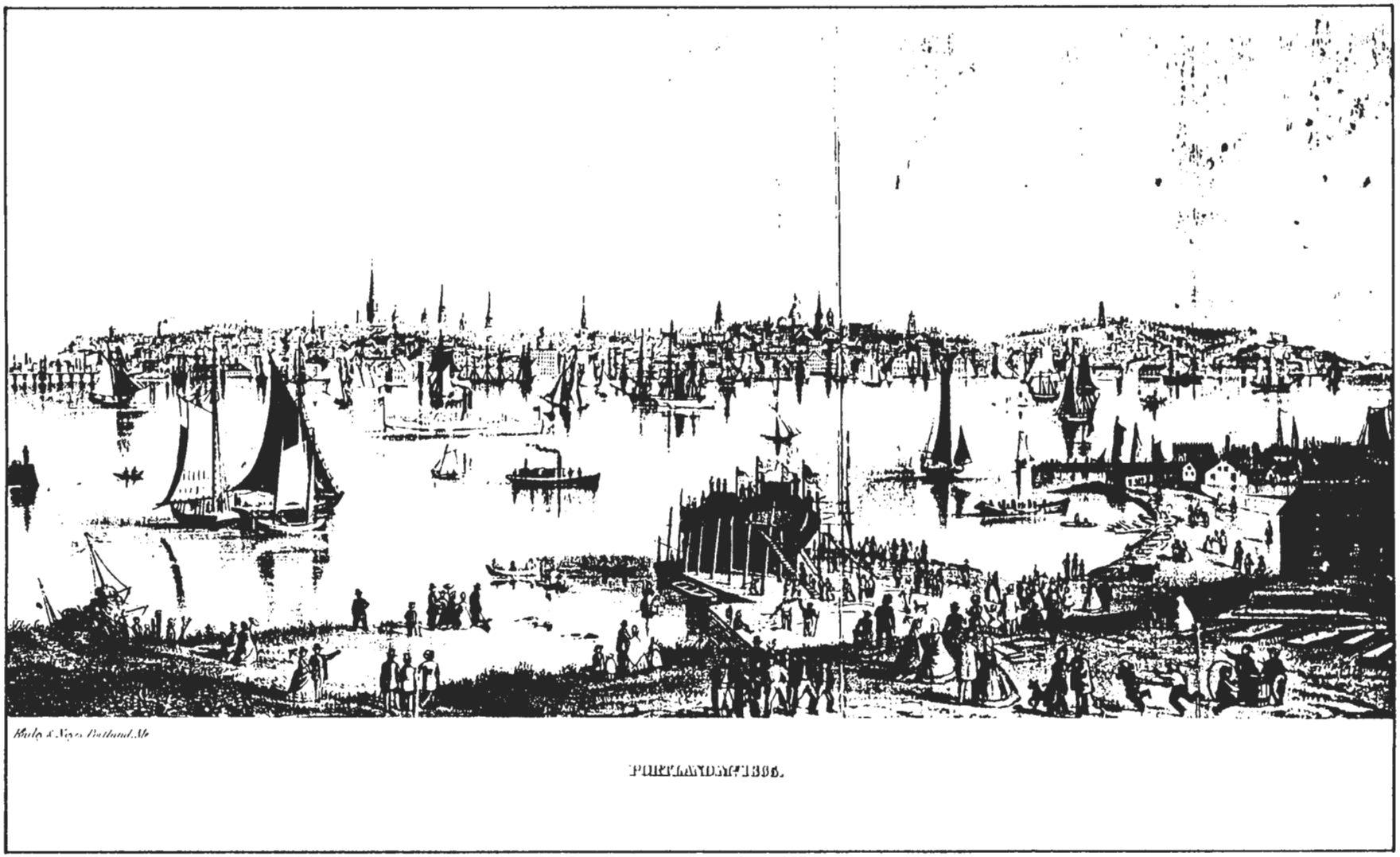



**Figure 2.23: Historic View of Portland Harbor**

## 2.23 System Description and Comparative Analysis

### Route Description

The Casco Bay Lines consist of two year round essential public transportation routes, and multiple seasonal excursion and commercial charter operations, which utilize the basic fleet during off-peak periods. The two year round services consist of Portland to Peaks, and the multi-stop loop from Portland to Great Diamond Island through Cliff Island. Schedules and frequency of service change seasonally and from weekday to weekend depending on needs. The routes are shown in Figure 2.21.

**Portland to Peaks Island:** The most frequent service is provided to the most populated island by passenger ferry and vehicle ferry. A new transfer bridge and modified passenger terminal provide expanded dock capabilities at Peaks. The year round population of Peaks is about 1000 which increases to nearly 5000 during the summer season. In 1992, 480,000 passengers and 5,000 automobiles were transported to and from the island. The majority of the year-round commuters to Portland from the islands travel on the 14 daily scheduled trips. The 2.5 mile trip takes 20 minutes. The recently completed new vehicle ferry vessel "Machigonne II", combined with the new transfer bridges in Portland and the island have improved access by passenger and commercial vehicles to Peaks. Figure 2.22 shows the shorter routes including Peaks.

**Portland to Great Diamond, Long, Great Chebeague and Cliff:** The linear route connects the four islands to Portland with a minimum of 4 weekday trips, and provides a commuter option for the approximately 300-400 year round residents. The population for the four islands plus Little Diamond increases during the summer months to over 2500. The ferry service carried 150,000 passengers on the "down island" route in 1992. Current dock design is oriented toward the passenger ferries and vehicle transfer capabilities are currently limited. Terminals are being replaced by Maine DOT, with the next scheduled for Long Island in 1994-1995. The islands each have a distinct topographical and resident character. Long Island for example, seceded from the city of Portland in 1992, and regards growth management of the relatively undeveloped island a high priority. The residents are currently debating the merits of a transfer bridge for vehicles as part of their new terminal with Maine DOT, and feel that its inclusion might accelerate development. Maine DOT takes the longer view that such an opportunity comes once in several decades and should not be missed, whether or not the residents choose to use it in the near future. The service provided in the off season represents a minimum threshold of daily links to the city which can sustain year round commuting populations on the islands.

### Transportation Factors

The role of the Casco Bay ferry system in its present form is based on the formulation of the CBITD and the mission statement which followed, as described in the Martin O'Connell Report of 1988, A Study of the Casco Bay Ferry services:

> " The Casco Bay Island Transit District (CBITD) was legislated into existence on April 17, 1981. CBITD's formation was an emergency measure designed to ensure transportation to residents of the Casco Bay islands subsequent to the bankruptcy of Casco Bay Lines, the privately-owned predecessor company of CBITD. The enabling legislation defined

the purpose of CBITD as:

> "...providing ferry service among and between the islands of Casco Bay and the mainland, Cumberland County. The District so formed shall be a body politic and corporate... and do things necessary to furnish waterborne transportation in this area, including incidental tour and charter service, for public purposes in the interest of public health, safety, comfort and convenience of the inhabitants of the islands comprising the district."

Given this legislative directive, the CBITD has adopted the following mission statement:

> CBITD's Mission:To provide safe, reliable, clean, on-time, courteous, reasonably-priced marine transportation."

While both are considered integral links in the state highway system, the two routes provide differing service levels relating to the commuting populations of the islands. With the Peaks service carrying nearly five times as many passengers as the other islands combined, the weekday and weekend schedules are correspondingly different. The longer trip distance and lower volume of riders on the "down island" route results in a much higher cost per passenger mile than the Peaks service. However the fare structures are balanced in order to provide affordable fares for all islands on a year round daily basis, and higher fares for seasonal and excursion users to cross-subsidize the off-season. This type of fare manipulation and cross subsidy is commonly used on essential publicly operated island services around the country.

A comparative summary of the Casco Bay Routes by function and trip distance is provided in Table 2.21. Since all services are essential island connections, their differences are based on individual island need as described above.

Interesting parallels exist between the Casco Bay service and the Maine State Ferry System, which provides services to islands on a year round basis. Those 6 routes vary in distance from 3 miles to 23 miles off shore, with only one, Islesboro, being considered a daily commuting route. The Maine State system is fully subsidized by the state for capital improvements and 55% for operational costs, while the Casco Bay Island system is required to fully cover all operations and capital costs through its own revenue stream. In practice Maine DOT does assist in funding of long term capital improvements and a small portion of the operating costs. The net result is that fare structures for the two systems are quite different with CBITD needing to charge twice as much per passenger mile as the Maine Ferries for year round passage. Such was the argument by CBITD in their 1993 request for increased state operating subsidy for the municipal system, which otherwise may face increasing fare hikes in coming years to balance revenues and operating costs.

The Casco Bay islands and their relationship to Portland have evolved over the past few centuries. The residential islands served by the ferry system have functioned in many ways as part of the shipping heritage of Portland. Long Island was once a busy ship building center far more populous and self sustaining during the 19th century. Many of the islands served as military installations to protect the busy port during various wars dating back to colonial times and as recently as World War II. Portland was the closest natural deepwater port to Europe and therefore was of considerable strategic importance.

**Figure 2.24: Photos of Existing Casco Bay Ferry System**

Later in the island's history. The recreational uses of the islands included the popular turn-of-the-century amusement center, Greenwood Park, which was frequented by Portlanders by ferry for many years. Summer resort type inns and hotels flourished on the islands until the Depression, as did summer residences for Mainers as well as the out-of-staters who had access by steamship and by rail to Portland. While the residential populations declined during the 50's and 60's, a resurgence of both year round and seasonal interest took place in the 70's and 80's. Much of the repopulation took the form of recycling of existing houses including winterization of many for year round use. The 1980's predictions of major resettlement of the islands never quite took hold, however, but did leave several dedicated and firmly entrenched communities on various islands. With its village-like neighborhood clustered around the ferry terminal on the broad south west face of the island, Peaks Island has predictably attracted by far the largest number of year round residents (1,000) who find the short 20 minute ride just enough distance from the center of Portland. The other year round islanders face varying longer lengths of commute and less frequent service from Great Diamond, Long and Chebeague, but also enjoy greater privacy and more rural settings.

Summer residents are a combination of renters and owners who enjoy the unique aspects of the linear Casco Bay islands. The summer population of the islands swells to more than 5,000. The ferry connections in summer provide just the degree of detachment needed to feel remote while in reality being only several miles distance from Maine's major coastal city. With the reinstitution of train service from Boston to Portland in the next few years, the islands may regain even more of their past activity levels.

There has been enough development pressure on the islands vacant land in the past 10 years to create some concern on the part of long term residents. As in other island communities served by ferry, the transportation link continues to be regarded as a landuse and population regulating device. The CBITD, which is islander controlled, provides residents a higher degree of self determination regarding growth and change, than other authority-type services such as those serving Martha's Vineyard and Nantucket

**Local Geographic and Environmental Conditions**

Climate, Geography, Waterways, and Environment: As has been described the extreme weather conditions in Casco Bay are the primary determining factor in system component design and operations. The physical character of the islands testifies to the extreme effects of north Atlantic Storms in Casco Bay, as is typical along the Maine coast. The windward sides are rocky, eroded and unapproachable by vessel, while the leeward or protected sides facing northwest, are generally suitable for vessel docks and terminals. The combination of cold, wind, tide, fog and wave action along the two routes requires ocean going vessel design to assure safe, warm and marginally comfortable passage during the winter months. The vessels and dock designs have evolved into a proven and reliable system which seems a perfect match for the year-round service needs.

The multi-deck layout allows for boarding at different tide conditions from the various fixed piers. The freight boarding and down-island vehicle loading is all carefully incorporated into the predominantly passenger oriented vessels. The open top decks allow for more capacity in the busy summer season.

The geography of the islands determines the ferry routes and habitation patterns as shown in

Figure 2.2. The year round commuter orientation of the islands is in part due to their proximity to Portland with the furthest island only 6 miles from the downtown. The northeast channel from Diamond Pass to Great Chebeague Island creates a semi-protected route for ferries, where as an outside passage in winter months would be extremely difficult in storm and wave conditions. The micro-climates of the islands have also determined their settlement patterns. The majority of the Peakes Island community for example is nestled on the protected south west corner, which in turn has always been the location of the ferry pier. Such geographic features are major determinants of settlement and ferry connections in a location of weather extremes, than is the case in San Francisco or Seattle.

**Environmental Factors:**

The necessity to overcome extreme elements has generally been the overriding designing factor in terms of vessel and pier design over the centuries. The wake of the vessels has little impact on the rugged rocky coastline. The terminal designs have been located by trial and error wherever they would survive and accommodate vessel navigation. The energy consumption of year-round and summer residents for transportation purposes would be very efficient as the majority are foot passengers. The vessels themselves have been designed to be efficient in terms of fuel consumption because of the long operating hours and few passengers during the off-season have and the need to minimize annual operating expenses.

## 2.24 System Performance and Decision Factors

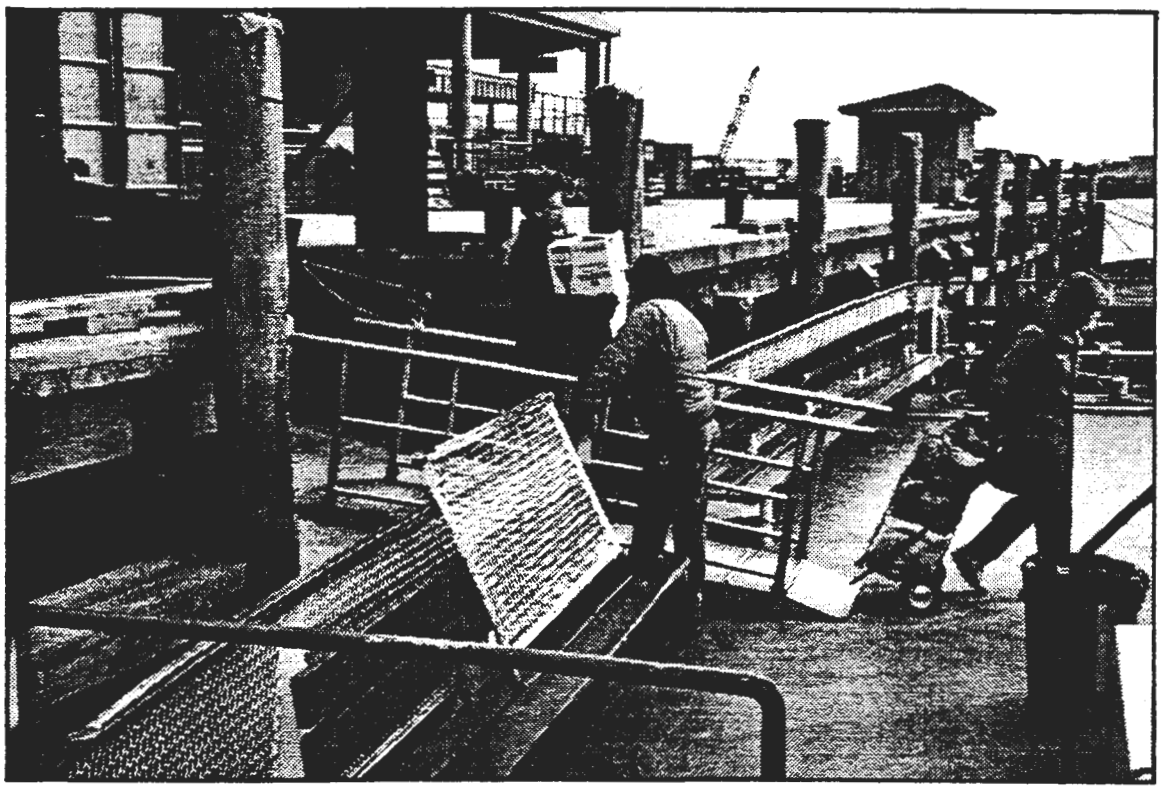
**Institutional Factors - Public and Private Operations**

One area of continuing debate has been the suitability of the ferry as a public utility to capitalize on excursion opportunities, particularly offering such services on both the regular mail boat runs as "harbor tours" and evening and weekend excursions when regular service vessels are on "slack" time. Private excursion operators have claimed in Portland as in other urban harbor settings that subsidized public operators have an unfair advantage of low incremental costs and high visibility, in competing as excursion services. Casco Bay Lines has been assiduous in avoiding use of vessels which were externally (to the CBITD) financed, and tried to avoid an apparent unfair advantage. It might be argued that if a transit district with limited financial resources is to minimize operating subsidies that such cross-subsidization as that implied by the excursion operations should be allowed, but that undue advantages over competing private operations should be avoided. The complicating factor in Portland is the very short excursion season, compared with San Francisco or even Boston, and a relatively small market.

From 1982 to 1990, Casco Bay Lines also managed to increase revenues by offering charter services for construction equipment and materials for the mini-development surge. The demand receded quickly at the end of the 1980's and new barge type ferry operations which could deliver materials ashore at multiple locations began to be used instead of the CBL vehicle ferry.

It may be argued that the Casco Bay Lines ferry system is effectively as much a part of the state highway and bridge network as are the other state operated ferry routes along the coast, and as such should continue to receive state and federal assistance, including partial subsidies if needed. As with other larger waterfront, ferry dependent municipalities, Portland and its residential island ferry service finds itself caught between state and city jurisdiction while the ferry system has

**Figure 2.25: Photos of Existing Casco Bay Ferry System**



remained economically viable without substantial state subsidy over its 120 year history, the time seems to have arrived for the state to consider providing a safety net for the Casco Bay Lines to continue their excellent balancing of system costs and revenues to maintain the non-profit status.

While Casco Bay Lines tries to balance fare costs and year round income it has become apparent that the mandate for a break-even service is becoming increasingly difficult to achieve. In response, CBITD initiated legislation with the State in 1993 to provide an annual percentage operating subsidy as a measure of relief in the economic balancing act, and to relieve the City of Portland from what has proven to be a somewhat unpredictable shortfall in operating costs in recent years. Maine DOT continues to assist in terminal facility construction, and the City of Portland in concert with Maine DOT built the Portland Ferry Terminal Facility opened in 1988.

A final footnote to the current Portland ferry network relates to the secession of Long Island from the city in 1992. While the number of residences on Long Island is not great by large city standards (Portland's population is approximately 200,000), the loss of tax base for combined year round and seasonal properties has been felt, and the uncompensated costs of providing various services such as hospital, education and transportation have been felt. The city has resolved not to let other residential communities, whether on islands or mainland, splinter off and indirectly impact already strained urban financial balances. These issues clearly raise the policy questions of how long and at what costs island communities can be efficiently maintained as part of the city and at what point the costs become too burdensome. The year round island populations are aging at a more rapid rate than those on the mainland. If the trend continues, the island population may require altered service levels in the future to meet the need of a retirement population.. Conversely if the population trend reverses, and more families choose to settle, the service may require other adaptations.

## 2.25 Summary of Findings and Lessons for Other Systems

The Casco Bay ferry system exemplifies a marine highway and transit link to islands which has evolved to accommodate a wide range of weather and navigation conditions, while serving the weekday commuter and daily trip needs of a small year round population, as well as the tourism and recreation needs of a much larger summer population. As there are no land based travel alternatives, the system is representative of those serving as a lifeline to year-round island populations. The higher volume of summer residents and incidental excursion users provide an effective subsidy for the frequent daily trips serving commuters from the island communities to downtown Portland jobs, school and other support services. The challenge to Casco Bay Lines as a non-profit service owned and operated by the Casco Bay Islands Transit District is to find the annual balance of fares, routes, and ridership to be at best marginally profitable and at worst minimize the needed to achieve the minimal subsidy possible. The centuries old traditions, of year round island communities along the Maine coast have been sustained by ferry services such as the independent Casco Bay Lines as well as the Maine State ferry system.

The lessons to be learned from this medium volume public ferry network are typical of many traditional marine highway systems: serving islands.

o Design and Operations for Extreme Weather Range: Virtually all aspects of vessel and terminal design are locally determined to operate in one of the broadest ranges of

weather and navigation conditions in the U.S..

o Use of Traditional Energy Efficient, Proven "Low-tech" Vessel and Terminal Design: Basic "low-tech" vessels are sometimes best suited to the collective service and operations needs for a short distance, medium volume system such as Casco Bay Lines.

o Smaller Fleets May Require Incremental Replacement of Vessels and Terminals: Annualized upgrading and replacement for vessels and terminals are planned for Casco Bay Lines to phase capital improvements and take advantage of multiple funding sources.

o Essential Lifeline Services Required for Year Round Island Habitation: The year round service perpetuates island residential communities which otherwise might not survive without daily transportation lines to the city.

o Financial Self-Sufficiency Requires Annual System and Operations Adaptation: The efficient and creative management of the system is continually adjusting and balancing trip times, fare structure, vessel stock, new services and riders to best meet annual needs.

o Local versus State Funding for Essential Water Transportation Services: The secession of Long Island from the City of Portland in 1993, and requested secession by two other islands points out the delicate funding balance inherent for a locally funded, special transit district type service. The secessions of islands whose services are already cross subsidized by more heavily used routes may complicate the future funding balance by city and state, which is indirectly tied to Portland and island real estate taxes.

Table 2.21

**Portland: Casco Bay Islands**

**Comparative Analysis of Individual Routes By Transportation Function and Land-based Alternative**

| Location and Route: | 1.Trans/ Essential Link | 2.Trans/ Compli-mentary | 3.Trans/ Option'l | Land/ Alts. | Route Dist. | Institu-tional |
|---|---|---|---|---|---|---|
| **1. Peaks Island** | Yes | - | - | None | 2.5m. | Public Trans. Dist. |
| **2. Little Diamond Isl.**** | Yes | - | - | " | 2.0m. | " |
| **3. Great Diamond Isl.*** | Yes | - | - | " | 2.7m. | " |
| **4. Long Island *** | Yes | - | - | " | 4.5m. | " |
| **5. Great Chebeague *** | Yes | - | - | " | 7.1m. | " |
| **6. Cliff Island *** | Yes | - | - | " | 8.2m. | " |

* All Islands on daily year round Mailboat Run
** Little Diamond on seasonal service only

## 2.3 SAN FRANCISCO BAY FERRY NETWORKS

### 2.31 Network Description and Summary Findings:

**Existing Routes and Operators (all passenger only)**

o Sausalito to San Francisco (Golden Gate)
o Larkspur to S.F. (Golden Gate)
o Tiburon to S.F. (Red and White)
o Vallejo to S.F. (Red and White)
o Oakland/Alameda to S.F. (Blue and Gold)

**Proposed Expansion Routes (all passenger only):**

o Port Sonoma to San Francisco (North Bay)
o Benecia/Martinez to S.F. (Suisan Bay)
o Berkeley/Albany to S.F. (East Bay North)
o Alameda (Bay Farm Island) to S.F.
o "Interlining" and Upgrading of Existing Routes

Because of the unusual peninsula location the city and geography of San Francisco Bay, the ferries have long been symbolic of the city itself. Just as a ferry ride across San Francisco Bay was once the only practical connection to other cities in the port and points east, for passengers and freight, an excursion trip on the great bay today is virtually mandatory for all visitors. In addition, however, during the past 25 years, the ferries have reinstituted cross-Bay service to provide selectively alternatives, commuting routes to highways, bridges or BART transit system. The Golden Gate Ferry System remains the prime example in the U.S. of water transit routes planned as deliberate alternatives to other landside options. The new Sausalito and Larkspur Ferry routes were combined with an expanded bus transit system in the 1970's as an option to building.A new bridge or an extension of the rapid transit system, for accommodating ever increasing commuter traffic around the north side of the bay. The publicly mandated planning process which led to the system implementation was an innovative transportation decision, as were the design of vessels and terminal systems which it created. The Golden Gate system provided the first example of a purpose-built high-speed ferry transit link nearly 25 years ago, and ushered in a new era of ferry service in America. It demonstrated the viability of a long distance ferry ride competing with the auto commute from outlying suburban communities. The more recent Vallejo to San Francisco route established the first daily operation of a highspeed catamaran commuter route in the U.S. and opened the way for longer ferry routes than were traditionally considered viable. The later Oakland and Alameda routes (1991) along with the long established Tiburon (1968) route complete the current network.

The combination of routes implemented over nearly 20 years and the widespread Bay Area acceptance of ferry commuting led to the recent referendum vote by Californians to expand ferry transit state wide. Starting with the specific referendum mandate to expand the Vallejo service, a Bay-Area ferry plan including proposed new routes and vessels was prepared in 1991, and has

served as the blueprint for the next era of ferry expansion. The new initiatives were driven by an established regional interest in accommodating increasing travel without building new landside infrastructure, combined with federal requirements for improving air quality, and increasing a growing interest in options for water transit around the bay.

**System Types: Existing and Proposed Routes**

The San Francisco Ferry system has also pioneered the use of ferry routes for both weekday commuter transit and off peak recreational uses. The suburban areas offer superb attractions for city dwellers to escape to the countryside. The communities and ferry systems have encouraged such recreational uses by providing bicycle and jogging paths connecting to the ferries as well as accommodation of equipment on the vessels. The trips across the bay are an attraction by themselves for many. These successful year round multiple uses of the Larkspur, Tiburon and Sausalito routes are certainly in part attributable to the combination of the attractive landscape and climate to be found around the Bay. Private operators have also found that excursion packages can be integrated with the commuter routes, transporting visitors from San Francisco to outlying attractions in Vallejo, Oakland, and the wine country.

**Summary of Key Issues and Findings**

Significant characteristics and precedents established by the San Francisco Bay ferry network may be summarized to include the following:

**Historic Decision Factors:**

o San Francisco as a Classic Ferry-Oriented Urban Port Region: With a major employment center in the original downtown commerce district on the peninsula, ferry and water connections dominant until the two major cross-bay bridges were built in the 1930's.

o The First Modern Era Highspeed Ferry System as Planned as an Alternative to Land-based Transportation Expansion: The Golden Gate Ferry (1970's) is the classic example of an early regional transportation planning decision to provide a publicly subsidized high speed ferry system in lieu of expanding land-side and bridge infrastructure. The system was started in 1970, and continues to increase in ridership.

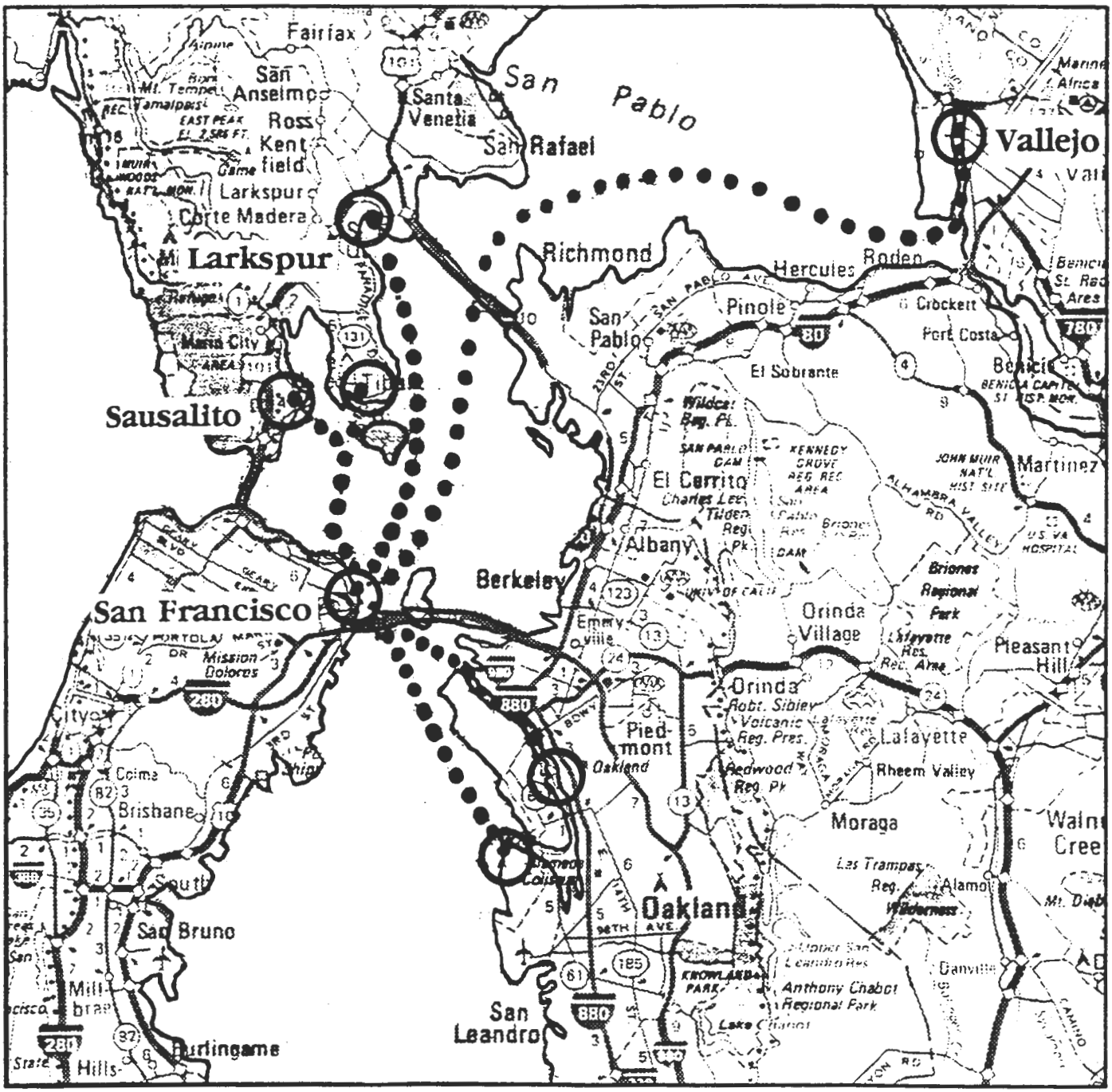
o First Application of Highspeed Catamaran for Longer Distance Route: The Vallejo commuter route marked the earliest U.S. use of the high speed catamaran for a ferry commute too long for conventional lower speed vessels (1986).

o Golden Gate Corridor Analysis as a Precedent-Setting, Dynamic Planning Process: The extensive transportation alternatives analysis, long range plan, funding mechanisms, and public participation process set a model for later water/land transit plans for the Bay area and other cities to follow. The process, started in the late 1960's, also established an ongoing set of monitoring and planning procedures making the Golden Gate Bridge and Highway District accountable to the constituents over the long term with mandated milestones.

**Existing System Issues:**

o Current Systems Provide Complementary Alternatives to Land-side Routes: The public and

Figure 2.31: Existing San Francisco Bay Ferry Network



private ferry services in San Francisco Bay provide useful transportation alternatives to land-based highway and transit options, offering varying degrees of time/distance savings along selected corridors.

o First Uses of Highspeed Vessel Technology to Establish Longer Routes: Both the Golden Gate System and the Vallejo routes established new standards for commuter ferry routes by shortening travel time through higher speed vessels. The Golden Gate monohulls have proven durable and well suited for the medium volume of ridership served, and the Vallejo "Catamaran" demonstrated that peak use on long haul routes could be successful.

o Combining Commuter and Tourism Uses on Privately Operated "Blended" Routes: The privately operated, publicly subsidized routes to Vallejo and Oakland rely on off-peak, reverse flow excursion uses of vessels to internally cross-subsidize routes. For routes with public subsidies and private operators, these combined operations are encouraged through creative contract incentives.

o Combined Commuter and Tourism on Public Routes: The Golden Gate Ferry system found that promoting tourism on scheduled peak and off-peak boosted revenues. Fares for commuter versus off-peak trips are adjusted accordingly. Off-peak and weekend reverse use of ferries for city to country recreational trips has been successful in San Francisco Bay.

o Favorable Year Round Climate and Navigation Conditions: The climate and character of San Francisco Bay have sustained year round tourism/excursion fleets. The year round climate has been a major factor in the competitiveness and success of private sector fleets.

o Joint Public and Private Development at New Remote Terminals: The choice of the terminal location at Larkspur has resulted in an evolving new town and mixed use terminal area at an appropriate nexus of land and water transportation systems. Better anticipation of the site development implications and early planning coordination for joint public and private development would have resulted in a different land use pattern with more density, and more efficient street and pedestrian connections.

**Proposed Plans and New Routes:**

o Recently Completed Regional "Ferry Plan: San Francisco Bay" as an Innovative Multi-jurisdictional Effort: Prepared by the Metropolitan Transportation Commission (MTC), the objective was to explore new ferry options to land-based highways and transit throughout the Bay area. The planning initiatives were accompanied by legislative funding commitments through a state-wide public referendum for planning and implementation of route proposals for Vallejo and Alameda.

o Coordinated Regional Ferry Plan for Expanded and New Routes: The major inter-jurisdictional planning effort coordinated expansion plans being prepared by existing systems (Vallejo, Alameda/Oakland and Golden Gate) with new route opportunities and initiatives. The MTC Regional Ferry Plan systematically evaluated all existing routes and a comprehensive set of potential routes to provide more time-efficient options by water than presently offered by landside highway or transit. The potential routes were prioritized according to projected cost effectiveness and ridership. The following routes were selected as being most likely to succeed and were recommended for early implementation.

o Port Sonoma to San Francisco (North Bay): This destination at the top of the bay is projected long and circuitous commute by land and Golden Gate Bridge and would benefit from a direct high speed ferry connection. Tourism potential to Sonoma Valley exists.

o Benecia/Martinez to S.F. (Suisan Bay): The Benecia to San Francisco route is proposed to relieve combined highway and transit congestion from communities in the same area as Vallejo. Travel distance savings of 30 versus 35 miles could be realized, and would require high speed vessel technology (35-40 knots).

o Berkelev/Albanv to S.F. (East Bay North): Serving a heavily populated area of Berkeley, this was formerly a vehicle ferry route. The benefits of this shorter water route of 7 miles versus 12 miles of highway and bridge travel would be to relieve highway and transit congestion.

o Interlining and Upgrading of Existing Routes: The MTC plan included recommendations regarding the existing Golden Gate, Tiburon and Oakland routes, which could be to operated as continuous routes through The Embarcadero in San Francisco with higher speed vessels. Operations could be improved with the provision of higher speed, lower wake new vessels on these current routes which would then offer a shorter time option to existing landside routes. The new vessels would supplement rather than replace the existing fleet, moving slower vessels to shorter routes.

o Private Operators Continue to Seek Better "Blending" Packaging of Commuter and Excursion Trips: The successful balancing by private operators of commuter and tourism services can be expanded with the new routes to other attractive Cross Bay destinations.

o The State Referendum Approved Future Investments of $18 million in Capital Improvements Primarily for Bay Area Ferries: Capital for vessels and terminals are to be provided as an innovative twist to avoid long term operations subsidy. Vallejo and Oakland/Alameda have commissioned new vessels and are trying to determine how best to bid out services.

o Consolidation of Transit Agencies in Bay Area: Proposed as a major objective by MTC to provide appropriate integration of all transportation modes between the existing 19 separate districts.

## 2.32 Network History and Context

### History of the Bay Area Ferry Network and Key Decision Points:

The geographical context of San Francisco has been a major factor in the history of ferry service in the Bay Area. With its location between the protected deep water natural harbor and the raging Pacific Ocean, the city on the peninsula has always been isolated from other Bay area population centers. Prior to the construction of the two engineering marvels, the Bay Bridge and Golden Gate Bridge in the 1930's, all cross-Bay travel was provided by ferries from the mid 19th century onward. The late 19th century terminal locations are shown in the 1978 view in Figure 2.32, and the map of 1898 in Figure 2.33. In an address to the international Marine Transit

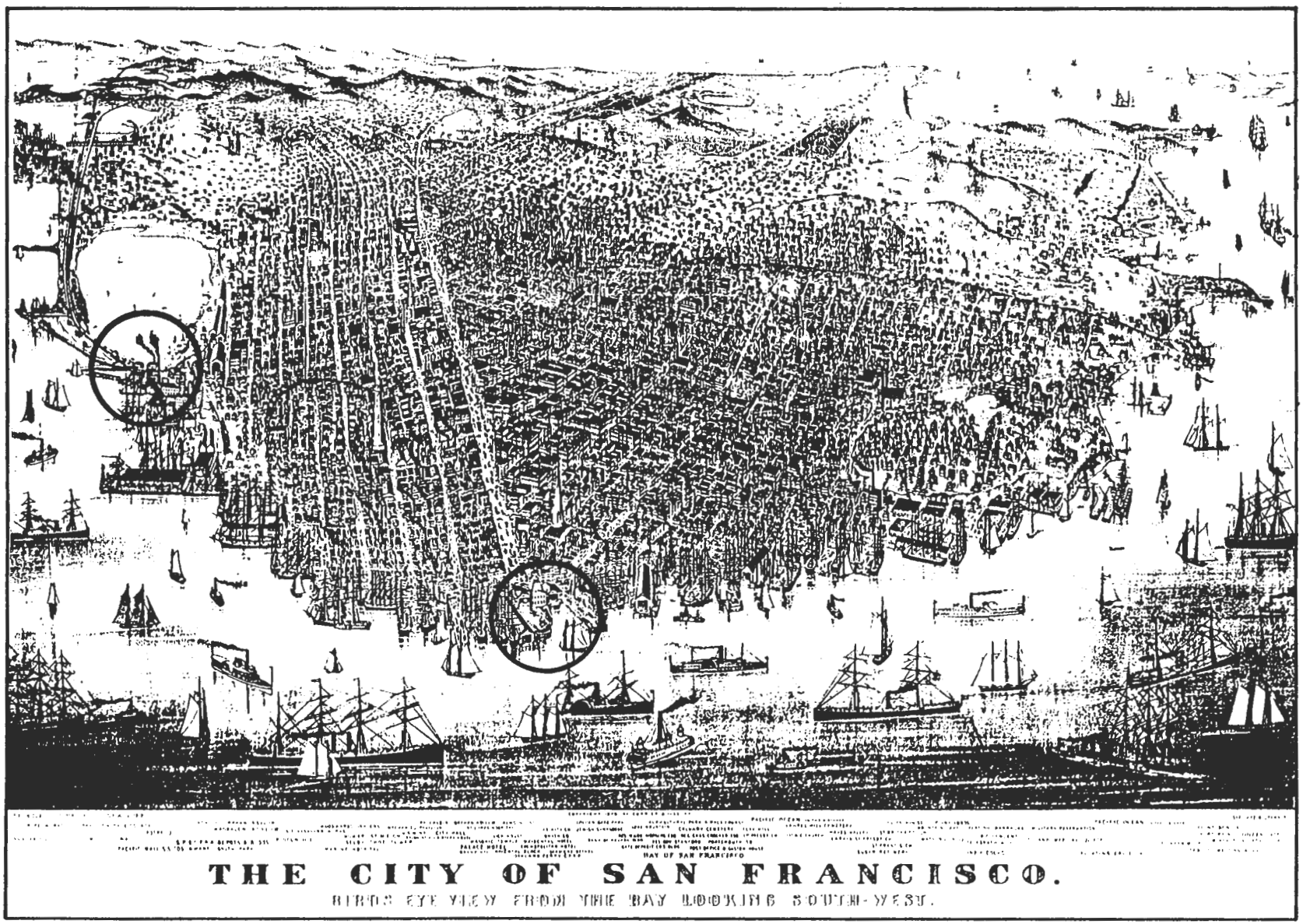



**Figure 2.32: Historic View of San Francisco - 1878**

Association in San Francisco in October 1993, Roger Murphy of the Blue and Gold Fleet summarized the long history of San Francisco Ferries succinctly from the point of view of a present day operator:

> "... Ferries in one form or another, have been in operation on San Francisco Bay for almost 150 years. There have been nearly 30 major ferry routes on the Bay at one time or another. This count does include some overlapping in that some discontinued services would reappear with new operators. One of the busiest and longest running ferry services over the years was the Oakland to San Francisco route. First started be the Central Pacific Railroad in 1865, this service lasted for 88 years. Prior to the Oakland service, the San Francisco and Alameda Railroad, a subsidiary of the Central Pacific, had instituted a service in the same year from Alameda.
>
> "The Key System Ferry, operated by San Francisco, Oakland and San Jose Railway, was initiated in 1909. Key system ferries carried nearly 15,000,000 passengers in 1921 between Oakland and San Francisco. Total ferry passengers in the entire Bay Area reached a high of over 55,000,000 passengers in the late 20's and early 30's. But all of this changed in 1936 with the completion of the San Francisco/Oakland Bay Bridge and a few months later, the Golden Gate Bridge. Ferry services all over the Bay were discontinued after the completion of these two bridges and the trend continued with the opening of the Richmond/San Rafael and Martinez/Benicia bridges."

Mr. Murphy continues to point out the importance of intermodal passenger connections in the early history of the ferry systems:

> "It is interesting to note that all, or most, of the turn of the century ferry systems were owned by the railroads. Railroads were the giants of industry in those days, not only in California, but across the Nation. When the railroads were running these services they provided the necessary means for a complete system. Trolleys were waiting at either end of the marine link of the system to accommodate passengers. Later, car ferries became the man unit in the ferry system. Huge piers and terminals were constructed all over the Bay Area to accommodate these vessels which themselves were enormous in size. The Berkeley Pier which allowed cars to drive almost half way across the Bay to get to their ferry was just one example of the tremendous infrastructure the railroads developed to maintain the ferry system. However, once the bridges were opened these integral parts of the overall system began to deteriorate and/or disappear.
>
> "The last of the railroad operated ferries ceased service on the San Francisco Embarcadero to Oakland Mole in 1956, breaking the last connection with the transcontinental and northwest rail terminal. The post-war era was also marked by major shifts in population growth around the Bay, made possible by the new highway systems which criss-crossed the region. After World War II, new communities began to appear all over the Bay Area and the Nation as people moved from the inner city to the suburbs. With these moves came the love affair with the car. As people moved farther and farther from the cities they became more and more dependent on their cars....
>
> "In the 1950's and 60's states and the Federal Government went into large highway projects freeways, bridges, tunnels -- you name it. The name of the game was to meet the needs of the car and those needs skyrocketed. Freeways were under designed

before they were finished. More and more cars hit the roads and the word "gridlock" entered into everyone's vocabulary."

The revival of ferry service as an alternative to land-based transportation occurred in three loosely defined periods, and parallels a more general trend toward public transit options around the Bay. The initial period, the 1960's and 70's was marked by the start-up of a commuter service from Tiburon to San Francisco, and the Golden Gate Ferry System from Sausalito and Larkspur to San Francisco. The second generation was started in 1986 with the first high speed ferry service from Vallejo to San Francisco utilizing the new catamaran technology for the first time in the U.S., followed by service to Oakland and Alameda which started in 1989 after the earthquake. The third generation is now under way with the first phases of implementation of the MTC Regional Ferry Plan, expanding existing services and adding new routes with the next generation of high speed ferries.

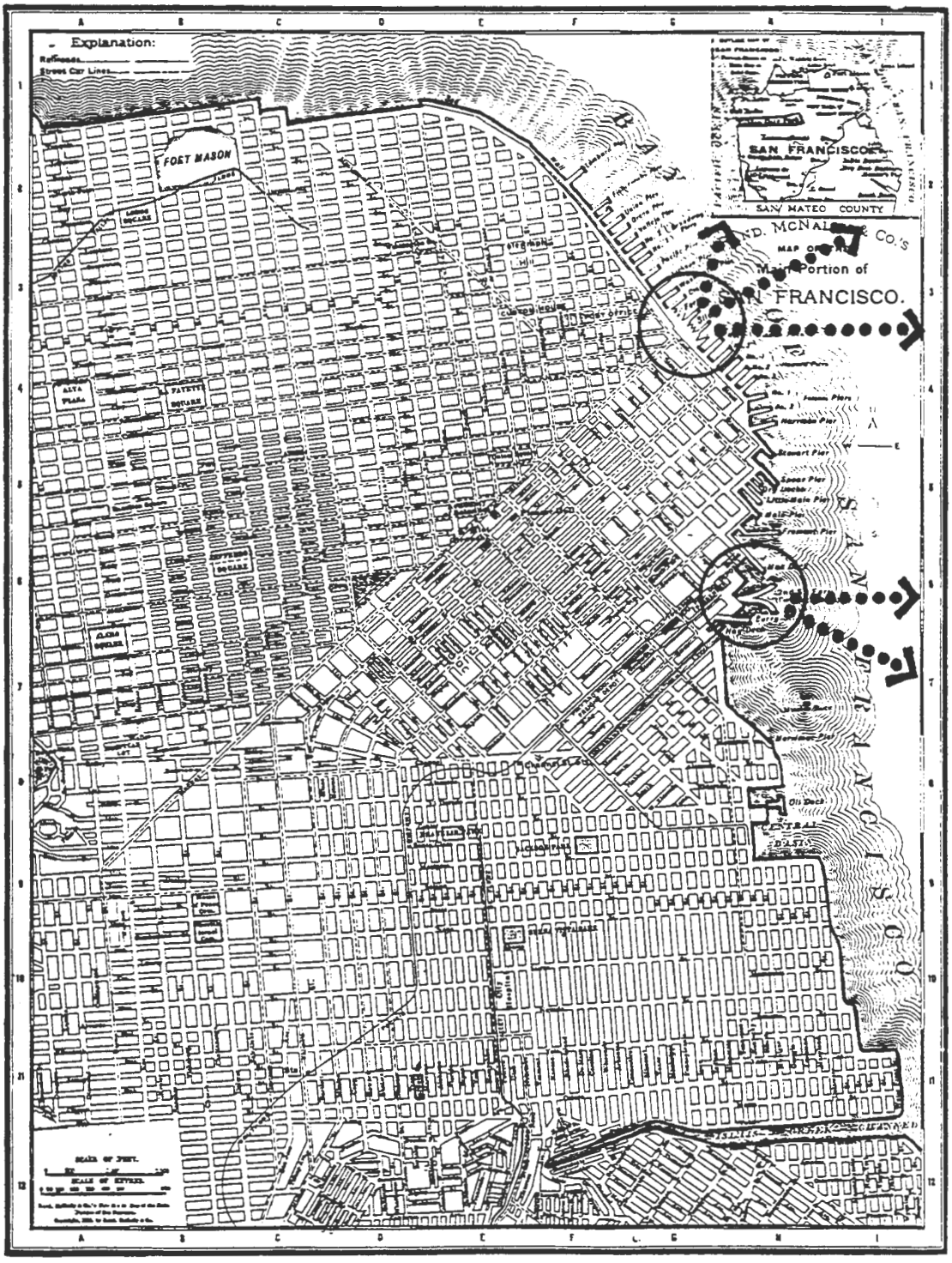
The first generation of ferry services responded to the suburban expansion in the Bay Area, and came in the form of a new Tiburon to San Francisco ferry service provided by the Red and White Fleet. In response to the Marin County town residents growing concern about traffic congestion on the Golden Gate Bridge, a small commuter ferry route was initiated in the 1960's. With a combination of some public subsidy, and a combined off-peak service for tourist trips, the first "public/private" blended service was introduced.

The next response during the same period and in the same Golden Gate/Marin and Sonoma County corridor came in the form of the Golden Gate Ferry System. With the recognition that the Golden Gate Bridge was operating at design capacity and would not be able to accommodate more growth, the Golden Gate Bridge Highway and Transportation District (GGBH & TD) initiated plans for an aggressive expansion of public transit through bus and ferry services to relieve highway pressures. In an innovative corridor analysis and planning process, the GGBH & TD concluded that the combined two transit modes could absorb much of the growth in a more cost effective manner than expanding the land-based highway infrastructure which would necessitate new bridge and highway construction by adding another leg to the Bay Area Rapid Transit system which was being built at the time. The GGBH & TD, with endorsement from the voters of Marin and Sonoma counties, was able to secure U.S. Urban Mass Transit Administration (UMTA) funding for the ferry vessels and terminals, and the bus fleet. The District implemented new commuter ferry services from Sausalito and Larkspur to a renovated Embarcadero terminal in San Francisco in the mid 1970's. The Golden Gate Ferry system provided an exemplary state-of-the art vessel fleet capable of 25 to 28 knots, high speed in that era, along with innovative side loading systems.

The early prototype for a "modern" ferry system offered transit options which were complementary to land-based highway and bridge options. Although they were not appreciably faster than the land-side routes, being only slightly shorter distances, they did succeed in demonstrating how the addition of incremental parallel transit services can relieve highway infrastructure corridors enough to preserve capacity and relieve over loading. By being able to regulate bridge tolls, bus fares and ferry fares, the GGBH & TD has been able to perform a sub-regional transportation balancing act which has been a useful lesson for other urban areas with water options as well as other Bay Area sub-regions.

The second generation of high speed ferries arrived on the San Francisco scene in 1986 with the launching of the Vallejo commuter catamaran service, operated by the Red and White Fleet. The

Figure 2.33: Historic Plan of San Francisco - 1898



first U.S. application of 2nd generation high speed, high maneuverability catamarans, capable of 30 knot operations, opened up possibilities for longer water routes just as auto and BART commuters were beginning to travel 45 minutes to an hour to and from work. The 70 minute run was not for everyone, but demonstrated that a regular commuter ridership could be attracted with a publicly subsidized, privately operated ferry service to the growing but somewhat isolated suburban town of Vallejo. Furthermore, Red and White found that by "blending" off-peak tourist runs to Vallejo attractions, the costly trips could carry commuters in one direction and tourists in the other. The high speed cats were also used for the ongoing Tiburon service. When the 1989 earthquake occurred, all ferries were pressed into service for Oakland, Berkeley and Richmond routes until the Bay Bridge was repaved and re-opened, demonstrating uses of ferries as mitigation. During the post earthquake service which carried on average 10,000 passengers per day, the ferries were performing "essential" functions for which there were no practical land-based options.

The third generation of ferry service was outlined in the 1991 Regional Ferry Study prepared by MTC, which evaluated demand for new and improved existing services in a rigorous frame-work. Existing services to Marin County and Oakland were found to have potential for expanded ridership if they became more competitive with auto users, and new, longer distance routes were found to be feasible with the advent of the next generation of fast ferries, with recommendations for vessels capable of 35 to 40 knots. The plan recommendations were backed up by a state capital funding for water transportation vessels and terminals. This encouraged initiatives for new vessel orders from Alameda, Vallejo and Golden Gate, all of which were earmarked for faster more efficient service.

The interesting legacy of the San Francisco ferry history is that of innovative corridor planning to use ferries as alternatives to land side infrastructure investment over the past 25 years. IN parallel have been innovations by the two competitive private fleets, Red and White and Blue and Gold, which have both pioneered in the realm of "blending" or balancing public commuter services with private tourism and recreational services. The climate and physical setting of San Francisco Bay have certainly provided a highly conducive laboratory for public and private sector innovations in ferry service and operations.

**Regional and Urban Context The Land-Use and Transportation Context**

The context has been described in terms of the physical decentralization and dispersal of new development which has permeated the areas surrounding San Francisco Bay. The recent efforts by the Metropolitan Transportation Commission have been directly in response to the fragmented transit and general transportation institutional setting, which includes some 29 independent districts, many of which have overlapping jurisdictions and responsibilities. While the City of San Francisco has a long tradition and form of high density, the topography and settlement patterns of the greater Bay Area tend to be less urban and characterized by lower density and dispersed settlement. Hence the build-up of density around potential terminal sites does not exist and use of ferry routes requires an initial trip of some distance up to 15 minutes before boarding. The catchment potential for park-and ride or intermodal bus connections is not as great as in other more compact urban harbor settings such as New York or Boston.

The highway network generally parallels potential water routes and does not afford significant vessel trip distance savings. A comparison of land-side route to water route distances indicates the inability of ferries to "beat" alternative parallel trip times unless, as is increasingly the case,

the land-side routes become congested and trip times unpredictable. These factors are in part necessitating consideration of higher speed vessels to at least equal if not better land trip times.

**Environmental, Geographical, Climate and Waterway Context**

While the climate is generally very supportive and allows for maximum year round use of the Bay, there are several aspects which can inhibit ferry travel, particularly the high speed variety. Fog can cause visibility problems in some areas, notably towards the Golden Gate Bridge and western Marin County areas. As the vessel technologies approach maximum speeds of 35 to 40 knots, reliance on accurate electronic detection devices will need to increase. During some periods of the year with frequent fog, some routes may need to have greater slack time between runs to allow for delays. Shoreline and shoal water environmental issues are most acute in some of the terminal locations which limit speed and wake. The approaches to Larkspur, Tiburon, Oakland and Vallejo all experience reduced speed and wake. Recreational boating in some of the same locations can serve as another speed dampening factor. Hew vessels might be required to have both low wake and high maneuverability. Other than the few immediate approach channels to terminal areas, the Bay Area has broad waterways and relatively dispersed recreational and commercial uses.

## 2.33 Route Descriptions and Comparative Analysis

**Existing Network**

The ferry "network" in San Francisco Bay consists of routes run by several discrete institutional and jurisdictional entities: 1) the publicly owned and operated Golden Gate Ferry System (GGBHTD), for Larkspur and Sausalito, 2) The Tiburon and Vallejo services proved privately with public support by the Red and White Fleet, and 3) the Oakland-Alameda route also provided privately with public subsidy operated by the Blue and Gold Fleet. An additional developer subsidized private service connects from Alameda/Bay Farms to San Francisco's Embarcadero Ferry Terminal. The network is loosely organized using different terminal piers by public (Golden Gate) and other operators (Pier 1/2), and responding to separate transportation agencies in the origin locations. The private fleet provides excursion service from the Pier 39, Fisherman's Wharf area located 1-1/2 miles north of the Ferry Building. The Ferry Building is most suitable as the downtown terminus at the foot of Market Street as the best distribution point to downtown work destinations and transit connections, (MUNI Buses and subway). The topography of the city reinforces the Market Street connection as the gradual slope into the business district allows for gradual connections.

**Existing Ferry Routes (Figure 2.31):** The first three contemporary services in the Bay Area were from Marin County to San Francisco, including routes from Larkspur Tiburon and Sausalito as shown. Approximately 40.000 people commute daily from Marin County into San Francisco; and, of these, approximately 2,000 commute by ferry from either Sausalito, Larkspur or Tiburon. Of the remainder, 76% commute by auto (nearly 50% in single occupant vehicles) and 16% by bus. The California love affair with the car is prevalent throughout the Bay Area and is the preferred mode of commuting.

**The Golden Gate Ferry System:** Operation was started in 1976, making the crossing from Larkspur to San Francisco in 35 minutes with three 25 knot gas turbine powered, water jet

**Figure 2.34: Proposed New High Speed Passenger Ferry Routes - North Bay and Suisan**

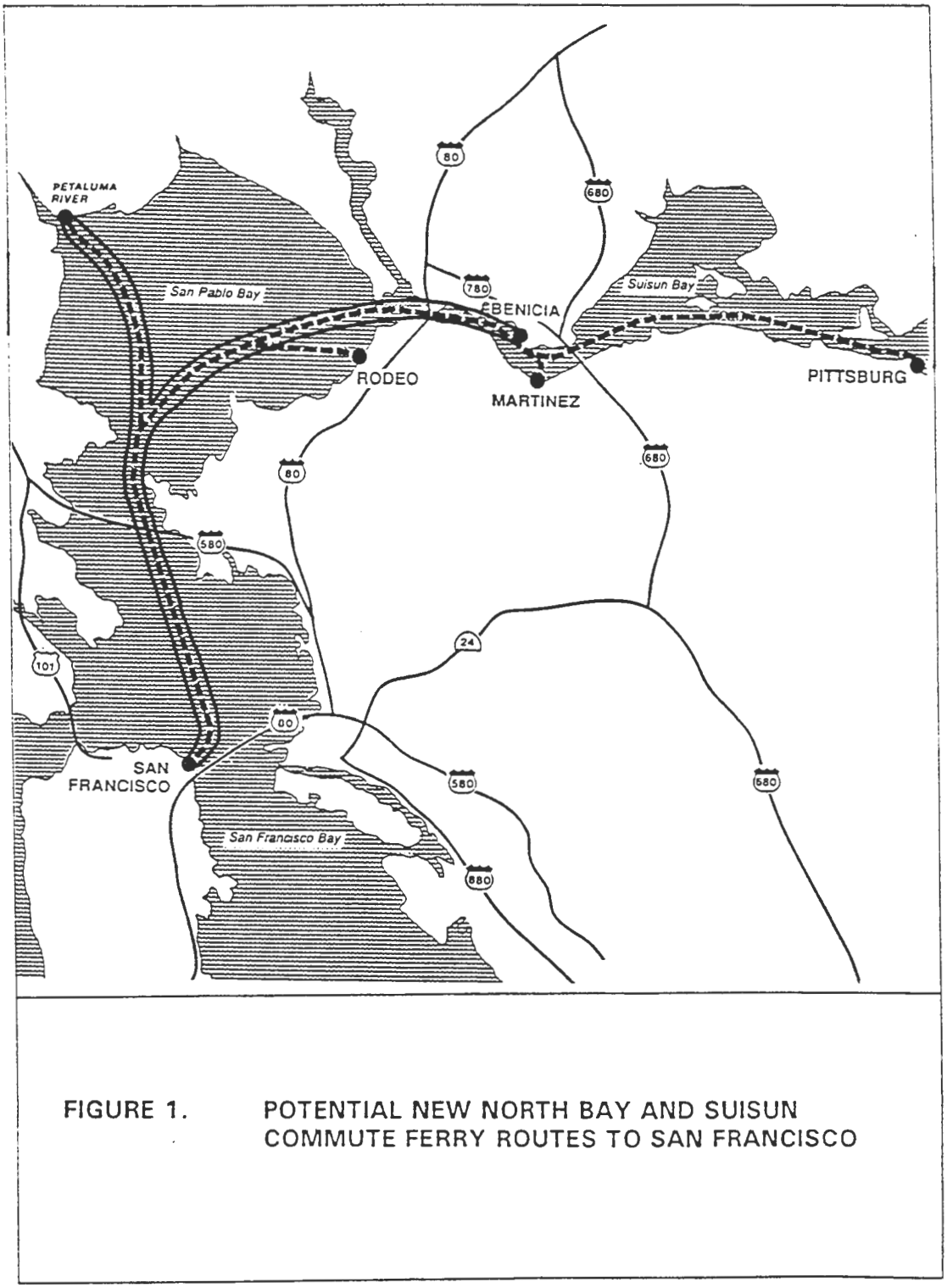



FIGURE 1. POTENTIAL NEW NORTH BAY AND SUISUN COMMUTE FERRY ROUTES TO SAN FRANCISCO

propelled, aluminum monohulls. While the service was immediately successful, two major changes took place within the first few years of operation:

o The perception of wake damage to the shore required a speed reduction in the 2 mile Larkspur approach channel.

o Rising fuel prices caused conversion from the uneconomical gas turbine/water jet propulsion to diesel/propeller propulsion. Vessel speed dropped from 25 to 20 knots.

These two changes and service disruptions caused two drops in ridership, attributed to the increase in crossing times from 35 to 40 to 45 minutes. since the conversion, the service has been steady and reliable and the ridership has increased consistently as the land-side alternatives have become less attractive. The service today carries an increasing number of off-peak users as well, attracted to the nearby shops and restaurants, the country side and the different micro-climate of the up-Bay sailing conditions. While no match for the volume of Sausalito recreational users, the midday and weekend ridership has helped with the off-peak utilization rates and farebox receipts. The popularity of the Larkspur park-and-ride lot has actually led to access/egress congestion problems from the fully utilized 1300 car lot.

**1. Larkspur to San Francisco:** The flagship route of the ferry fleet operates between Larkspur at the intersection of route 101 and 580, and serves towns to the north including San Rafael, Novato and Petaluma. The trip distance of 12 miles takes 45 minutes in part because of the slow approach speed to the terminal caused by a fragile shore line combined with vessel wake.

**2. Sausalito to San Francisco:** The "gold mine" of the network is the Sausalito route which has a loyal commuter following, but also carries large numbers of tourists and recreational users on the 6 mile, 30 minute trip. With spectacular views of San Francisco, the Golden Gate Bridge and Sausalito itself, the ferry is a popular year round attraction. The golden Gate Bridge, Highway, and Transportation District (GGBHTD) has operated the M.V. Golden Gate on the six mile route between Sausalito and the San Francisco Ferry Terminal since 1970. Red & White has operated mid-day tourist service to Sausalito on this route since 1983. The Sausalito terminal has no attached park and ride area in its present location, does not provide full access at the terminal, and has limited amenities, none of which have diminished its popularity.

**Tiburon to San Francisco:** The oldest of the modern ferry routes in San Francisco Bay, the commuter ferry from Tiburon, covering the 6 mile trip in 25 minutes. Red & White has operated service to Tiburon since 1968. The hours and schedule of service have changed periodically but the current service has been constant for several years. In 1987, the slower monohulls were replaced with the current catamarans. The geography of the Tiburon route is somewhat unique. Since it serves the residents at the end of a peninsula, the driving distance to San Francisco is considerably longer than the ferry route, approximately 16 miles by land and 7 miles by water. However,the catchment area for users is limited by the peninsula, and the potential for increased use is therefore related to achieving a greater capture rate than other ferry terminals.

The remaining routes serve the north bay location of Vallejo and east bay sites of Oakland and Alameda.

**Vallejo to San Francisco:** The Vallejo commuter is something of an anomaly by national ferry standards as it operates only one trip at each peak period for commuters over the 25 mile, 70

minute distance. The route which was started in 1986 by Red and White Fleet under contract to Vallejo, was innovative in proving the feasibility of using a then high speed catamaran. The patented Australian "Incat" design, was built in the U.S. by Nichols Brothers, to be used for regular scheduled service over a lengthy route. Red and White runs off-peak service for recreational users to Marine World, Africa USA and connecting bus tours to the Sonoma wine country to increase vessel utilization. The city of Vallejo is in the process of improving its terminal facilities and acquiring new higher speed vessels to increase service.

**Oakland/Alameda to San Francisco:** The traditional ferry route was re-instated following the earthquake and connects Jack London Square in downtown Oakland and the Alameda north park and ride terminal to downtown. The Alameda patronage is much greater than Oakland because of a longer driving time to San Francisco, fewer transit options and ample parking compared to Oakland. Blue and Gold operates the service under contract with the city of Alameda and Port of Oakland along the 6 mile, 25 minute trip.

**Alameda (Bay Farm) to San Francisco:** A privately operated ferry from the Bay Farm residential development in Alameda provides a more direct and shorter route than the highway and bridge alternative. The ferry distance is 8 miles and takes 22 minutes versus the highway trip of approximately 20 miles. The route has the potential for capturing a broader ridership with improved speed, transit feeder service and parking.

A summary of route length, travel time and average patronage in 1991 for existing services is shown in Table 2.31, from the above referenced IMTA Conference paper by Rod McMillan of 1993.

**Table 2.31**

Current San Francisco Ferry Services

| | Alameda/ Oakland Ferry | Alameda Bay Farm Ferry | Vallejo Ferry | Tiburon Ferry | GGBHTD Sausalito Ferry | GGBHTD Larkspur Ferry |
|---|---|---|---|---|---|---|
| Route Length (one way, miles) | 6 | 8 | 25 | 6 | 6 | 12 |
| Travel Time (one way, minutes) | 25 | 22 | 70 | 16 | 30 | 45 |
| Average Daily Patrons | 700 | 340 | 800 | 750 | 1,537 | 3,631 |

**Proposed Improvements to Existing Service and New Routes:** The routes currently planned for the Bay Area were identified and recommended in the MTC Regional Plan of 1991. They include upgrading of existing routes which were recommended for implementation and new routes which were recommended for further detailed analysis based on market demand findings.

Table 2.32

San Francisco Bay: Comparative Analysis of Individual Routes By Transportation Function and Land-based Alternative

| Location and Route: (All to S.F. Emb'o) | 1.Trans. Essential Link | 2.Trans. Complement'ry | 3.Trans. Optional | Land/ Alts. | Appro Dist. | Insti-tutional | Start-Up |
|---|---|---|---|---|---|---|---|
| **Golden Gate: Larkspur** | - | Exist/ Prop'd | Tour | Br./ Auto/ Bus | 11/15 | Public | 1976 |
| **Golden Gate: Sausalito** | - | Exist/ Prop'd | Tour | Br./ Auto/ Bus | 6/10 | Public | 1970 |
| **Tiburon** | - | Exist/ Prop'd | Tour | Br./ Auto/ Bus | 6/12 | Public Private | 1989 |
| **Oakland/ Alameda** | - | Prop'd | Exist./ Tour | Br./ Auto/ BART | 25/35 | Public Private | 1986 |
| **Vallejo** | - | Prop'd | Tour | Br./ Auto/ BART | 7/16 | Private | 1968 |
| **Port Sonoma** | - | Prop'd | Tour | Br./ Auto/ Bus | 23/30 | Public Private | 1996? |
| **Benicia** | - | Prop'd | - | Br./ Auto/ Bus | 30/35 | Public Private | 1996? |
| **Berkeley/ Albany** | - | Prop'd | - | Br./ Auto/ Bart | 7/12 | Public Private | 1996? |
| **Alameda (Bay Farm)** | - | Prop'd | - | Br./ Auto/ Bus | 8/20 | Public Private | 1991 |

The MTC planning process identified four criteria for attracting riders to improved existing service as well as new routes.

- o travel time savings for the passenger,
- o frequent service for the passenger,
- o comparable cost to the passenger as other modes, and
- o cost effectiveness.

**Planned Improvements to Existing Ferry Services (Phase 1):** In the MTC evaluation of existing ferry services, three main categories of deficiencies were identified in current services, which closely related to the above criteria.

- o Travel time on many of the services is not competitive with the automobile, which limits the services from long-term ridership gains.
- o For many of the routes there isn't enough frequency of service.
- o The existing terminal facilities do not offer basic amenities including covered passenger waiting areas, rest rooms, or do not meet ADA access requirements.

Specific recommendations for improving existing services include the following in Phase 1 of the regional plan:

- o Purchasing 5 new high speed vessels through the state legislated ferry program to include; 1) 1 high speed (35-40 knot), 300/350 passenger vessel for Golden Gate Larkspur service, 2) 2 similar high speed vessels for the Vallejo service, reducing the travel time to 1 hour and increasing runs, 3) 1 high speed 25 knot, 200/250 passenger vessel for Alameda/Oakland (delivered in 1994) and 4) 1 high speed, 40 knot, 150 passenger vessel for the Bay Farm Alameda service (delivered late in 1993).

- o Basic terminal improvements as needed at Pier 1/2 in San Francisco, as well as those in Vallejo, Sausalito, Oakland, and Tiburon.

- o Improving feeder bus services at all ferry terminals.

**Recommended New Ferry Routes (Phase 2):** The second phase of the plan recommended detailed evaluation and implementation of feasible new ferry routes in the region. The network and market analysis identified the following routes based on the same criteria applied for the existing route improvements.

**o Port Sonoma/Marin to San Francisco (Figure 2.34):** The new north bay route with fast ferry would deliver commuters to San Francisco in 60 to 65 minutes total travel time, compared to 90 minutes by auto. The area is not served by BART.

**o Benecia/Martinez to San Francisco (Figure 2.34):** Another north bay route would serve the area east of Vallejo and just out of reach for combined stops, providing a 60 minute commute alternative to the auto or BART trip. The 35 to 40 knot low wake vessels would be needed as the terminal site is located along the Carquines Strait. This route would serve as a complimentary parallel service to relieve highway and BART congestion by offering a cost and time effective alternative.

**o Berkeley/Albany to San Francisco (Figure 2.35):** A shorter route which was initially tried following the earthquake would be revived with higher speed service covering the 8 mile distance and serving the more densely populated I-80 corridor. The complimentary service would offer a similar attraction to the Sausalito run and would attract a portion of the near-in auto and BART commuters, again easing infrastructure pressures by providing an attractive option.

**o Alameda (Bay Farm Island) to San Francisco (Figure 2.36):** The existing route would be improved with new vessel technology and expanded parking and transit connections to other parts of Alameda and Oakland. The faster 8 mile water trip would be preferable for many commuters to the circuitous 20 mile landside route and would help reduce congestion.

**Comparative Analysis**

The comparison of services in San Francisco tends to be among routes trying to achieve roughly the same transportation functions; providing complementary water transit alternatives to parallel land-based options. By providing high speed, high amenity and cost competitive services, a portion of the commuter demand can be diverted away from the congested highways and fixed capacity transit system to the underutilized water routes. The existing and new routes are described in terms of their general transportation functions in Table 2.32. The table also indicated the comparative distances of the water to land-based routes as shown in the column marked "Appro. Dist". The geography of The Bay with its many peninsulas dictates land and water routes which are often very similar in distance. As in many other urban metropolitan areas, travel time/distances by land via high speed highway or transit are faster than by water. San Francisco's ferry plan is anticipating the point in time where higher increasingly congested land-side highways and transit.

There are several important network characteristics of note relating to existing and proposed Bay Area ferries. While the transportation functions of the routes to the North and East Bay locations are generally similar as shown in Table 2.32, there are several subtle differences which can be described. The routes can be divided into four groups; 1) North Bay/Marin short distance (10 mile ferry route or less), 2) North Bay/Marin long distance (greater than 10 miles, 3) East Bay short distance, and 4) East Bay long distance.

The North Bay routes, including Sausalito, Tiburon and Larkspur, were the first contemporary generation to be started based in part on the popular decision for the counties not to join in the BART system. The new routes were started at the same time BART was being constructed and in effect were considered to be the Marin County floating rapid transit route.

The longer ferry routes, particularly Larkspur, were able to attract a portion of the transit riders when the highway and bridge system began to show signs of congestion and delay and there were limited alternatives by land. The East Bay communities with different demographic profiles and home to work trips were attracted to the new BART system well into the 1980's, and in far greater numbers than their Marin and Sonoma counterparts. The new routes introduced to Vallejo and Oakland/Alameda were competing with auto and transit trip times which were comparable to the ferry services. As concluded by the 1991 Regional Ferry Plan produced by MTC, the ability for East Bay riders to attract larger numbers of riders from the highways and BART was dependent on the advent of the higher speed ferries initially developed abroad and

**Figure 2.35: Proposed New High Speed Passenger Ferry Routes - East Bay (North), Albany-Berkeley**

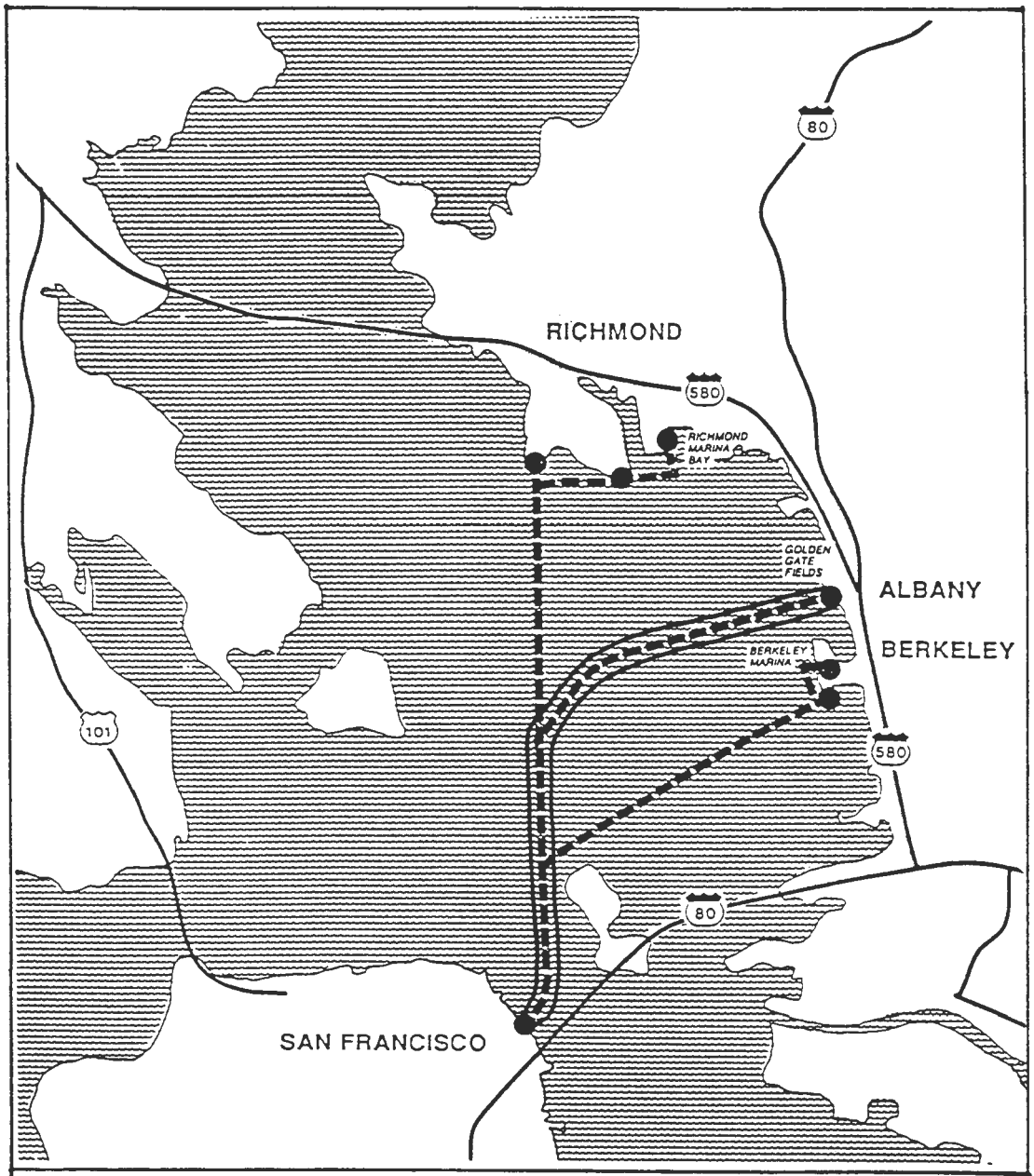



FIGURE 2. POTENTIAL NEW EAST BAY (NORTH) COMMUTE FERRY ROUTES TO SAN FRANCISCO

coming on market in the U.S. in the 1990's. It was also concluded that application to the long North Bay route at Larkspur would result in a faster trip by ferry than by land-based auto or bus, and therefore attract more patrons.

What seems interesting is that the shorter routes from the North Bay, Sausalito and Tiburon, as well as those from the East Bay seem to function differently with respect to mode choice. The land-side travel distances by highway and bridge, or by transit are relatively short, time-wise, barring traffic congestion. Commuter travel choices for those trips under 10 miles tend to be more finely tuned to the precise location of home origin and work destination. For example, a person living in Bay Farm/Alameda would find the ferry preferable to an auto or combined auto transit commute based on both the origin as well as San Francisco destination. If the person could walk from the Ferry Building to work and have a short drive to the Bay Farm terminal, the ferry mode might be preferable to auto or BART. By contrast someone living on the uphill part of Sausalito near route 101 and working in San Francisco away from the waterfront positions of the downtown might find that the auto or bus trip was far shorter in time than the combined trip downhill to the Sausalito ferry, a 30 minute crossing, and a transit trip on the San Francisco end. The shorter distance trip decisions tend to be much more localized, and in some cases where trip times are relatively equal, a matter of amenity or reliability as much as time.

The observation would be that the evolving San Francisco ferries are intended to expand to offer a complete set of travel choices for commuters, who can then select between water transit, land transit, or auto travel. It may also be that the emergence of reliable 35 knot ferries will provide attractive new choices for the longer distance trips. The shorter distance trips such as Oakland/Alameda and Berkeley/Albany may find dedicated niche markets to provide sufficient patronage, but may only succeed when congestion on the bridge and BART approach intolerable levels. Clearly the post-earthquake experience with East Bay Ferries indicated that those levels had not yet arrived.

Another interesting aspect of the three generations of fast ferries in the Bay Area is the advancement of vessel technology and its impact on ferry route viability and patronage. The original Golden Gate Ferries were specified to perform at 25 to 28 knots with water jets, and did so until the high cost of fuel and maintenance reduced speed and lengthened travel time. The "deep-V" monohull designs were state-of-the-art in 1970 when designed, for comfort and performance within the next few years, increased environmental regulatory requirements intervened, and because of wake and wash characteristics, reduced speeds on the Larkspur route. The catamarans introduced of the Vallejo service were fine until the engine maintenance began to affect reliability and performance on the somewhat underpowered and overworked early generation Incat catamarans. They did however demonstrate the comfort, manueverablity and popular appeal of the new technology and encouraged use on similar longer distance runs in other areas. The vision for the future is for vessels to fly across the harbor at average speeds approaching those for auto or bus trips while also to reducing wake in order to be able to navigate at speed through the straits and estuaries where the terminals are located. There are some reservations about natural conditions, such as fog which is common near the mouth of the Bay, creating periodically slower trips for the longer runs, but perhaps no worse than highway traffic delays along parallel routes. The geography of the Bay is certainly well suited to the new, faster technologies and should provide good test conditions.

## 2.34 System Performance and Decision Factors:

The San Francisco ferry network has provided useful examples of several key decision factors affecting the modern generations of "complementary" water transportation service.

**Transportation System Effectiveness:** The return of ferry service to San Francisco Bay has been primarily in response to the increasingly dispersed pattern of residential development and corresponding commuter travel needs to various corners of the Bay. In addition, some of the routes, such as those existing to Sausalito and Oakland or proposed to Berkeley/Albany are actually restorations of earlier connections. The new higher speed passenger vessel technology is creating opportunities for time-competitive water services compared to the landside highways and transit. As long as the ferry routes can divert enough riders away from auto commuting, even if the percentages are relatively small and require a transit level subsidy, then the ferries have achieved their purposes.

- o The Golden Gate routes met and exceeded their goals of providing water components of the regional transportation network in the 1970's instead of building more costly bridge additions or new rail transit systems.
- o Selected routes such as Tiburon, Larkspur and Alameda, have provided preferable routes to the land-based alternatives, and promise to offer better performance in the future.
- o Adding new high speed vessels to Vallejo and longer distance routes is likely to attract increasing numbers of riders if the fares remain competitive.
- o The land-based highway and transit infrastructure is for the most part complete, and should continue to encourage use of new and expanded ferry routes.
- o Proposed new routes are being planned to provide time and amenity benefits to commuters compared to the land-based options.

**Environmental Factors:** Several types of environmental impact have affected performance of routes such as the wake and speed problems with the Larkspur approach channel, as well as wake/speed limits on approaches to Oakland/Alameda and Vallejo. The next generation of vessel designs are intended to minimize these factors. Positive benefits of the ferries include improved air quality and reduced vehicular congestion, as well as preserving future rail transit capacity for some of the more remote northeast bay communities.

- o Research by Golden Gate Ferries on the Larkspur marsh impacts suggests the possibility that in some specific settings, environmental impacts may sometimes be disproportionately attributed to ferries, and that the current regulations may over-protect resource areas which might be better replicated elsewhere.
- o New vessel technologies will need to carefully factor in wake, wash, and emissions in new designs, as they are designed for the proposed new and upgraded services.
- o Cost-benefit measurements of water transit impacts versus new land-based transit or highway impacts may be needed to assist on a corridor-wide basis rather than in isolation, in considering new or enhanced services.
- o Air quality attainment requirements and concerns may accelerate ferry system expansion in areas such as San Francisco where auto travel continues to grow in response to suburban land development.

**Figure 2.36: Proposed New High Speed Passenger Ferry Routes - East Bay (South), Alameda-Bay Farm Island**

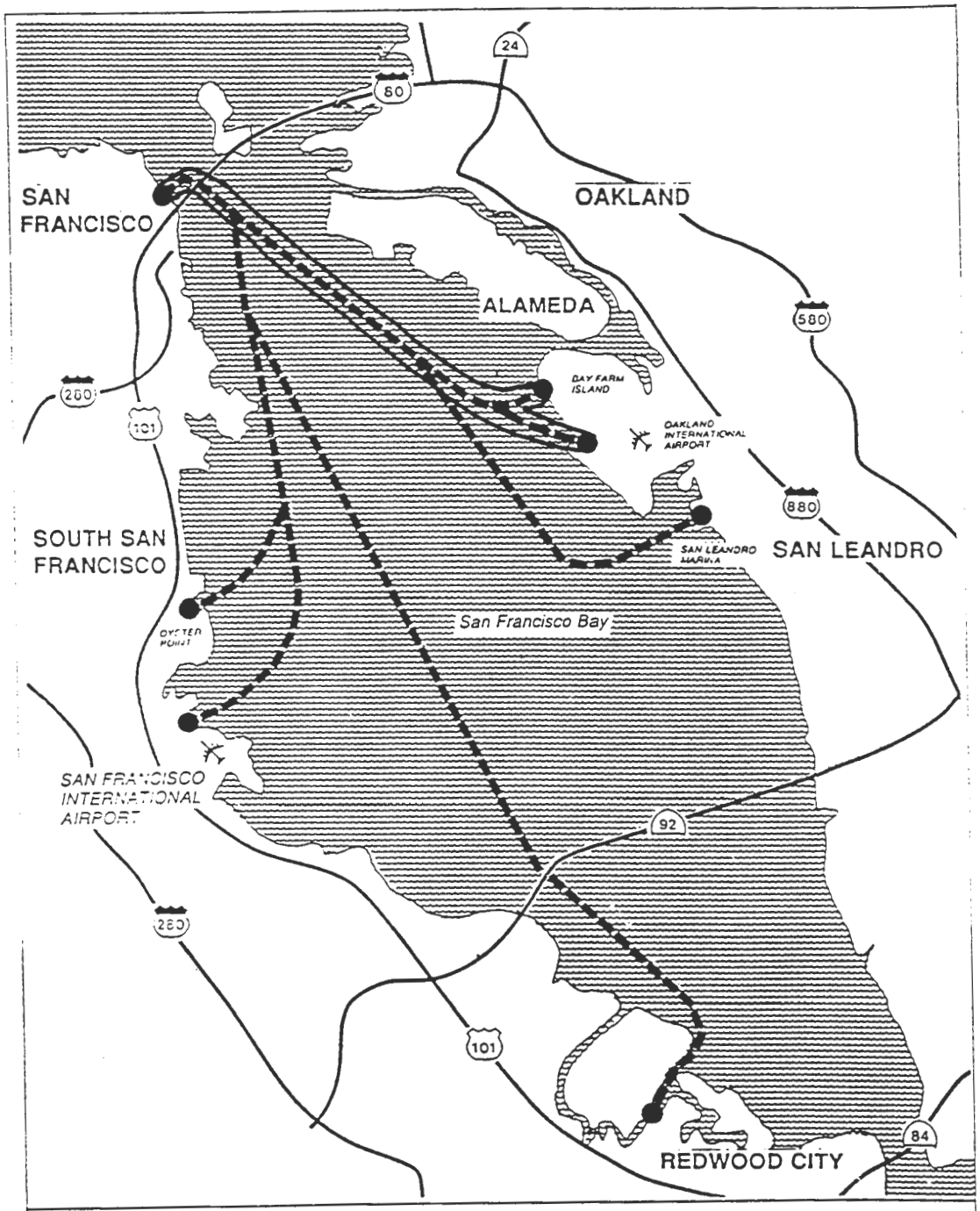



FIGURE 3. POTENTIAL NEW EAST BAY (SOUTH) AND PENINSULA FERRY ROUTES TO SAN FRANCISCO (INCLUDING AIRPORT ROUTES)

**Institutional and Planning Factors:** The two major planning processes each developed innovative techniques to demonstrate the cost-effectiveness of ferry investments over land-side investments in response to different public review procedures and reflecting the different regional transportation conditions which prevailed. The Golden Gate Bridge, Highway and Transit District established what must be regarded as a nationwide precedent for such cost-benefit analyses of ferries versus landside travel mode investments through an extensive regional transportation planning process. As described in their report to the California State Legislature of 1971 entitled Golden Gate Corridor Facilities Plan, the extensive public planning efforts to address excessive levels of congestion on the Golden Gate Bridge and corridor alternatives analysis findings and recommendations. The evaluative criteria for selecting a program of ferries, buses and HOV lanes to relieve immediate bridge congestion by reducing existing single occupant auto commutes and balancing auto and transit use in the future. The analysis included assessing capital and operating cost-benefits of 5 medium to long range plan alternatives which included various fixed transitway legs of the BART system and exclusive bus ways which would comprise the ultimate transit system. The plans also incorporated a variety of more flexible, lower capital bridge management and transit solutions as interim measures. It was resolved to implement the shorter term measures and select the routes but remain flexible on the longer term transit mode. An important factor in the selection of the plan was the documented effectiveness of the Districts recently implemented highspeed Sausalito commuter ferry which had successfully diverted substantial numbers of auto trips from the bridge in 1971, its first year of operation.

The more recent Regional Ferry Plan completed in 1992, nearly 20 years later, by the Metropolitan Transportation Commission built on some of the planning and ferry implementation successes of the Golden Gate plan, and introduced several new evaluative techniques for assessing cost-effectiveness of water and landside alternatives.

**Vessel Technology:** The ferry technology has undergone a series of transformations since the pre-bridge era of rail and vehicle roll-on/roll-off services. The Golden Gate system developed then state-of-the-art high speed/high capacity monohulls which have served well over their lifetime and will continue to be useful for Bay service in the future. The introduction of Australian high speed catamarans for the Vallejo route in 1986 and later the Tiburon and Oakland service proved the suitability for daily service on the longer run and the attractiveness of the jet-age interior amenities. The next generation of higher speed, fully accessible (ADA) and more reliable propulsion systems will test the next thresholds of speed and distance. Vallejo, Oakland/Alameda, and Golden Gate were all at various levels of commitment to new designs at the time of the study. The interchangeability of public and privately owned and operated vessels in San Francisco has also been a great asset by providing readily available back-up systems for day-to-day needs as well as periodic emergencies such as the 1989 earthquake. The San Francisco routes offer good proving grounds for new ferry technologies including high speed variations, low wake solutions, and navigation assistance devices for operations in fog conditions.

## 2.35 Case Study Findings and Lessons for Other Systems

### System Potential to Meet Future Regional Transportation Needs

The Bay Area has been well served by multiple public and private ferry systems and routes, and has been a major innovator in starting contemporary commuter systems over the past 25 years. The bay itself has proven to be an excellent testing ground for new vessels and services, and has

yielded useful lessons for other systems over the years. The size of San Francisco Bay and distances traveled by commuters have led to experiments with implementing increasingly longer distance high speed services such as the second generation Vallejo service started in 1986. With more routes in the planning stages, with more advanced vessels in construction, and with innovative state capital funding programs in place, San Francisco is about to enter its next generation of highspeed commuter ferry travel.

As described in the MTC Regional Ferry Plan, the necessity for the new ferry routes is to try to provide incremental corridor specific relief for growing commuter travel demands. In some respects, the relative ease of travel provided by the regional highway network and the BART system has contributed to the continued decentralization of residential and employment locations in the Bay Area.

The region has recently been characterized as having, in effect, a fixed and completed transportation infrastructure, combined with steady growth in regional trip demand. The combination of limited capacity to expand highways in the region with limited funding availability for new highway projects in the foreseeable future, has led to the search for alternative methods of increasing capacity by achieving a better balance of use of existing transportation modes and identifying new ones which are cost effective. The ferry options identified in the MTC study as higher priority were those offering waterways as an existing, underutilized right of way which was capable of diverting an appreciable number of commuters. As in the earlier Golden Gate planning process, the ferry is not intended to be a major high volume transit alternative such as the BART system, but rather like a fleet of express bus routes which reduce highway traffic incrementally along specific corridors by offering a cost and time effective option to single auto commuting.

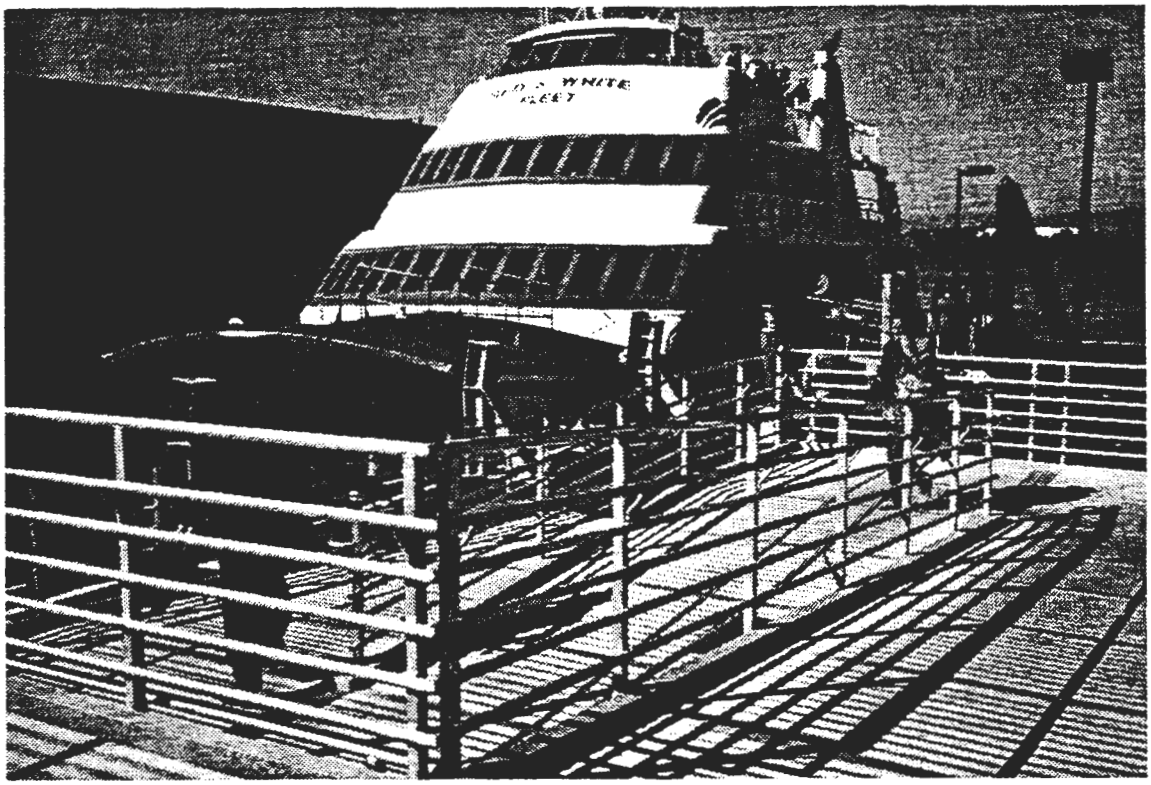
The next generation of ferry routes, which are currently being implemented, include higher speed, more competitive vessel technologies. These routes are being implemented in accordance with the MTC Regional Ferry Plan, and funded by the innovative state referendum providing capital funding for vessel and terminal construction, but leaves the operating costs to be covered by the system and local jurisdictions. This places more pressure on the public proponents to deliver a service which is clearly attractive in terms of time and costs, as well as amenity. The new routes and new generation of highspeed vessels are capable of providing faster water trips than the landside alternatives, while relieving pressures on the overburdened highway and transit infrastructure. Marketing will also play an important role in separating the Bay Area residents from their single occupant auto commutes.

### System Lessons for Other Cities

**Economic Development Catalysts:** Many innovations have occurred in water transportation planning and private operator initiatives to combine commuter travel and excursion service. In an urban area which prizes its waterfront and superb harbor recreational resources, the ferry systems continue to contribute in many ways to the economy.

- o Ferry service "blending" of commuter and recreation excursion type activity has been successful both for suburban community development as well as self-sufficiency of public and private routes. Public and private operators have had success with blending. These techniques should be useful in similar settings.

Figure 2.37: Photos of Existing San Francisco Ferries




o Reliance on two strong established ferry operators has proven to be good business and good transportation strategy. The more a service providing public transit can be privately operated and to some degree self sufficient economically the less of a burden imposed on the public sector. The well known competitiveness of the two operators is also an asset in developing innovative services.

o Bay Farm in Alameda represents an example of new waterfront residential development relying on ferry connections for attracting commuters. The service to date has been privately operated at a loss by the developers as a service to residents and attractions to new buyers. The city of Alameda plans to assist with the service by construction of new vessels and combined served with Alameda. Experience in other cities indicates that a broader public catchment is needed to make the ferry operations viable, which may prove successful for this route in the future.

**Institutional and Planning Innovations:** The evolution of the modern generation of San Francisco ferries offers two excellent examples of planning to optimize ferries as alternatives to land based transportation; the original Golden Gate Corridor Plan and the more recent Regional Ferry Plan by the MTC. The great hurdle in coordinating Bay Area transit and travel corridors has been the proliferation and autonomy of the 19 different and sometimes overlapping transportation districts. The ferry systems have served as a catalyst for coordination of these sometimes conflicted interests.

o The Golden Gate Ferry system remains an excellent example of a transit district providing balanced transportation services, with the funding ability to cross subsidize and fine tune demand through tolls and fare structure.

o The MTC approach to the ferry plan in 1991 was a worthy successor to the Golden Gate Bridge Highway and Transportation District efforts in the 1960's and 1970's.

o The Bay Area fragmentation of transit and transportation services has initiated regional planning and integration of the ferry network with other services, and land uses.

o The continuing pattern of urban sprawl of the Bay Area caused by the geography as much as by land development practices, creates dispersed low density residential settlement, generally not conducive to transit use, except along specific corridors where time and amenity incentives can be offered to park and ride users. Such has been the experience with existing services and is intended for those proposed.

o The state referendum mandating capital investment in ferry transportation is an innovative method of overcoming state transportation department priorities for land-based investments, a common problem in states with limited water transportation opportunities.

o The private fleets' willingness, ability and healthy cooperation in providing public/private service is a great asset to the Bay Area.

**Cost Effectiveness of Ferry Networks:** The economic justification of ferries as alternatives to land based options can be demonstrated in several ways by the various combinations of public and private services in the Bay Area.

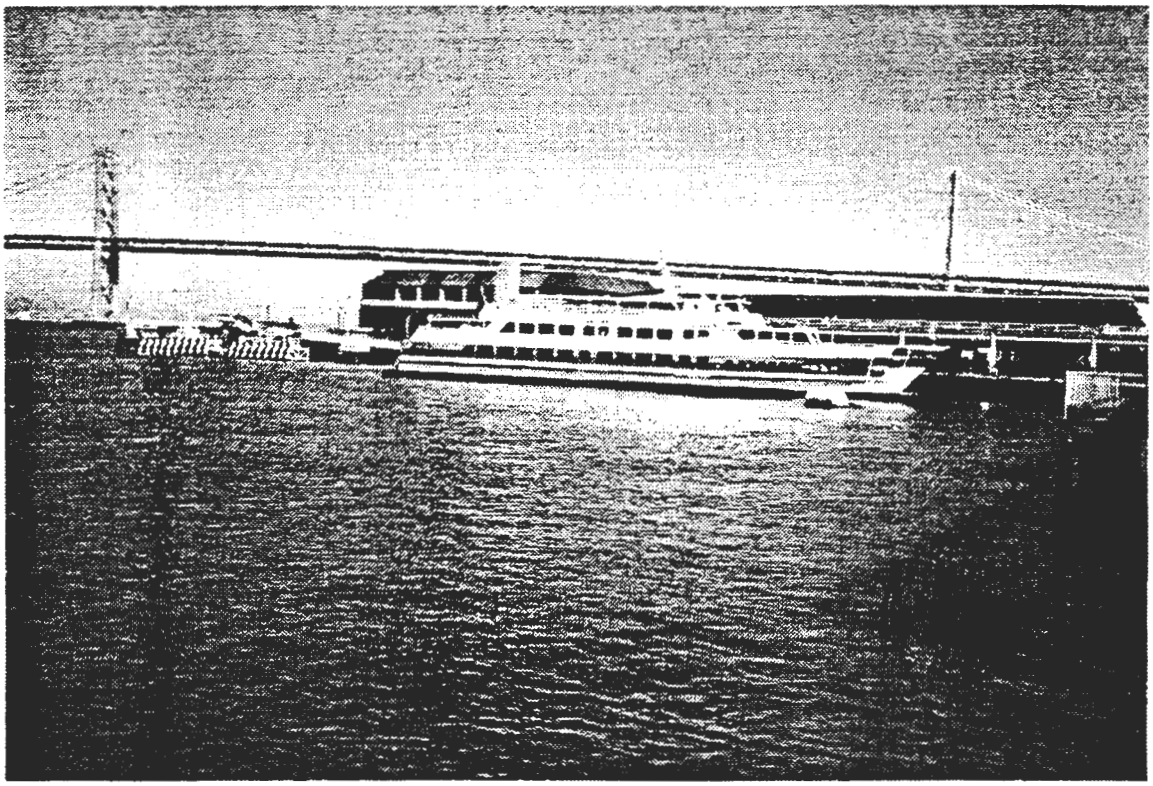
o All Bay Area commuter ferry routes are subsidized and are expected to continue to be so with the proposed system. The acceptable levels are those which match land-based transit subsidies.

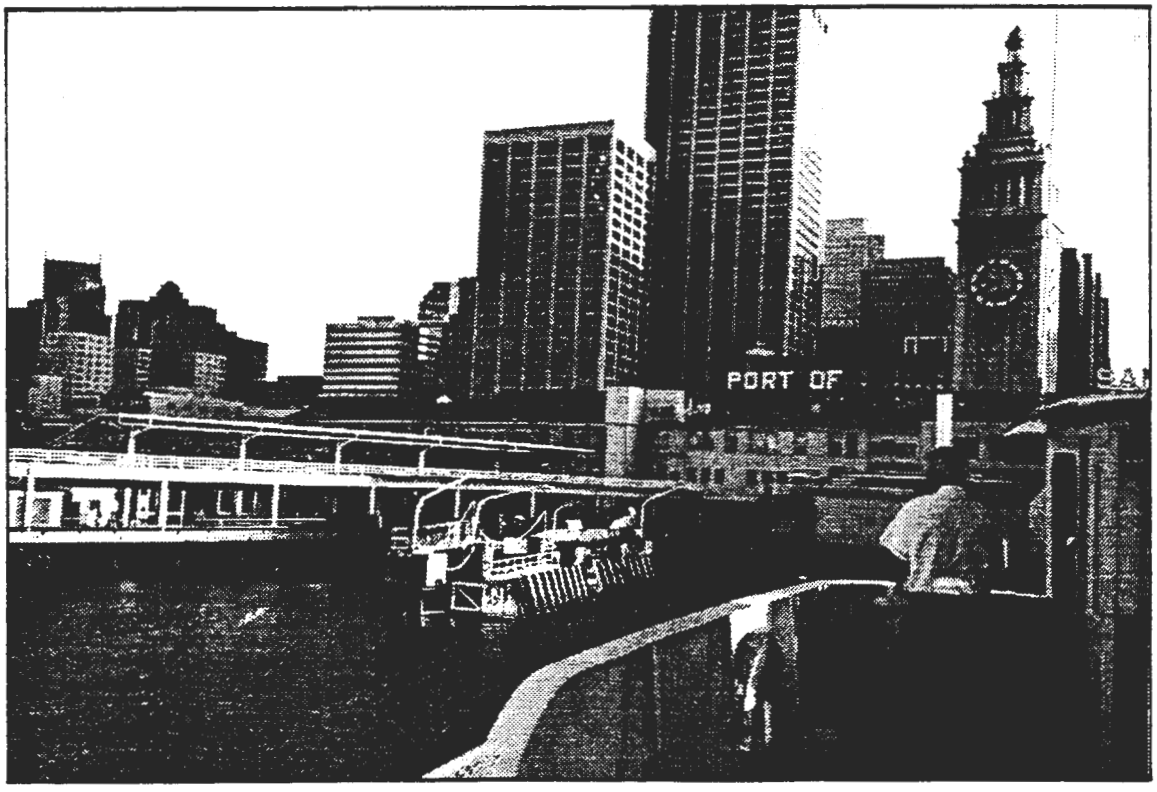
o Acceptance of subsidy necessities seems essential in trying to diminish single occupant auto use in the Bay Area. The mode split levels remain low by urban standards and high by California experience.

o The Regional Ferry Plan analyses of cost effectiveness include auto commute costs for comparison to ferries and other transit. The longer distance trips begin to show major benefits when compared to auto trips.

o The concept of use of ferries and other transit services to reduce infrastructure expansion through deliberate planning efforts is an important precedent and lesson from the Golden Gate Corridor Study, and echoed in the recent regional plan.

**Figure 2.38: Photos of Existing San Francisco Ferries**





## 2.4 MISSISSIPPI RIVER/NEW ORLEANS, LA

### 2.41 System Description and Summary of Findings

**Existing Routes**

o Pointe a la Hache*
o Belle Chasse*
o Chalmette(New Orleans) to Algiers (MRBA, CCC)
o Canal Street (New Orleans) to Algiers (MRBA,CCC)
o Jackson Ave. (New Orleans) to Gretna (MRBA,CCC)
o Edgard to Reserve (MRBA)
o Lutcher to Vacherie*
o White Castle to Carville (MRBA)
o Plaquemine (MRBA)
o New Roads to St. Francisville (MRBA)
o Angola Penitentiary(MRBA)

* Denotes parish or county operated route

**Proposed Routes:**
(No new routes proposed)

The cross-Mississippi River ferry routes are most typical of historic and contemporary vehicular systems in the U.S.. The ferries are predominantly short-haul, marine highway links across the river at location not served by bridges. They fall into two categories; the higher volume urban routes in New Orleans, and the rural routes at various locations up and down river. The system provides basic vehicle and passenger connections between towns and roads on the opposite side of the nation's largest and busiest river. The bridge connections which exist, even in New Orleans, are widely spaced due to the high cost of construction over a broad and swiftly flowing river, as well as to minimize navigational obstacles for the heavy shipping and with the long barge rafts which negotiate the winding river. More recently, since the early 1970's, the environmental constraints of the extensive wetlands along the levees have limited new bridge construction.

The river has always been regarded as the primary transportation system and the highways and bridges as secondary. Within the river as transportation system, ferries have always been secondary to shipping and has had to be capable of giving right of way at all times. Many similar ferry highway links exist further up the Mississippi and Ohio Rivers. Some of the more unique aspects of the southern Louisiana ferries relate to the topography and settlement patterns of the Mississippi Delta itself combined with the regional jurisdictional peculiarity of parishes straddling both sides of the river.

**System Types and Description of Existing Routes**

Of the eleven Mississippi River routes operating in Louisiana, six typical ones were selected for the case study analysis and are shown in Figure 2.41. They included: the three urban routes in New Orleans, the two rural routes up river from New Orleans at Edgard-Reserve and Lutcher-Vacherie, and one rural route down river at Belle Chasse. The routes are characterized by two public jurisdictional management types. Most of the crossings are operated by the Louisiana State DOT agency called the Mississippi River Bridge Authority (MRBA) with the New Orleans regional intermodal office known as the Crescent City Connection (CCC). The remainder are operated by the local county or parish governments (those noted with an asterisk in the above list).

Most of the services were originally operated privately and eventually found the low volumes of riders were not adequate to sustain the routes economically. They were gradually taken over by the state DOT or local governments to help commuting residents avoid the hardships of the long vehicular trips necessitated by distant bridges, often adding as much as 60 to 80 miles to a work trip by land as opposed to water. The rural routes providing cross river highway or town connections by ferry are in effect marine floating bridge linkages in the local road system. The bridges are generally located only where there are major east-west highway or Interstate river crossings, which are limited in the Louisiana delta. Present environmental regulations would most likely preclude any new highway bridges along the lower reaches of the river, even if there were any substantial new demand from changing land uses which appears unlikely, particularly in the rural areas .

The three New Orleans routes are somewhat different in function and have always carried much higher volumes of passengers and vehicles than their rural counterparts. The Algiers, Gretna and Chalmette ferries serve primarily as peak hour commuter carriers, following the traditional routes which connect major city streets as they have done for most of the 20th century, and carry workers from residential areas on the east bank of the river to industrial, military and maritime jobs on the west bank, or residents from the west to downtown and other dispersed jobs on the east. While Interstate alternatives exist to the ferry, the combination of passengers and vehicles can make shorter and faster trips by ferry. Primarily the ferry routes are complementary in their transportation role.

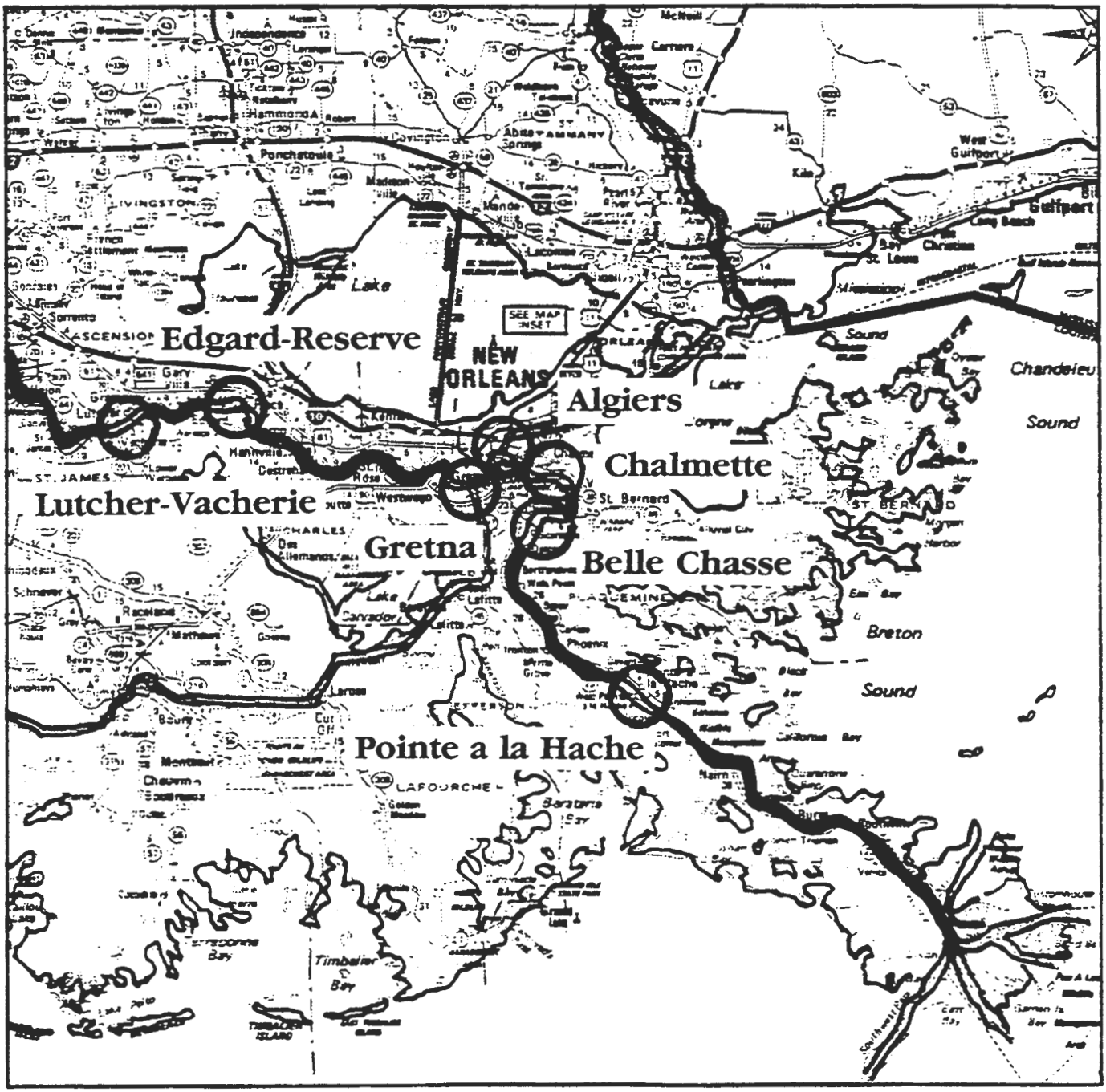
**Summary of Key Issues and Findings**

Distinguishing characteristics of the Mississippi River system include the following aspects of historical influences, existing system functions and limited proposed expansion plans.

**Historical Influences:**

o Historic and Geographic Factors have Been Primary System Determinants - Several distinct regional factors which have influenced the present routes include; 1) the Louisiana parishes straddle both sides of the river which encouraged linked settlement and cross river development (compared to upriver conditions with the river serving as the boundary between states, 2) Bayou wetlands and the changing course of river branches and canals in the delta have resulted in low density development and limited demand for frequent bridge crossings, 3) ferry and bridge systems are determined and controlled at the parish level, and 4) national environmental policy has limited major new highway and bridge construction since EPA legislation became enacted

Figure 2.41: Existing Mississippi River/New Orleans Ferry Network



in the early 1970's.

o At the Turn of the Century the Numerous Ferry Routes in New Orleans were Efficient Intermodal Passenger Links: The 6 or more routes connecting east and west banks connected on both sides to an extensive trolley network, which combined to provide a transit network for all sectors of the city.

o Public Routes and Ferries in New Orleans were Acquired by the State from Private Operators when the Systems became Unprofitable Following New Bridge Construction - From 1938 to 1965 as the 2 new bridges were built, the 6 remaining city routes were taken over by the state of which only the Jackson Ave. and Canal Street currently remain.

o Privately Operated Rural Routes were taken Over by State and Parishes as they became Unprofitable: In order to maintain essential river crossings connecting residential and new industrial work destinations, on opposite banks, and avoid excessive auto commutes via wisely spaced bridges.

o Waterfront and Adjacent Land-use Patterns have Changed in the Past 50 Years: These have reduced ferry demands in New Orleans and increased demand in the rural parishes. New river related industry has located along the east bank upriver creating new jobs, while center city waterfront shipping and port activities have relocated down river and in canals.

**Existing System Characteristics:**

o The Routes are Typical of the Majority of U.S. Water Transit Systems - Both the urban New Orleans and rural parish routes are typical of many U.S. systems; 1) accommodate low to moderate volume of passenger and vehicle user demand, 2) serve as critical highway transportation links for week-day commutes and goods movement, 3) serve a secondary use as recreational on weekends and off-peak, 4) provide short time and distance ferry crossings in lieu of bridge or tunnel, and 5) routes are state subsidized, publicly operated, with regulated low fare levels.

o Ferries Significantly Reduce Travel Time and VMTs For River Crossings where Bridges are Widely Spaced - The roll-on/roll-off ferry services are typically the most cost effective way of providing cross river links in the local road networks, and save daily users an estimated 1 to 2 hours travel time and on average between 60 to 100 vehicle miles per round trip.

**Proposed System Improvements:**

o Expansion of Capacity of the Chalmette Commuter Vehicle Ferry - As a long term substitute for the proposed Dixie Highway and Bridge, the heavily travelled cross river arterial connector continues to adapt and add new vessel capacity to keep up with gradually increasing demand. It continues to provide a direct alternative to the time consuming trip for commuters through the downtown.

## 2.42 System History and Critical Decision Points:

**History of the Louisiana Ferry System**

The Louisiana network of ferries have functioned in various different forms for over two centuries as cross-river passenger, street, highway, and rail links, and boast a long and colorful history. The network consists of two types of jurisdiction or operation; those run by the State of Louisiana DOT, and those run by individual parish or county governments. In researching the history of ferries in Louisiana, it was noted that little literature appears to be available on the system. Much of the information used, therefore, is from interviews, site visits, and map study of the unique Mississippi River delta in which much of the system operates.

The fundamental water and land transportation decisions relate to the long history of the great river which has served as a major north-south shipping route and also as a barrier to east-west travel. As early as the expedition of Hernando DeSoto in 1539 to 1541 the ferrying men and supplies across the river provide a major challenge. In 1541 the crossing was resolved by the building of barges built from trees called Piraguas to transport 150 foot soldiers and 30 cavalry men from east to west bank. At that time route and terminal choices were made based on factors such as the availability of timber for barge construction, and the appropriate crossing point to avoid hostile Indian villages along the banks.

By the time New Orleans and other Louisiana river towns emerged as active ports in the mid to late 1800's, the ferry network was an absolute necessity it remained so well into the 20th century as an essential connection for work, for city business, and movement of train cars across the river to rail heads. Ferries also served to connect across the river for church and social events. The early New Orleans riverfront as shown in the aerial view in Figure 2.42, and the 1898 map in Figure 2.43, show how the ferry served to connect street ends in much the same manner as the remaining urban routes.

The pattern of routes for both rural and urban ferries on the Mississippi were determined in the 19th century when commercial activity and residential settlement ended on opposite banks and necessitated passenger, vehicle and rail transfers. Leonard Huper writes in his book, New Orleans, A Pictorial History (Crown Publishers Inc. 1971); in a chapter called "Vanishing Ferries";

> "Ferries on the Mississippi at New Orleans were very much a part of the local scene, almost since the first steamboat came to the city. This is the earliest photograph (1878) of a New Orleans ferry-the Canal Street ferry "Louise". This boat, which did not have the conventional pilot house perched on its top most deck, ran between 1867 and 1879."
>
> "The Canal Street ferries advertised that one could ride all day for a nickel, a bargain even in the days when five cents could buy something. This is the ferryhouse with its clock tower. The wing to the left was the harbor precinct police station." (Figure 2.45)

During the early years of the 20th Century, the ferry routes served the busy Port of New Orleans as integral cross-river links in an extensive public transit system connecting residential areas and the commerce center with the port functions which lined both banks. The ferry routes were the shortest distance connectors of the radial Streets of the east bank to the corresponding streets in towns along the west bank. The originally privately operated ferry routes connected the east and west banks along radial street lines at numerous points on the busy port waterfronts, as shown in Figure 2.43. The radial and circumferential trolley network of 1925 shown in Figure 2.44 indicates how the ferries connected directly at the terminals with the extensive trolley system

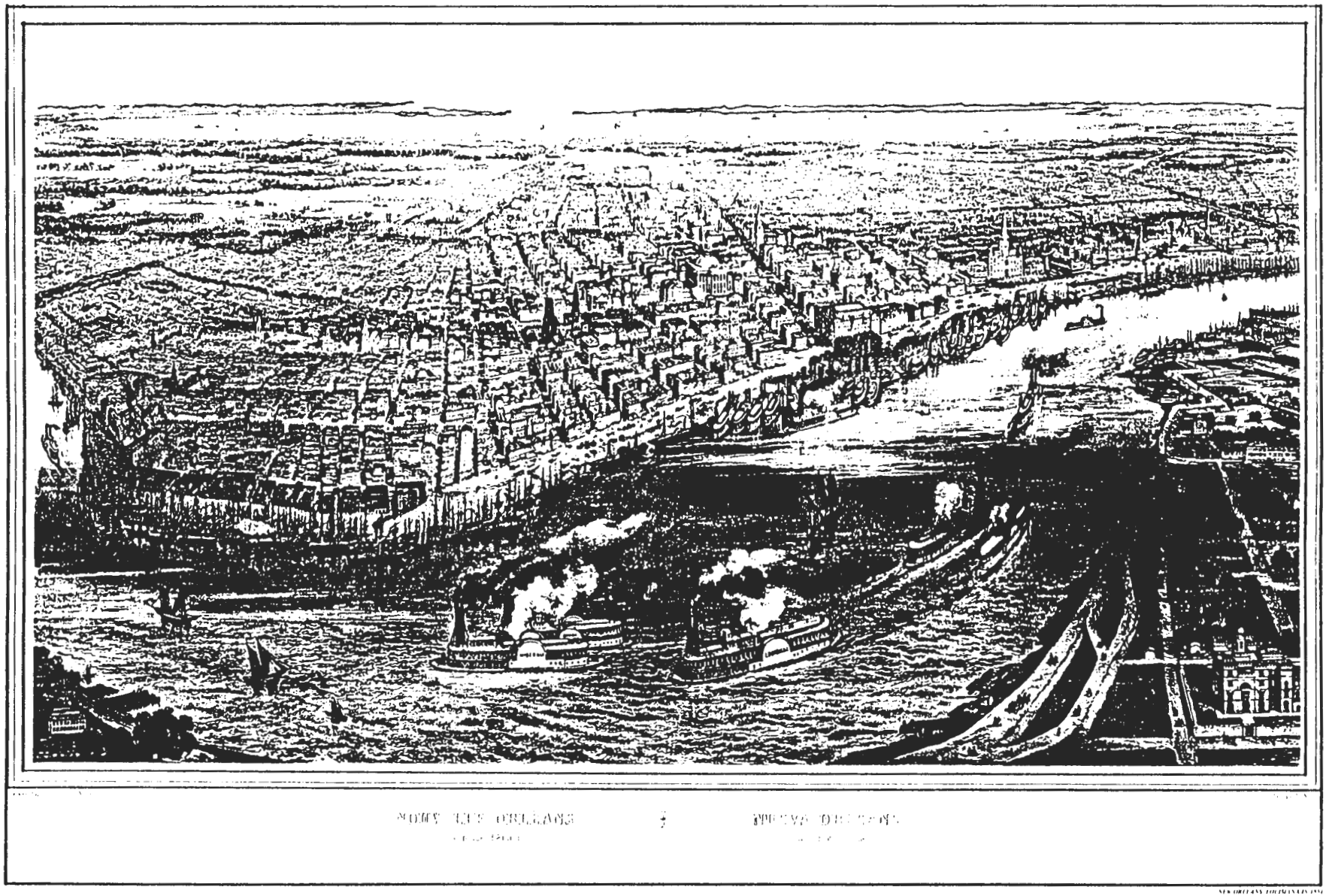


**Figure 2.42: Historic View of New Orleans in 1851**

and together provided an efficient urban intermodal transit system.

In the late 1930's, the Huey P. Long Bridge was completed at the western end of the city as one of the first south of Baton Rouge along the river. The second major bridge to be completed was the Mississippi River Bridge in 1957, later replaced by the I-90 Crescent City Connection bridge. As these new bridges were completed the private ferry operators gradually went out of business with the diminishing demand for passenger and vehicular crossings. The Louisiana State DOT purchased the remaining routes including the older vessels and terminals in the early 1950's. The Mississippi River Bridge Authority was established linking toll bridges to ferry funding. Three of the ferries routes continued to operate; including Jackson Ave. and Algiers. In 1969 a new route was added down river between Chalmette and Algiers to serve the growing port and industrial corridor, and the connector road, Route 47. From 1975 to 1980, extensive upgrades to the remaining terminals and refits of the existing vessels were completed, signifying a long term commitment to the urban ferry system. The Crescent City Connection Division of the State DOT was established as a New Orleans metropolitan transportation authority to operate the toll bridges, transit system and ferries. The connection currently links the tolls for the replacement bridge to the ferries and other ground transit systems.

In the up river parishes, the ferries have evolved in much the same pattern. Cross river ferries have remained where bridges have not been built, and have been abandoned where bridges have been completed. The ferries are all operated by either the state or by local parishes. On the up river routes studied, the uses include cross-river connections to parish churches or courthouses which are on opposite banks than the residential. In addition there are dispersed newer industrial sites offering employment opportunities along the low-lying west bank with most of residential areas on the east bank in older parish towns with access to Interstate I-10. While several bridges have been completed providing faster cross-river driving connections, others have been delayed by EPA regulations. The Gramercy Bridge near Lutcher has been completed but not open for several years because of a combination of structural and environmental problems with off-ramps and grade connections to existing highways.

The down river ferry systems at Belle Chasse and Pointe La Hache have continued to serve in lieu of bridges for the residents of the sparsely settled lower delta area, connecting the string of towns, scattered port activity and recreational areas along this stretch of the river.

**Decision Points**

The differentiation of historical periods of the Mississippi River ferry system in Louisiana seems somewhat muddy because of the relative continuity of routes and functions, with the surviving routes performing generally the same functions they did over 100 years ago. The frequency of the initial urban routes appear to have provided primarily passenger links between east and west bank, particularly linking the active port functions and the densely built residential areas along the east bank. The pedestrian ferry links were then augmented by a growing landside trolley network which extended away from the riverbank to new residential neighborhoods. The extensive linked ferry and trolley network was at its peak in 1925 as shown in Figure 2.44. The first major shifts away from total dependence on the ferry /trolley transit network occurred on different routes as bridges were built. Only the in-between routes survived as the adjacent ones became somewhat redundant.

The major decision points determining the present system relate, therefore, to the construction

of individual bridges and the subsequent replacement of individual ferry routes. New Orleans presents an interesting exception in some ways, as three of the six ferry routes were continued even after new bridges were completed nearby. The state DOT decision to maintain operation of state highway links along the river and provide options for reduced auto trips to and from work has proven effective and allowed smaller towns not served by bridges to survive. Key historic decision points could be summarized as follows;

o Huey P.Long Bridge (1930's) and Mississippi River Bridge (1957) Construction: These two bridges combined with the construction of new arterial highways caused many of the initial ferry routes to become redundant.

o Mississippi River Bridge Authority (MRBA) Established by State (1960): Authorized to combine bridge tolls with ferry operations after new bridges served some segments of the river leaving others for ferry service.

o State Acquisition of Private Ferry Operations (1960's): As new bridges made ferries along or near the same crossing redundant, the LA-DOT acquired the ferry companies and diverted use of vessels to remaining routes.

o New Ferry Installed by MBRA from Chalmette to Algiers (1969): In response to changing port industrial and residential growth, a new marine highway link was started along the route of the proposed Dixie Freeway.

o MRBA and LA-DOT Improvements to New Orleans Ferry System (1975-80): $30 million invested in terminal improvements and vessel upgrades marking a long term commitment to ferries and bridges as a combined crossing system.

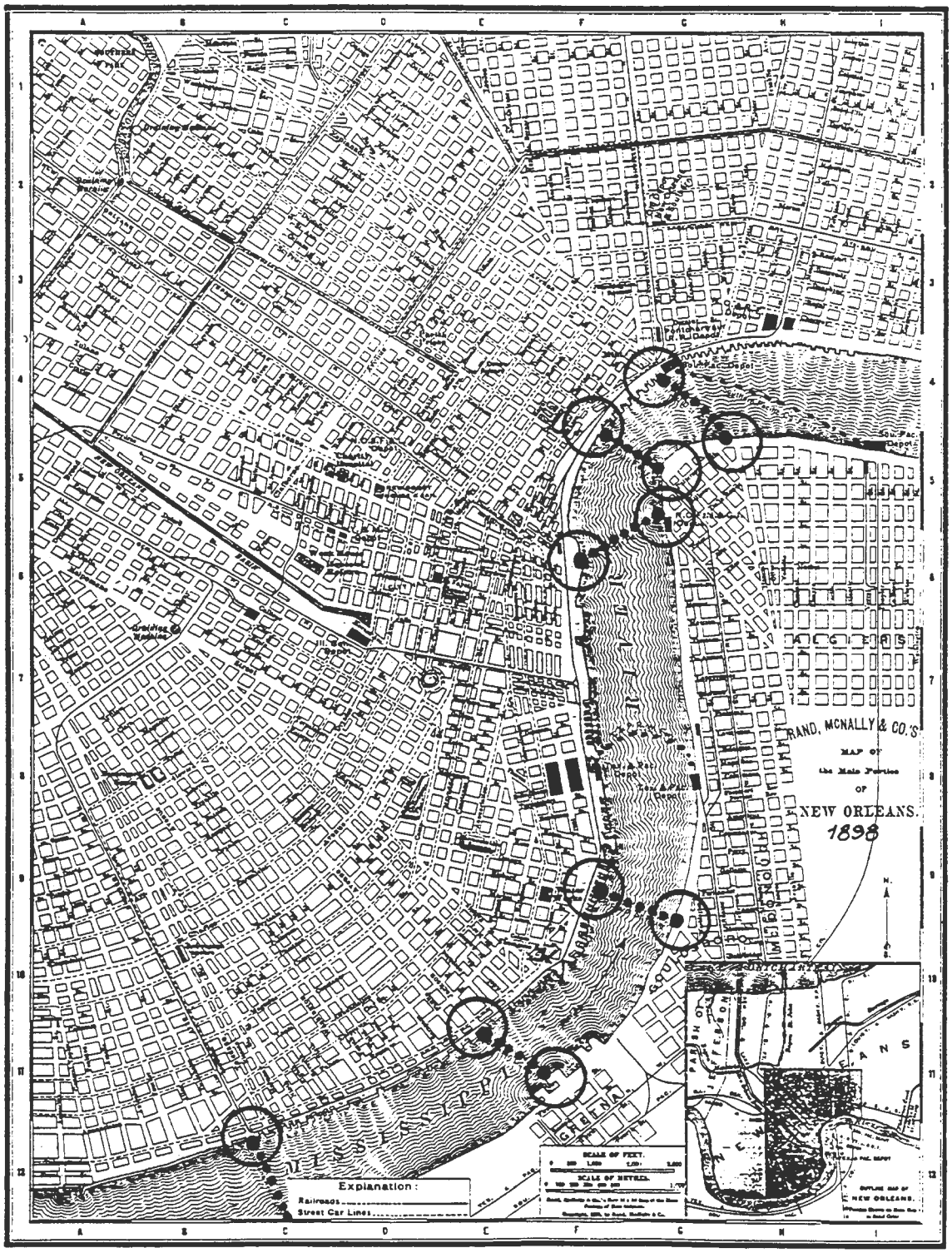
o Use of Ferries as Mitigation During Expansion of the I-90 Crescent City Bridge in New Orleans: The Algiers-Canal Street and Gretna-Jackson Ave. routes served as traffic detours and bypasses during construction of the new I-90 parallel bridge span in 1989-91.

**Regional and Urban Context:**

**Land-use and Transportation System:** The Mississippi River serves as the primary transportation spine for the region with all land-side and cross-river connections as ancillary to the waterway. The land-uses and employment opportunities have long been determined by the river as waterway and its evolving transportation systems, the shipping business and associated water related industries. In New Orleans the port and maritime related businesses and industries have dispersed somewhat from the 19th and early 20th century central city concentrations. As the highway system opened up areas around the city perimeter, the absolute focus on the port for all commerce gave way to a somewhat more diversified and decentralized economy. The pattern of major center city employment along the rivers edge which activated the ferries and trolley system, has gradually changed leaving only pockets of intensive port use. More recently river front gambling in New Orleans and along the river represent a partial re-use of the once thriving wharfs and piers on the east and west banks.

The landside transportation system has also become decentralized and primarily oriented to vehicles. The once extensive trolley system no longer connects all sectors of New Orleans to the ferry landings. While the current ferries have reasonably good bus connections, most ferries

**Figure 2.43: Historic Plan of New Orleans in 1898**



today are predominantly vehicle oriented with the exception of the Algiers ferry which still carries the most passengers of any routes. The most notable aspect of the land side transportation has been the impact of environmental constraints on expanding highways and bridges because of the predominance of wetlands.

**Physical Context-Environmental, Geography, Climate and Navigation:** The ferry system land-uses, and travel patterns along the lower Mississippi are all greatly influenced by the unique setting of New Orleans and the river delta. Because of the dominant presence of wetlands, andy new project in the area is subject to stringent environmental regulation, and indeed numerous regional transportation projects started in the 1950's and 60's have been delayed or canceled because of such regulatory constraints. These conditions have also insured that ferry travel routes located at intervals along the river will also continue to be necessary as an environmentally more compatible mode than additional highway construction. The geography of the land has also created a generally low capacity of clustered settlement pattern of many small villages along the pier, with few major east-west highway connections, but many rural arterioles. These tend to be well suited to the low density vehicle ferries, where bridge connections are costly and of disproportionate capacity for these low growth, low density areas.

The Mississippi River ferries are typical of many low capacity, low cost ferry systems in the U.S. in that they provide cost-effective marine highway links with capabilities well matched to the transportation needs.

The climate and navigation issues have contributed significantly over the years to the system configurations. The shipping traffic on the lower Mississippi is heavy year round. The combined swift river flow and size of vessels along with hairpin bends in the channel makes the down river shipping lanes particularly dangerous for cross river ferry traffic. When combined with tropical rain squalls or fog at various times of the year, the navigation demands on vessel design and handling are particularly challenging. An early vessel technology response was the design of catamaran hulls early in the century to support the broad deck platforms. The narrow dual hulls provided less displacement and added maneuverability for the cross river routes. The ferry captains have always been highly skilled, and usually remain on a given route throughout their careers to insure familiarity with the idiosyncracies of each individual route.

## 2.43 Route Descriptions and Comparative Analysis

### Existing System and Route Descriptions

The routes visited and documented represented a cross section of the river ferry network and different contexts. The routes are grouped in three categories; 1) the urban New Orleans routes, 2) the down river rural routes represented by the Belle Chasse ferry, and 3) the up river rural routes represented the Edgard-Reserve and the Lutcher-Vacherie ferries. The route visits took place in June of 1993. The contiguous routes are located on a stretch of the lower Mississippi in the New Orleans metropolitan area as shown in Figure 2.41.

**1) New Orleans Crescent City Connection Routes:** The three routes within the Parish of Orleans which includes the city of New Orleans and the town of Algiers are operated by the Crescent City Connection Division of the Louisiana DOT, in conjunction with the toll bridge and metropolitan bus and transit system. Two of the routes were part of the original group of street and neighborhood connecting routes which numbered 6 as late as 1938 and diminished as

waterfront employment changed and as the bridges were built.

**o Algiers to Chalmette** - The Chalmette route was initiated in 1969 in response to new industrial development on the east bank. It is currently the most actively used of the vehicle commuting routes. It carries primarily vehicles, with no park and ride facilities on either side, and limited bus connections. The approximately 3/4 mile crossing takes 5 minutes, and serves commuters travelling from home to work in both directions. The east bank town of Chalmette contains a variety of employment destinations including the Martin-Marietta plant, and an industrial and manufacturing corridor to the north along route 47, as well as a substantial residential population. The town of Algiers is predominantly residential along the river bank, but also contains a Naval Reservation, and beyond in Belle Chasse, the Callender Field Naval Air Station.

The ferry route was originally to be replaced by the Dixie Freeway, a major east side highway and bridge connection from I-10 along the route 47 corridor through Algiers and connecting with I-90 to the west. The plans were halted in the 1970's because of environmental constraints, and the project is currently on hold. In the meantime the ferry, with expansion recently to three vessels, is carrying the load. There are traffic impacts of approaching vehicles on the Algiers side because of its circuitous route through residential neighborhoods. The Chalmette ferry saves commuters considerable time and distance which otherwise would be needed if they used the alternative Crescent City Bridge and freeway route (approximately 40-50 miles round trip and 40 minutes each way).

**o Canal Street to Algiers** - The "flagship" of the New Orleans ferry system is the vehicle and passenger ferry which carries commuters and visitors in equal numbers to and from the only downtown terminal location. One of the oldest ferry routes in the city, the ferry connects from Canal Street and the Riverwalk to the port town of Algiers, once a major shipping employment destination. At present the route is used by west bank residents commuting to downtown jobs, by visitors to historic Algiers and to attractions such as the Mardi Gras float factory. Intermodal connections are available including active bus and van connections at both the attractive Algiers Terminal and Canal Street terminals. On the New Orleans side the renovated terminal is now at the center of the tourist activity area and many visitors take the 25 cent ride just to see the river. The riverfront trolley also serves the terminal. The route closely parallels the dual span Crescent City Bridge, which has the same $1 toll as the vehicle ferry fare common to all New Orleans ferry routes.

The ridership increased dramatically during the 1986 Worlds Fair, then again during construction of the new I-90 bridge span construction, dropped after the completion of the new span, and increased back to pre-new span volumes by 1993. The navigation issues are of note as the ferry route is just upstream of a dramatic horseshoe bend in the river, and the ferry captains must maintain constant radio contact with the harbor control tower to time and gauge their crossing time and route. Three vessels are used with one being for passengers only and used during peak periods. The ferries operate at 15 to 20 minute headways in peak and off peak periods. They are also used for major annual events such as Mardi Gras.

**o Jackson Avenue to Gretna** - The route connects the town of Gretna in Jefferson Parish to Jackson Avenue along the industrial waterfront area formerly known as the Irish Channel, and to residential areas of New Orleans beyond. Originally a private service, the route was taken over by the state in 1965 when the system was no longer able to compete with the newly

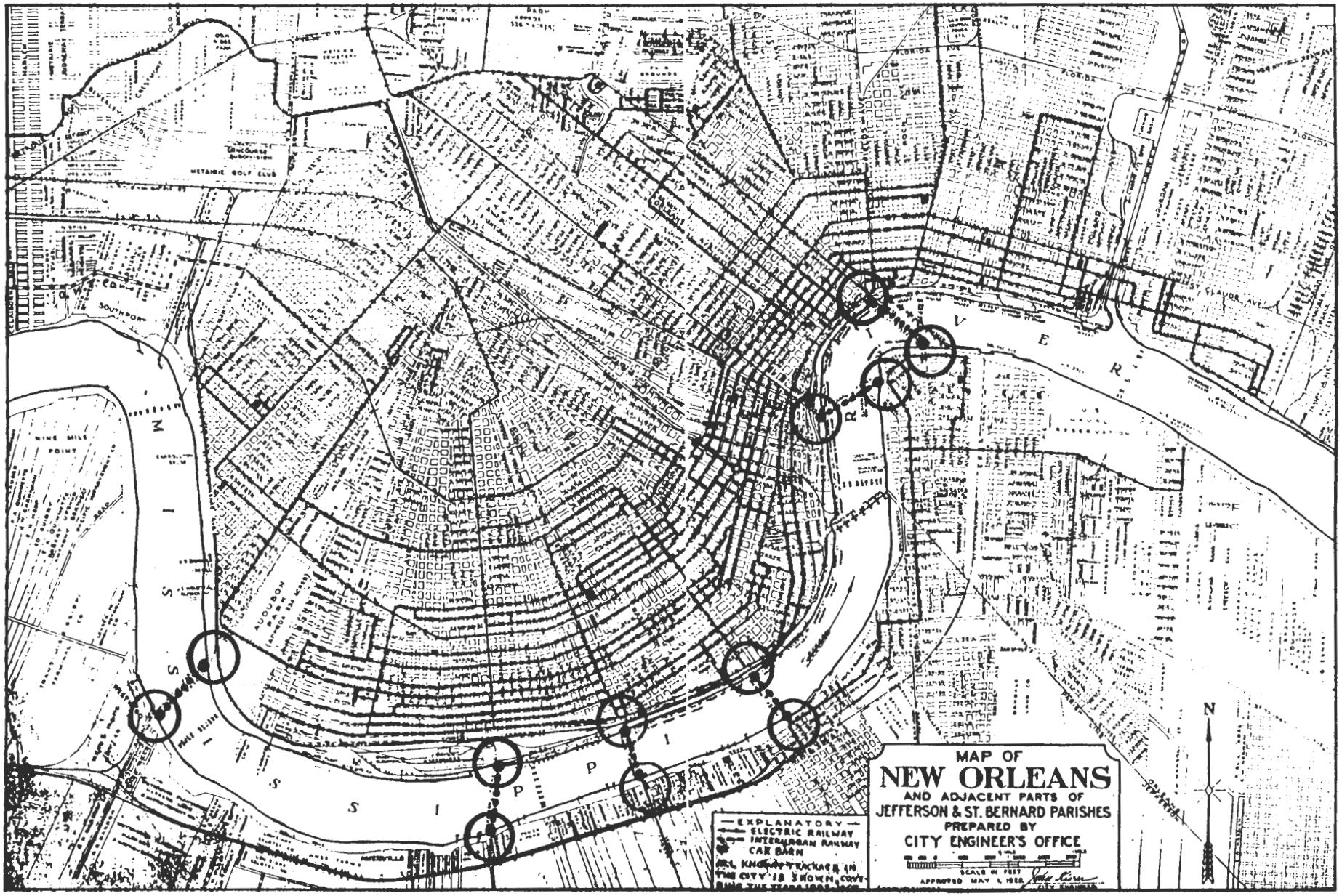



**Figure 2.44: Ferry and Trolley Routes in New Orleans in 1925**

opened Mississippi River Bridge (now the Crescent City/I-90 Bridge). The Ferries were rebuilt from the catamaran hulls up, and new terminals were constructed on both sides. The Jackson Avenue and Gretna terminals both provide grade separated pedestrian and vehicular access, as do the Algiers and Canal Street terminals. The former trolley connections on both sides have been replaced by bus links. The Gretna terminal is located in close proximity to the Jefferson Parish Courthouse and the Parish government offices. The original use of the ferry as access to west bank employment has declined and been replaced by selective commuter uses, primarily by vehicle. The town lost in its recent bid for a riverboat gambling license which might have affected ferry usage, or possibly required its relocation. The volume of vehicular ridership is the lowest of the three at 220,000/year, and the passenger use of 275,000/year ranks well below the Canal Street route. In fact the pedestrian use has declined so much in recent years as to warrant elimination of the 25 cent fare altogether. Two sideloaded vessels are used and operate at 15 minute headways during peak periods, and 30 minute headways at off peak times. The vessels carry 60 vehicles and 800 passengers each, but rarely are filled to capacity.

**2) Down River Routes:** There are two down river routes below the Chalmette service. No bridges exist down river of the Crescent City Bridge and the population is sparse in the river towns along the levee. For towns in Plaquemines Parish which straddles the river, the ferry is the only means of crossing to jobs or other activities such as the courthouse or church which are located across the river, without driving through the center of New Orleans. The two ferries are operated by the parish.

**o Belle Chasse to Scarsdale** - The route visited was the Belle Chasse ferry which operates seven days a week connecting Belle Chasse and Callender Field on the west bank to the towns of Poydras, St. Bernard, Scarsdale, Dalcour and Bertrandsville on the east bank, and also connecting state highway routes 23 and 39. The round trip through New Orleans would require a 60-70 mile drive and take 30-45 additional minutes each way depending on local traffic. The Callender Air station is the major employer along the lower river, with an assortment of smaller maritime related industries scattered along the rivers edge. The ferry is actively used during the week by commuters, and on the weekend for recreational access to the St. Bernard peninsula.

**3) Up River Routes:** The up river ferries serve similar functions to those down river, and tend to compete with newer bridges at various intervals. The two routes visited were directly up river from the New Orleans routes. The Edgard-Reserve ferry is operated by the state DOT through the Mississippi River Bridge Authority, while the Lutcher-Vacherie ferry is operated by St. James Parish. The function is much the same as the down river ferries in saving daily commuters great distances and time travelling to up or down river bridges. The employment locations at river side industrial sites are along both east and west shores. In what seems to be an historical anomaly, the county seats including parish churches and courthouses were built on the west bank, while the residential population is more concentrated on the east bank, therefore requiring a variety of cross river institution related trips in addition to job commutes.

**o Edgard to Reserve** - The ferry transports residents from the east bank to west bank jobs and parish civic functions. The modest barge mounted terminal facilities were being upgraded by the state indicating a commitment to the site and the service. The levee walls are prominent on both shores requiring the access roads to traverse up and over to gain access to the ferry boarding location. The ramped road sections built into the levee serve as the stacking area. As at the other rural terminals, park and ride facilities are not required as there is no transit service linking with the ferries. On the day of the sity visit an extended trial at the St. John the Baptist

Parish Courthouse on the west bank was creating an unusually high and peak condition demand on the service. The open deck ferry appeared to accommodate approximately 30 cars. Edgard and Reserve are about 15 miles from the newly opened Luling Bridge thereby reducing the former trip via the Huey P. Long Bridge at I-90. The round trip driving distance between terminals is approximately 30 miles and the trip time would be about 45 to 50 minutes each way, on the winding levee road.

**o Lutcher to Vacherie** - The service is similar to that of its down river neighbor, but utilizes older vessels and terminal facilities. Although heavily used at AM and PM peak times, it appears that the parish operated systems have fewer resources and greater difficulty in maintaining and improving their terminals and equipment compared to the state operated routes. It is assumed that the parish systems receive a combination of operating subsidies, since the levels of demand and low tolls didn't appear enough to support the systems. The Lutcher-Vacherie route is situated several miles upstream of a new but unopened bridge at the nearby town of Gramercy which has had a combination of structural and environmental problems. No apparent date has been set for its opening, and in the meantime the parish ferry will continue to perform. The closest useable bridge is about 15 miles to the north creating a similar alternative travel distance and time as for Edgard-Reserve.

The existing routes are compared and summarized by general operational characteristic as described above in Table 2.41.

**Proposed Routes and Terminals:** There are no new routes proposed at present and expansion is anticipated only for the Chalmette-Algiers route. An additional new vessel and transfer bridge are planned to be added to reduce waiting time and increase peak hour capacity by 33%. If the MRBA and LA- DOT need to consider new ferry routes as highway links and substitutes for bridges in the future, the Chalmette route will serve as an excellent model. It has demonstrated how much capacity can be handled by a ferry connection, stacking techniques for vehicles along the levees at both terminals, and other operating techniques possible for maximizing ferry-bridge use. While long term regional transportation plans still call for the southeastern ring road including the Dixie Highway and bridge, the environmental constraints remain formidable. The expanded Chalmette ferry will therefore be needed in the interim for an indefinite period.

### Transportation Functions

The comparative route typologies are shown in Table 2.42. The routes may be categorized as complementary transportation services since all provide varying degrees of time and energy savings over land-based options. Two of the New Orleans routes offer benefits primarily to residents and commuters with origins and/or destinations near the ferry terminals for the Gretna-Jackson Ave. and Algiers-Canal Street runs. The Chalmette service provides time/distance savings of greater magnitude for commuters in both directions, and for through highway travellers as well. The rural routes offer even greater benefits for cross river travel saving users from 40 to 60 miles for various round trip commutes. These time/distance/energy savings are primarily a benefit to the individual users, but also assist the region in reduced emissions and improved air quality.

**Table 2.41 - Mississippi River Ferry Network in Louisiana: Comparative Analysis of Typical Individual Routes**

**Key:**

Type: **1.**Ferry/Bridge or Tunnel Characteristic:
**2.**Ferry/Parallel to High.
**3.**Ferry to Island(s)
**4.**Ferry + Bridge or Tunnel
**5.**Ferry + High. or Rail
**6.**Ro-Ro/Highway Link

**A.**Commuter/Recreation or Tour
**B.**High/Low Volume
**C.**Int'national/Int'state/Int'city
**D.**Public/Private
**E.**New or Expanding System

| Route: | Type | Characteristics | An.Vol. Pass. | An.Vol. Vehic's | Jurisd'n | Subsidy /% est. | Gen'l |
|---|---|---|---|---|---|---|---|
| **New Orleans** | | | 3.6m | 1.75m | LA-DOT | 90% | |
| **Chalmette-Algiers** | 4.6 | Com, low, Exp. | 1.3m/ 12k | 1.1m | LA-DOT CCC | " | Most Veh. |
| **Canal St.-Algiers** | 4.6 | Com/ Rec, low | 1.8m/ 1.5m | 250k | " | " | Most Pass. |
| **Jackson Ave.-Gretna** | 4.6 | Com., low | 560k/ 300k | 220k | " | " | |
| **Down River** | | Pub. | NA | NA | Parish | NA | |
| **Belle Chasse-Scarsdale** | 4.6 | Com., low | | | Plaque-mines | | |
| **Up River** | | Pub. | NA | NA | Pa/DOT | | |
| **Edgard - Reserve** | 4.6 | Com., low | | | LA-DOT MRBA | | |
| **Lutcher-Vacherie** | 4.6 | Com., low | | | St.James Parish | | |

## 2.44 System Performance and Decision Factors

### Transportation System Effectiveness in Meeting Market Demand

The existing urban and rural routes have been described as being historically essential, and currently cost and time efficient in meeting weekday commuting and through traffic needs. Since the Louisiana landscape and regional transportation system are unlikely to change, and since land-use patterns will continue to focus on the river, it can be safely assumed that the ferry routes will generally continue to serve an important and cost effective role. The system is typical of many low volume ferry-bridge marine highway links in the U.S. which have been treated as an extension of the state and/or interstate highway system. In the case of the New Orleans routes the ferries serve almost as extensions of the city street system.

### Environmental Factors

The ferry routes have historically responded to a complex and changing set of environmental priorities from the days of Hernando De Soto to the present. The environmental factors and decisions influencing the present day system include the following:

o The Land-based Highway System and Transportation Infrastructure is Generally Complete - Through a combination of EPA constraints on building across wetlands and a limited growth rate in the area since the oil boom period, the completion of a planned regional highway and bridge system in the New Orleans area as well as up river has stalled over the past 20 years and at present seems to be on indefinite hold. The remaining ferry routes which are substitutes for bridges are therefore likely to continue.

o Intermodal Transportation Hierarchy: The River as the Primary North South Transportation System, with the East-West Ferry Crossings as Secondary - All of the routes are designed and operated to recognize the commercial shipping and navigation as primary and having absolute right of way, with particular attention given to down river traffic in the wide, swiftly flowing, and winding lower reaches of the Mississippi.

o The Lower Mississippi Creates a Complex and Challenging Navigational Context - Due to the heavy shipping and barge traffic, tropical weather patterns, and river currents, exacting ferry technology and operations are required. The systems include highly skilled operators familiar with their own reach of the river, and vessels with sufficient power and backup to safely negotiate the cross river routes.

### Economic Development Influences

The ferry routes have reacted and adapted to changing economic development trends during their long history, and continue to respond at present. The key function of the ferries is to provide efficient access to employment, a role the ferries have fulfilled for centuries. In recent years, the added factor of visitor and tourism use has expanded on busier routes.

o Growth of Off-Peak Tourism and Recreational Uses for the System - Although not a major source of revenue, the Canal Street ferry has emerged as a major tourist attraction and the whole system is used with extended service for major events such as Mardi Gras.

o Ferries Provide Important Job Links for Rural and Urban Residents- Job locations are often related to available riverfront sites and are often remote and across the river from residential areas.

**Institutional Factors - Public and Private**

The treatment of the ferries as highway links by the state DOT is consistent with state operations and funding sources in other jurisdictions nationally. The linkage with toll bridges and transit in New Orleans is a somewhat innovative institutional twist, since the Crescent City Connection seems to be an arm of the State DOT, rather than a metropolitan or municipally based transit authority.

o State Operation of Ferry Routes as Links in the State Road Network- The state takeover of the private ferry routes in the 1960's was essential as the private operations became unprofitable, and the vessels and terminals required extensive repair. In rural areas the state and parish subsidized routes provide low volume links which are crucial to the economic survival of the parishes and non-urban industrial regions served.

o Major State DOT Investment in Vessels and Commitment to Complementary Ferry System in New Orleans with the Terminals from the late 1970's to the mid-1980's - vessels were refitted from hull up. Several new ones in New Orleans acquired intermodal landside terminal connections, and improved vehicular and pedestrian loading and off-loading through separate ramp structures.

**Cost Effectiveness**

While the subsidy levels appear to be high for the system on an operating basis, the capital expenditures on vessels and terminals have been relatively low because of the recycling of both. The Chalmette-Algiers system would seem to be the most cost effective of the ferry-bridges because of the relatively high utilization rate for the busy corridor.

o Public Routes and Ferries in New Orleans were Acquired by the State from Private Operators when the Systems became Unprofitable Following New Bridge Construction - From 1938 to 1965 as the 2 new bridges were built, the 6 remaining city routes were taken over by the state of which only the Jackson Ave. and Canal Street currently remain.

o Privately Operated Rural Routes were taken Over by State and Parishes as they became Unprofitable - in order to maintain essential river crossings connecting residential and new industrial work destinations, on opposite banks, and avoid excessive auto commutes via wisely spaced bridges.

o Waterfront and Adjacent Land-use Patterns have Changed in the Past 50 Years: These have Diminished ferry demands in New Orleans and increased demand in the rural parishes. New river related industry has located along the east bank upriver creating new jobs, while center city waterfront shipping and port activities have relocated down river and in canals.

**Vessel Technology and Terminal Design:** The technology of the broad decked, side-loaded, and powerful ferries has changed little since the turn of the century. The application of the

Table 2.42 - Mississippi River Ferry Network in Louisiana and New Orleans

Comparative Analysis of Routes By Transportation Function and Land-based Alternative

| Location and Route: | 1.Trans. Essential Link | 2.Trans. Comple-ment'ry | 3.Trans. Optional | Land/ Alts. | Approx Dist. | Insti-tutional |
|---|---|---|---|---|---|---|
| New Orleans (LA-DOT/CCC) | | | | | | Pub. |
| Chalmette to Algiers(CCC) | - | Yes (V.) | - | Br. | .5m/ 25m | LA-DOT CCC |
| Canal Street to Algiers(CCC) | - | Yes (V.+P.) | Yes | Br. | .5m/ 5m | LA-DOT CCC |
| Jackson Avenue to Gretna(CCC) | - | Yes (V.+P.) | - | Br. | .5m/ 6m | LA-DOT CCC |
| Down River (LA-DOT&Parish) | | | | | | Pub. |
| Belle Chasse to Scarsdale (Plaquemines) | - | Yes (V.) | - | Br. | .1m/ 35m | Parish |
| Up River (LA-DOT&Parish) | | | | | | Pub. |
| Edgard to Reserve (LA-DOT/MRBA) | - | Yes (V.) | - | Br. | 1m/ 30m | LA-DOT MRBA |
| Lutcher to Vacherie (St.James) | - | Yes (V.) | - | Br. | 1m/ 30m | Parish |

catamaran hull was an innovative step to reduce displacement, therefore cutting the power requirements and operating costs, while improving vessel handling. The distances are short, totalling 1 to 2 miles depending on the specific river location. The power is required more for maneuverability across the swift currents and shipping lanes than for speed. The newest vessels on the Chalmette-Algiers route represent the state of the art for the lower Mississippi providing efficient rapid crossings, with quick loading and turnaround characteristics. The terminal boarding system is well designed for the vessels and the urban sites owing to the 1980's reconfiguration. Designs are innovative but minimal at rural sites where volumes are lower and budgets limited.

The design and operation of the New Orleans terminals are worth noting since they separate pedestrian and vehicular traffic by separate ramps. The system expedites the loading/unloading cycle and helps make the use of the ferry more competitive with bridges and other combined land-side options. The functional, open and attractive terminals have also been inviting to tourists, particularly on the Algiers-Canal Street route, which is immediately adjacent to the new Aquarium. On the downtown side the adaptive reuse of the original Canal Street terminal actually creates a partial barrier or detour along the recently completed Riverwalk, and helps with visitor awareness and orientation to the ferry. The circulation elements of the terminals are far more complex than they appear, due to the extreme variations in river height which occur seasonally on this stretch of the Mississippi. Even without extreme flooding, the river level often ranges as much as 25-30 feet. This requires long operable ramps connecting the terminal headhouses to the loading floats, which span more than 100 feet.

o Technological Innovations and Adaptations - Since the first "ferries" built by DeSoto, various innovations have been introduced including the steam engine, catamaran hulls, and grade separation of loading of passengers and vehicles.

## 2.45 Case Study Findings and Lessons for Other Systems

### Decision Factors - Water-Based vs. Land-Based Choices

It has been described how the Mississippi River ferries significantly reduce travel time and VMTs for river crossings between communities and work destinations where bridges are widely spaced. The roll-on/roll-off ferry services are typically the most cost effective way of providing cross river links in the local road networks, and save daily users an estimated 1 to 2 hours travel time and on average between 60 to 100 vehicle miles per round trip.

The critical initial turning points in the modern era ferry history occurred in the 1940's and 50's when the first bridges were built across the Mississippi in New Orleans which made many of the ferries redundant. This was accompanied by relocation of the major port related industry and jobs from the central east and west riverbanks to more remote locations down river. Many of the traditional ferry routes in the parishes were maintained as there were fewer and more widely spaced bridges, and the cross-river work opportunities remained. The state purchased the remaining routes in New Orleans and many of the Parish systems and continued their operations as highway links.

A second decision point involved the start-up of the first new ferry service in New Orleans in nearly a century, when a vehicle only service was instituted by the Crescent City Connection in response to new industrial development downriver and in anticipation of a new highway bridge crossing. The Chalmette-Algiers ferry was introduced in 1969 as a temporary substitute for the then-proposed Dixie Highway, and serves as a downtown commuter by-pass in two directions. The highway is permanently on hold because of environmental constraints, a typical condition along the bayou since NEPA legislation in 1970, and the ferry continues to be the highest volume route in the system.

Future decisions for the Mississippi ferries are related to several variable factors. Future environmental legislation may or may not allow new bridge and highway construction along the river edge, which in turn will lead to abandonment or continued ferry routes depending on location. Another determinant of the urban services will be future new uses along the New Orleans east and west banks, such as riverboat gaming, and their impacts on the existing transportation system.

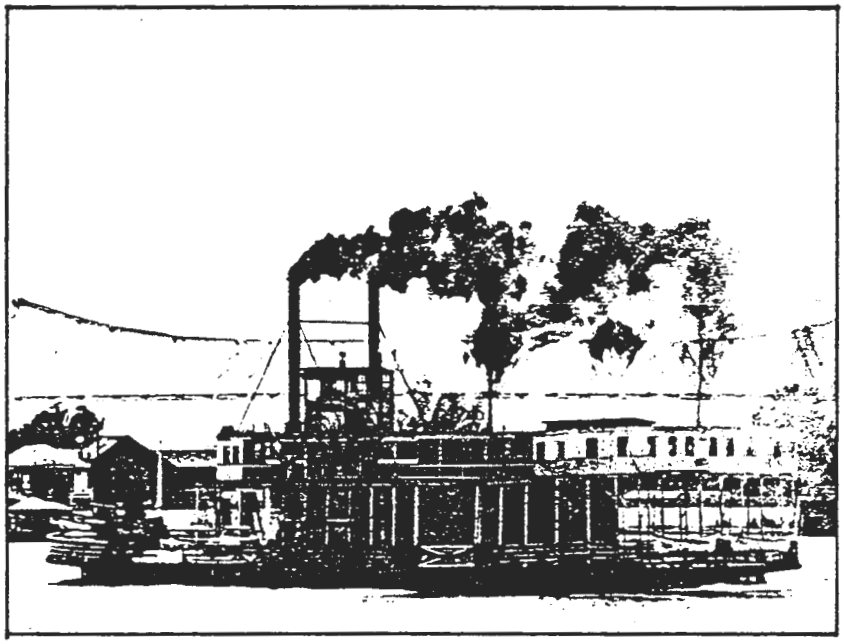
**System Potential to Meet Future Regional Transportation Needs**

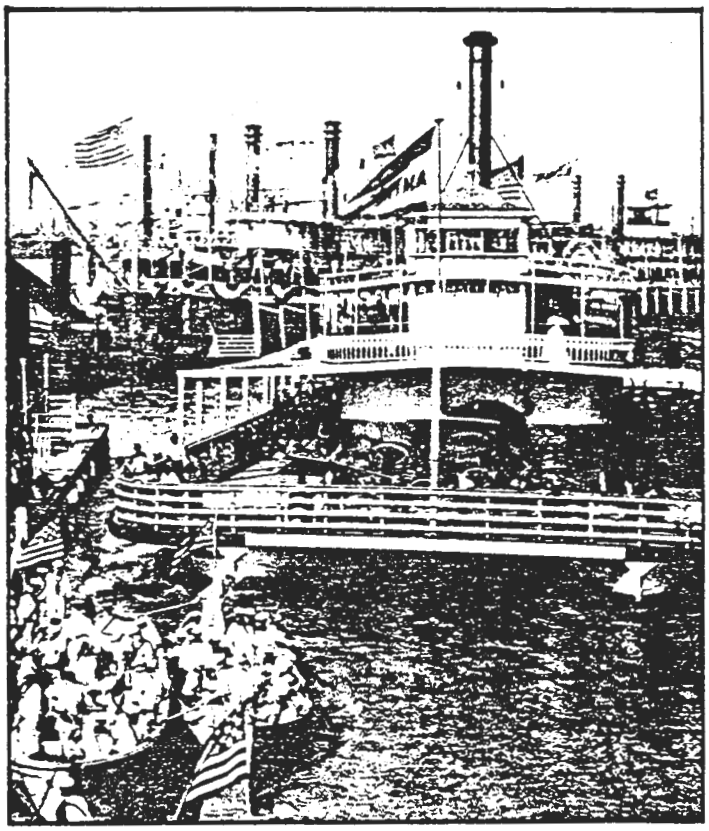
The network of cross-river routes up river, down river, and in New Orleans will continue to meet regional transportation needs as long as they provide shorter and more predictable trips for drivers, pedestrians and bicyclists than land and bridge alternatives. The more substantial capital improvements for the New Orleans routes are likely to provide longer term service than some of the rural routes, although LA-DOT is in the process of replacing some of their older terminals and vessels. The longevity of the side-loading ferries has been truly remarkable for both state and parish operated routes. Until such time as new bridges are built in the rural and urban areas, the ferries should continue to serve as time and energy saving alternatives for river crossings in the "in-between" zones.

System improvements might be considered in several areas. While the ferry system as it presently exists is a long term commitment by the LA-DOT with operating subsidies tied into bridge tolls, there may be broader market potential and uses for the existing ferry routes. As evidenced during the case study visit when major reconstruction and ramp reconfiguration on I-10 was causing massive city-wide traffic delays. In terms of uses for commuter trips and through traffic, the New Orleans routes might attract more riders if the efforts to improve the intermodal bus connection on both sides are improved. While it is unlikely that the transit dependence of the trolley/ferry era will ever be restored, it is likely that several particular bus routes might serve to connect residential areas to specific employment destinations more effectively than current auto trips, while also providing transit options for those finding auto commuting to expensive. Provision of public park and ride lots for car and van pooling and transit transfers in locations such as both Algiers terminals as well as Chalmette, Gretna and Jackson Avenue might attract new users in the future. Currently such use of the routes is inhibited by the absence of convenient and secure parking.

One conspicuous feature of all of the current ferry routes is that they are uniformly difficult to locate for anyone not familiar with the system. While this works for daily users, it discourages any new ridership either by residents or visitors. The terminals are not well signed from the approach roads or highways, and there are no maps or promotional literature. Most other urban and rural areas served by ferries are incorporating such services, both public and private into regional transportation information and visitor publications.

Figure 2.45: Historic Photos of New Orleans Ferries





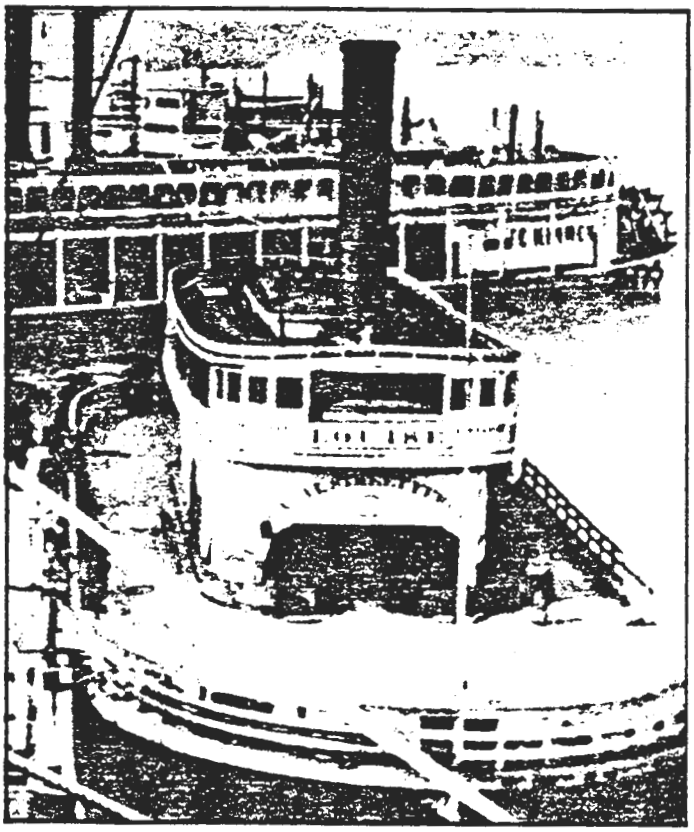
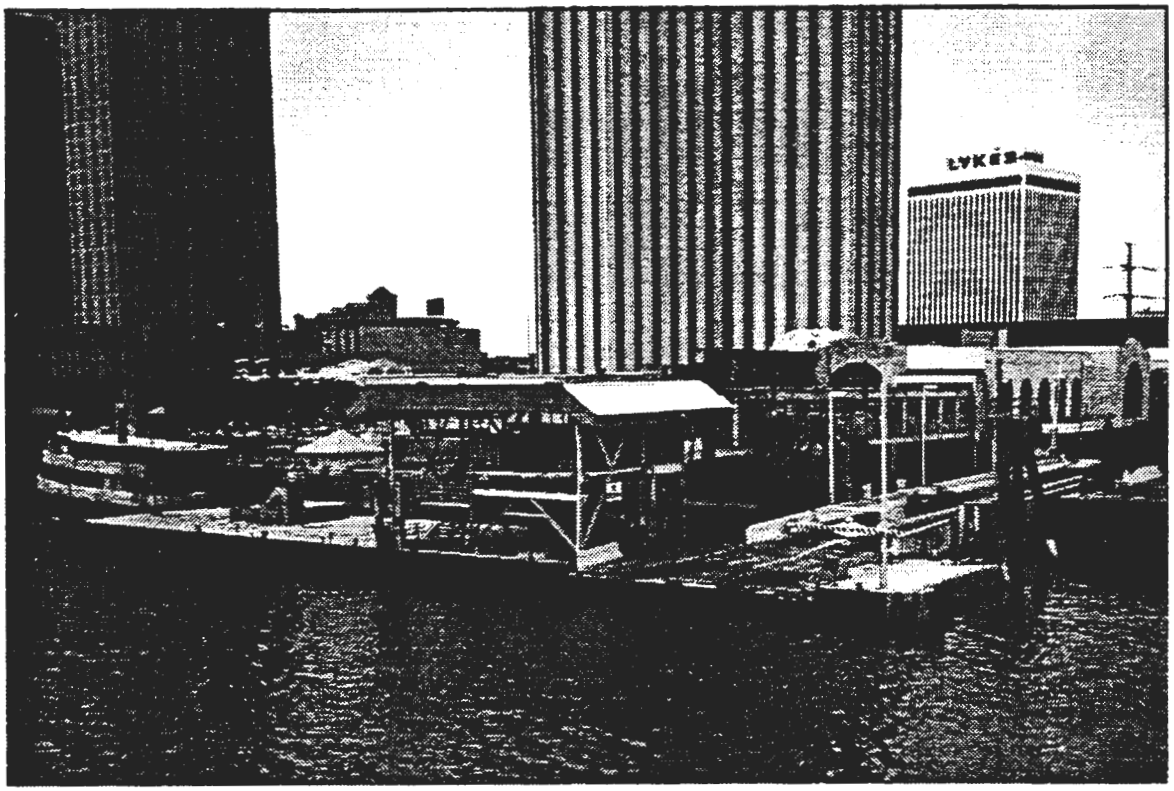
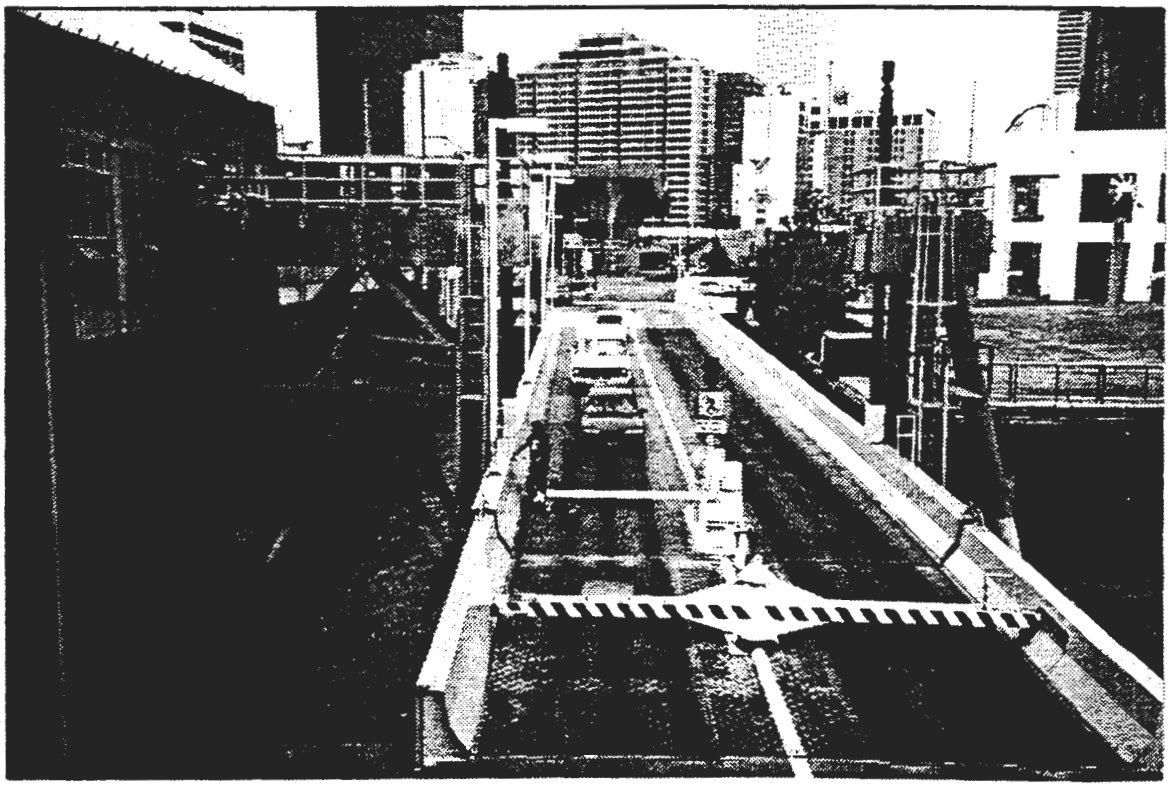


**Figure 2.46: Photos of Existing New Orleans Routes**





As the new riverfront casino and riverboats were being planned there were opportunities to consider parking locations on the west bank with shuttle bus and ferry connections to the preferred east bank sites, and possible reverse connections from the French Quarter to the west bank sites, which may yet warrant consideration. There has been in recent years an increased use of the Algiers-Canal Street route as a shuttle bus and park-and-ride site for visitors to and from the historic areas and entertainment district. Such uses are also currently promoted for special events such as Mardi Gras. An expansion of these efforts would benefit residents and visitors alike.

One benefit of the relatively short river connections is that added capacity for a given route can be easily achieved by adding vessels. At present there is little flexibility or interchangeability of teh vessel fleet because of teh idiosyncracies of each route's vessels and terminal design. If in teh future as vessels were replaced and terminals rebuilt any standardization, even between 2 or 3 routes would allow for much greater flexibility than presently exists.

**System Lessons for Other Cities**

The primary lesson of the combined vehicle and passenger ferries such as those on the Mississippi River is the need to maintain cross water highway connections in areas where daily travel volumes of passengers and vehicles are too low to warrant bridges or tunnels, and too important to do without such ferry services. If the rural ferries were abandoned, the impacts increased employment travel or civic connections across the rivers would substantially affect the viability of the communities and businesses along the river. The "ferry-bridge" operations are essential to maintaining the traditional and evolving land-uses along the river while also providing a level of through traffic for state highways.

**Operations:** The state operated rural and urban routes along with parish operated routes have replaced private ferry service because of the inherent unprofitability of such services owing to increasinglabor and capital expenses. Many private systems become financially unfeasible through a combination of declining ridership and aging vessel and terminal conditions. The skill levels required for navigation across heavily travelled shipping channels are substantial.

- o State and parish operations are essential for low volume frequent service type operations (7 days/week, 365 days/year).

- o Regional transportation offices such as the Crescent City Connection for New Orleans can help in tailoring service to specific needs.

- o Skilled operators are needed for many challenging navigation routes such as those across the Mississippi.

**Institutional Policy:** The system takeover and operation of private ferry routes by the Louisiana State DOT at the time of bridge construction in the 1950's set the precedent for the public marine highway system. Vessel and terminal investments in the '70's and '80's extended the commitment. Inclusion of the river ferries as part of the state highway and bridge transportation system seems consistent with similar commitments in such states as Maine, North Carolina, and Washington.

- o The State Operated Ferry System as part of the regional highway and bridge network

is consistent with ISTEA and FHWA policy.

o The Chalmette-Algiers route as a higher capacity, newer technology system represents a good model for a ferry-bridge substitute for a highway-bridge corridor.

o Linking bridge tolls to ferry operation as a cross-subsidy reflects similar recognition of the functional and financial linkages in the Golden Gate Ferry and the Washington State Ferry systems.

**Economic Development:** The Mississippi River ferries have succeeded in sustaining development and land-uses rather than generating new opportunities for the urban riverfront of New Orleans which has lost much of its central port and maritime activity, the Gretna and Algiers ferries are maintaining the opportunities for redevelopment of new industries such as the tourist related casino riverboats or other recycled maritime activities. The ferries also maintain cross river employment connections, particularly in the rural communities, and some new corridor development locations such as the Chalmette/Route 47 industrial area.

o The routes are typical of the majority of U.S. water transit systems. Both the urban New Orleans and rural parish routes are typical of many U.S. systems; 1) accommodate low to moderate volume of passenger and vehicle user demand, 2) serve as critical highway transportation links for week-day commutes and goods movement, 3) serve a secondary use as recreational on weekends and off-peak, 4) provide short time and distance ferry crossings in lieu of bridge or tunnel, and 5) routes are state subsidized, publicly operated, with regulated low fare levels.

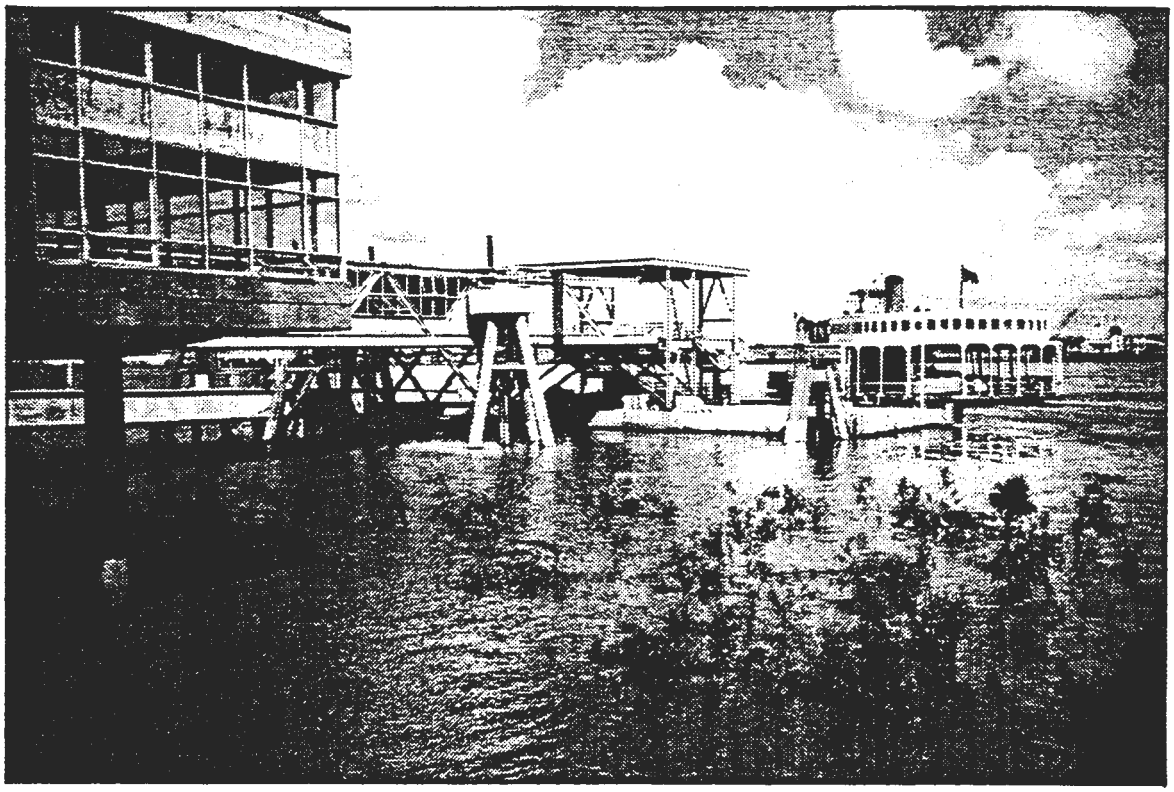
o Rural marine highways can sustain existing riverfront communities industrial sites and other land-uses dependent on river crossings.

o Urban ferry-bridges can support existing employment connections and maintain links to riverfront areas for future redevelopment.

o Multiple uses of daily ferry crossings for tourism and recreation such as the Algiers-Canal Street route can provide new visitor attractions at no new costs and potentially generate revenue sources.

o The fares are kept low ($1.00 for vehicles, $.25 for passengers) to encourage ridership but also to make the ferries accessible to all users.

**Figure 2.47: Photos of Existing New Orleans Routes**



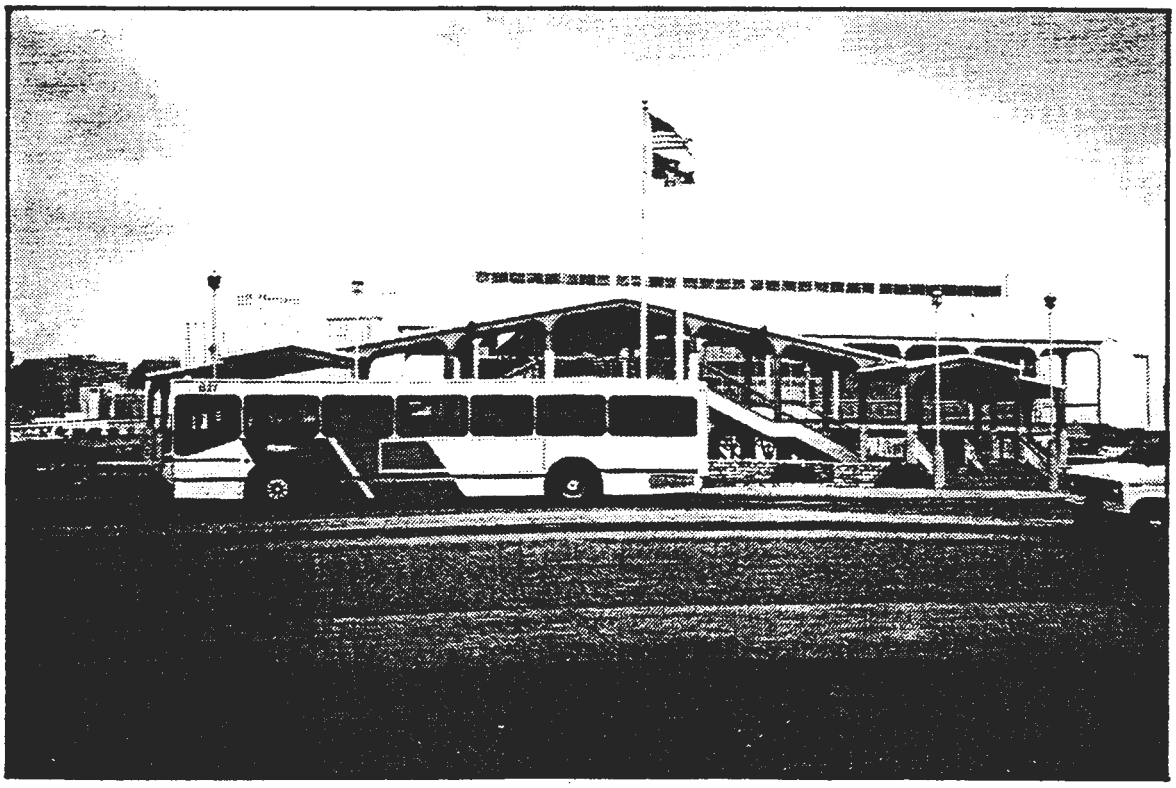
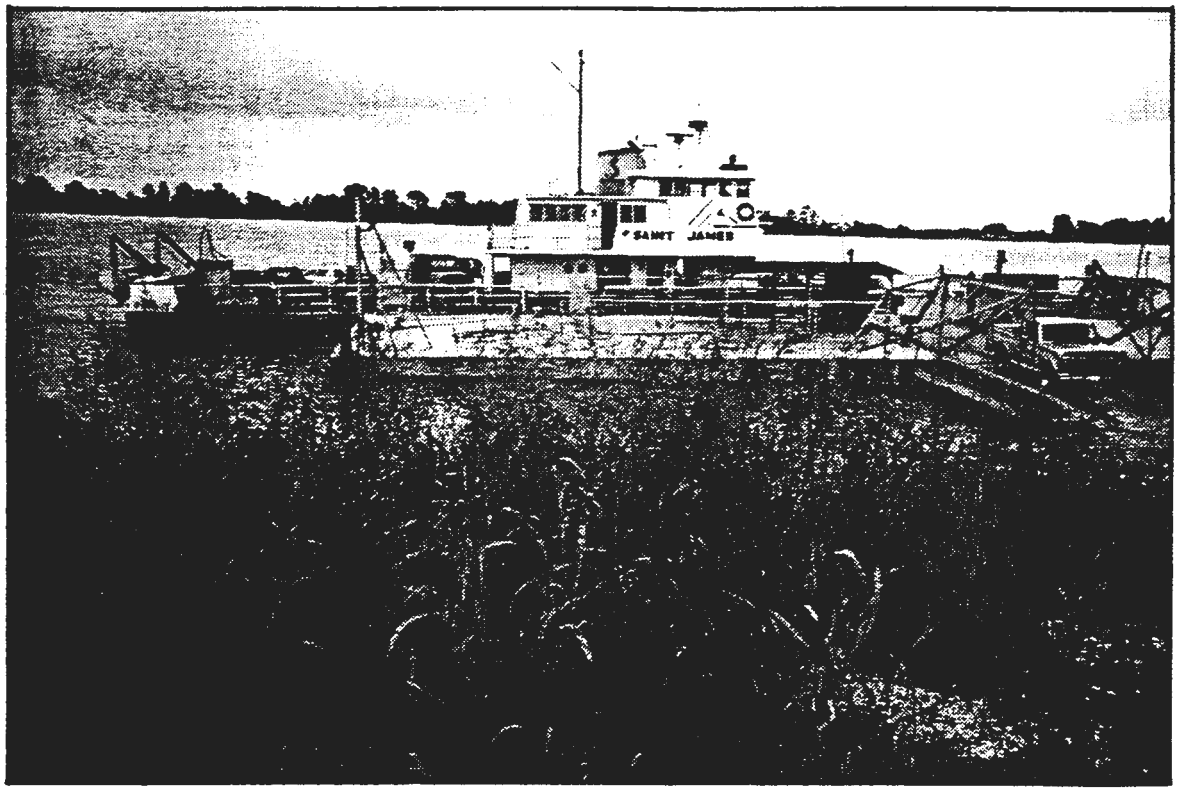
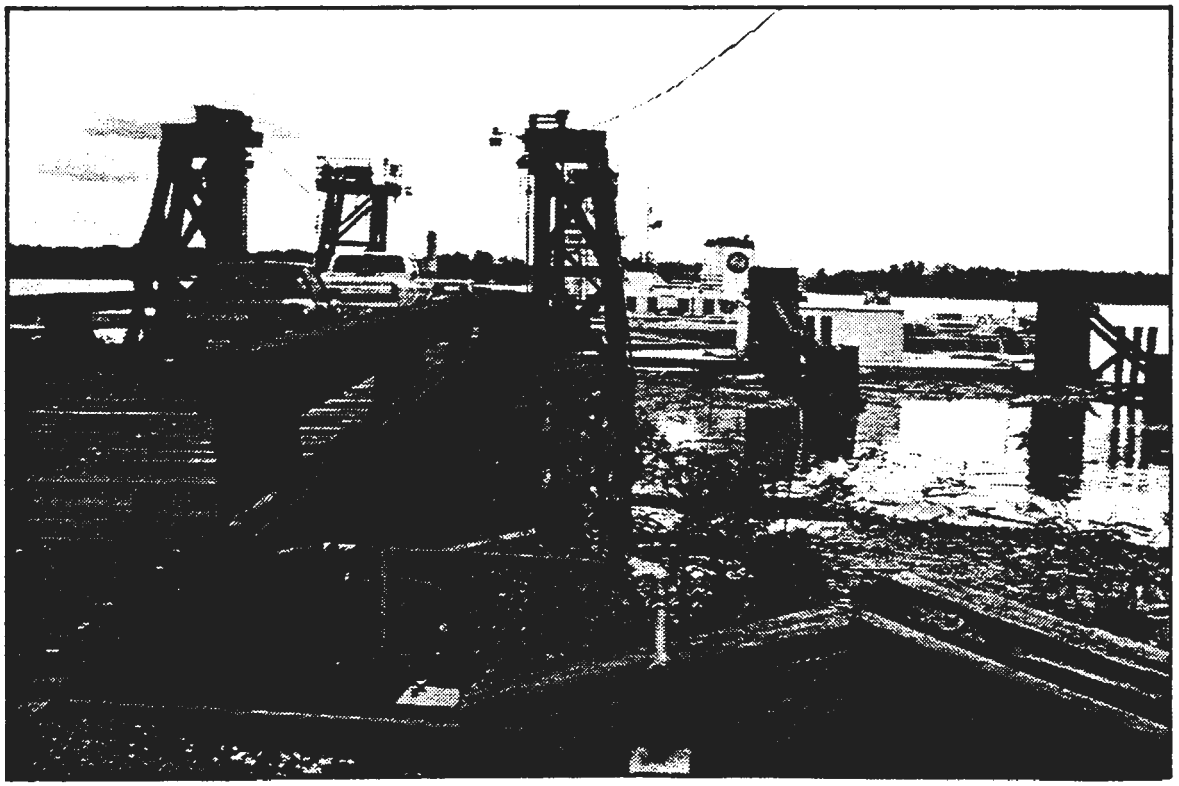


Figure 2.48: Photos of Existing Mississippi River Routes



## 2.5 NEW YORK CITY FERRY SYSTEMS

### 2.51 Network Description and Summary Findings:

**Existing Routes Analyzed (Figure 2.51):**

o Staten Island to Downtown/Whitehall
o Weehawken to Midtown/Pier79
o Hoboken to Downtown/Battery Park City
o Bayshore to Brooklyn to Downtown/Pier 11

**Proposed Routes (Figure 2.54):**

o Staten Island to Midtown West
o Brooklyn/Gowanus to Downtown
o Hunter's Point to Midtown/E.34th St. and Downtown
o Rockland/Tappan Zee to Yonkers to Midtown

The New York waterborne transportation network provides the most dramatic examples of traditional and new ferries as alternatives to multiple land-based routes. The New York ferry routes are particularly noteworthy in terms of volumes of passengers carried, planning and policy initiatives to encourage new ferry services, and private operator initiatives to fill gaps in the current regional transportation network. In the context of one of the world's most complex commuter travel networks, three generations of ferry service are considered in the case studies. The Staten Island to Manhattan ferry exemplifies the traditional high capacity, short distance route which continues to carry by far the largest daily volume of passengers in the U.S. The three new generation services including the Bayshore, Weehawken and Hoboken routes, all started after 1986, and provide medium volume, high speed, high-tech passenger transit, filling important niches in the transportation system. Building on the success of the recent water links, are four proposed new high speed passenger routes providing new ferry options to difficult land-side commuter routes, including a new Staten Island route, Hunters Point to midtown, Brooklyn to downtown and Tappan Zee to midtown. The existing routes combine to carry over 88,000 commuters daily and over 25 million per year.

The Staten Island Ferry has certainly been the foremost ferry route in New York City and in the U.S. for almost a century based on its long history as a public transit system and the high volume of riders it carries to and from Manhattan each day. However, more recently it is important to recognize the dramatic successes of contemporary cross-Hudson routes started during the 1980's, which were the first new high volume, privately operated passenger ferry services to be introduced in the region to serve the commuter market in over 50 years. These new routes are operated with market rate fares in response to an ever increasing demand for commuter alternatives to land based highway and rail travel.

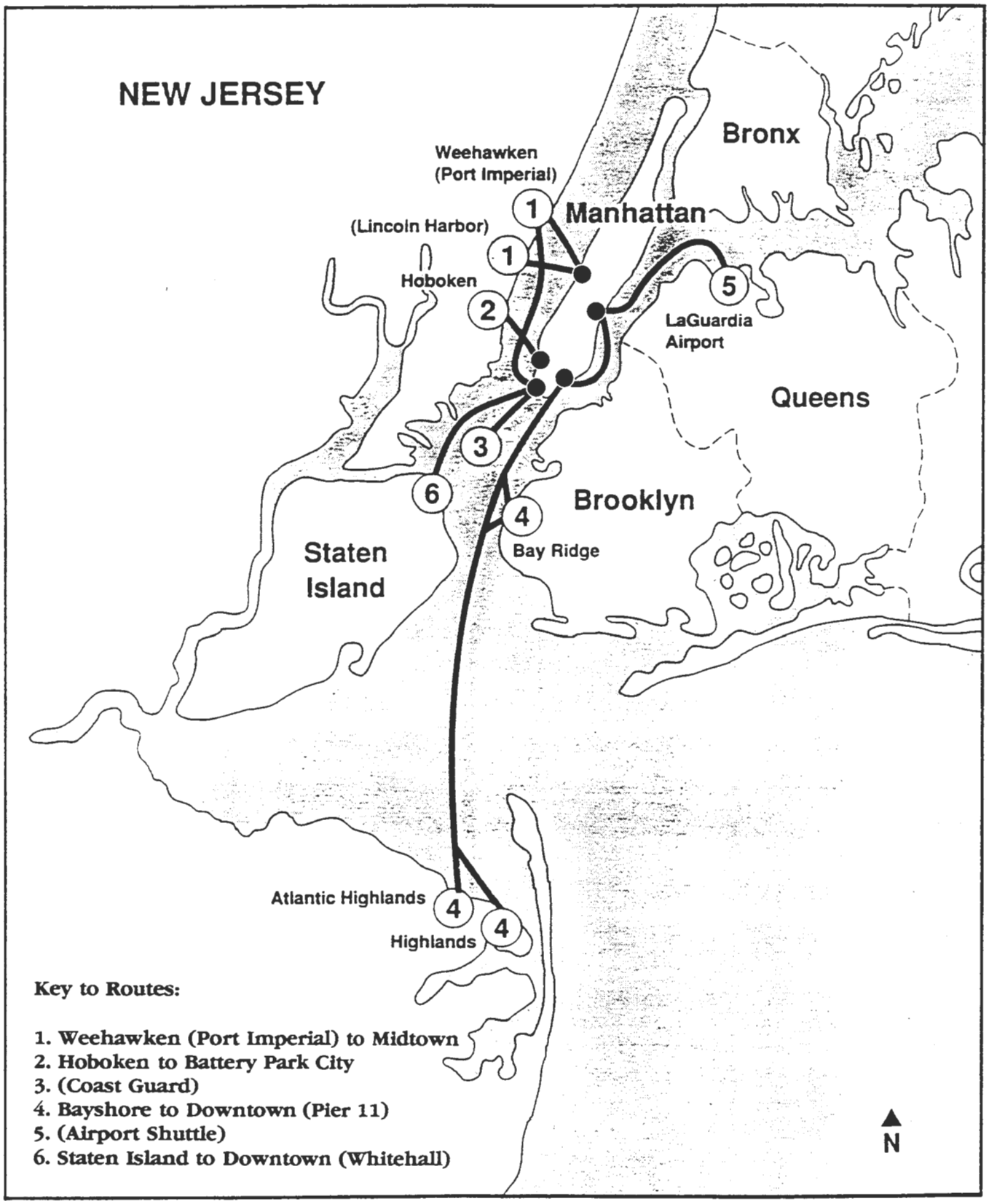
In the busiest commuter market in the country, where the majority of trips involve crossing at least one water body, several corridors of the combined radial highway/tunnel/bridge network and the commuter rail/subway system had become overloaded by the growth in commuter trips during the mid-1980's, and traffic projections for the 1990's looked even more staggering.

Another contributing factor was that increasing numbers of Manhattan bound employees were moving further out in the suburbs and commuting longer distances, up to 2 hours each way to work. Depending on their final destination in Manhattan commuters are likely to choose the most time-efficient route they can afford from a variety of alternatives available to them. The new ferries are offering different connecting links and more attractive choices. The Bayshore, Weehawken and Hoboken ferries all were started on the premise that commuters would pay a premium over other commuter transit fares, or would leave their cars for a faster, more reliable park-and-float system which would deliver them close to their Manhattan destinations. In many respects the new ferry routes were all inspired by the well established lead of the highest volume passenger ferry in the U.S., the Staten Island Ferry, which had been carrying commuters across the Hudson for nearly a century. By 1993, the Staten Island Ferry was carrying 70,000 passengers per weekday and 3 of the newer private services were collectively carrying close to 23,000 per day, for a total of nearly 26 million commuter trips per year.

The Staten Island ferry route had always provided a combined passenger and vehicle service between the two islands in New York Harbor in lieu of bridge or tunnel, until a recent fire in the Whitehall terminal. The service is now limited to passenger only. By contrast, the newer privately operated cross-Hudson routes are all ones which compete with parallel landside systems consisting of combined bridge highway and tunnel connections. While the city has one of the most heavily used landside transit networks in the world, there is presently no physical capability to expand capacity by adding new rail lines. Vehicular traffic has been constrained in Manhattan by limitations on roadway capacity and parking. As the use of the transportation infrastructure began to reach its capacity, particularly for midtown and lower Manhattan trips, the need to implement alternatives and encourage mode shifts by commuters created a market for the new routes. Through the combined planning efforts of the Port Authority of New York and New Jersey (Port Authority), the New York City Department of Transportation (NYCDOT), New Jersey Transit (NJT), and the initiatives of several private operators, a variety of new systems emerged. It is interesting to note a portion of the mission statement contained in the 1986 New York City Waterborne Policy Transportation, which recognized the need and helped encourage the growth of the new passenger ferries:

> "1. Growth and Decline of Ferries
>
> Formal ferry service was established as early as 1730 between New York and New Jersey. By the end of the 19th century, the area was served by fifty ferry routes, carrying tens of thousands of passengers daily. The end of the ferry era was signalled by the opening of the Brooklyn Bridge in 1883, and later by the proliferation of automobiles. When the Hoboken to Barclay Street ferry closed in 1967, only the Staten Island ferry remained as a regular commuter service used by the general public.
>
> 2. Interest in High-Speed Ferries
>
> In the mid-1970's, renewed interest in ferries focused on high-speed technology (air cushion vehicles, surface effect ships and hydrofoils). But the high cost of purchasing and operating high-speed ferries prevented private entrepreneurs from entering the ferry business at that time. The City, not wanting to incur additional heavy subsidies (Staten Island ferry operating subsidies cost the City and State $24.5 Million in FY'86), let prospective ferry operators know that they could expect no financial assistance. As result, few would-be ferry operators went beyond making initial inquiries.

Figure 2.51: Existing New York Ferry Network



3. The Current Situation

> Recently the ferry alternative has become more attractive because of increased traffic congestion on the bridges and tunnels leading into Manhattan. At the same time express bus fares have risen, making fast ferry rates more competitive. Ferry capital and operating costs have also been dropping sharply. In addition, there is heightened public awareness of the water and the enticing prospect of being able to cross it by boat."

At one time during the revival of ferries in the late 1980's, there were as many as a dozen different operators providing new services, and experimenting with various combinations of routes, vessels, fare structures, and amenities to try to attract dedicated riders. Through trial and error, several operations emerged as having the right combinations, and have expanded dramatically in the 1990's. The Port Imperial FerryBus from Weehawken to Midtown, was initiated late in 1986 by Arthur Imperatore, and has set the pace and established the model for efficient and reliable short distance crossings. The current Bayshore to Lower Manhattan service from Monmouth County NJ, was also initiated in 1986, and evolved from the original converted crew boats operated by Direct Lines to the current high speed catamaran service operated by TNT Hydrolines. The Hoboken to Battery Park City route, operated by a consortium of Hartz and ARCORP and sponsored by the Port Authority, was opened in October 1989 and has expanded rapidly as an unsubsidized waterborne alternative to the PATH rapid transit route which tunnels under the Hudson to the Downtown area.

It should be noted that as in other urban ferry systems, the private operators rely heavily on revenues from off-peak tourism and recreation excursion services, in addition to fares collected on the more price-sensitive commuter routes. However in recent years the private commuter routes in New York Harbor are more self-sustaining financially than in other ferry served cities due to the immense volume of commuters and demand for new cross-water options. The viability of private, non-subsidized services depends on the combined revenues to gain full utilization of the relatively expensive vessels and effective deployment of the crews. The opportunities around Manhattan tend to be somewhat seasonal because of the climate and full utilization of the vessels requires some ingenuity.

The new ferry routes have also played an important role in water front economic development. The original Port Imperial service was intended to provide a credible link from the still proposed missed-use development for the site. The private ferry to neighboring Lincoln Harbor provides an essential midtown Manhattan transit business link allowing for major corporate offices to be located on the New Jersey waterfront. New services are planned to start in 1994 connecting the redeveloped Colgate complex and Jersey City to Manhattan for similar purposes of linked office development. While earlier links to isolated residential areas such as Port Liberte were not as successful the mixed use office/hotel/residential waterfront projects provide enough density to make the ferry service both viable and necessary transit option. ARCORP operates the two cross-Hudson reverse travel links with their commuter fleet, which adds to the system revenues and efficiency.

The experiences of the private ferry operations in finding the right combinations to attract surprising numbers of passengers in recent years has provided the impetus and groundwork for planning a series of new routes. An ambitious program of potential new routes was identified through the High Speed Ferry Task Force, an intergovernmental, interstate group convened by NYCDOT, and the New York State Urban Development Corporation, with assistance from the

Port Authority. This process was a direct outgrowth of the original NYC ferry policy of 1986. In 1992, a request was sent out to the private sector by UDC and NYCDOT for proposals for 8 to 10 new unsubsidized commuter ferry routes,along with vessel construction and terminal development. In September of 1993, three operators were designated for 4 new high speed routes; 1) Yonkers to Midtown, 2) Staten Island to Midtown, 3) Brooklyn/Gowanus to Downtown and 4) Hunter's Point/Queens to Midtown. In addition Monmouth County NJ has plans to provide a new terminal facility to allow for expanding Bayshore commuter ferry services to Manhattan.

The dramatic growth of privately operated passenger commuter services has demonstrated in the New York commuter market how effectively ferries can be used by commuters as alternatives to the overcrowded highway and transit routes. This has been achieved by providing more reliable, and more comfortable, but not necessarily faster, modes of commuter transportation. The Weehawken system provides an alternative to the Lincoln Tunnel crossing to Midtown, the Hoboken service provides relief for the overcrowded PATH connector to Downtown, and the Bayshore service provides a faster and more reliable trip from Monmouth County to Downtown. It was intended that the proposed new routes provide similar relief from other landside corridors. Such would be the case with the Hunter's Point route as a new connection from Long Island and Queens, the Brooklyn route as mitigation during the 10 year reconstruction period for the Gowanus Expressway, and the new Staten Island route as a bypass to Midtown which will take less trip time than the current slow speed ferry link to Whitehall.

In these respects the new ferry systems are being promoted as a cost effective means of expanding commuter "throughput" or capacity without building new bridges, tunnels, or transit lines, and as such are on the vanguard of ISTEA planning for more effective intermodal use of the infrastructure. When considering that the 50 ferries operating at the turn of the century carried as many as 200 million passengers per year, there would appear to be considerable additional growth potential for existing and new routes along the same relatively unencumbered waterways surrounding Manhattan.

**Summary of Key Issues and Findings:**

A summary of key issues and important decision factors observed from the analysis of the New York systems includes the following;

**Historic Precedents and Decision Factors:**

o Staten Island Ferry Serves as a Model for High Capacity Public Passenger Ferry Transit Service: Serving the one cross harbor corridor in New York City without direct bridge or rail connections, the service has evolved from the turn of the century as originally passenger, then vehicle and passenger and more recently as passenger only. It currently carries by far the largest daily volume of commuters as any single route in the U.S..

o The Last of the Private Passenger Ferries Stopped Operation When the Landside Network was Most Efficient (1967): At the peak of combined vehicle highway and rail transit capacity in the 1960's when most bridges and tunnels were complete, the traditional cross-Hudson private ferries were no longer competitive with the transit and highway commuter routes.

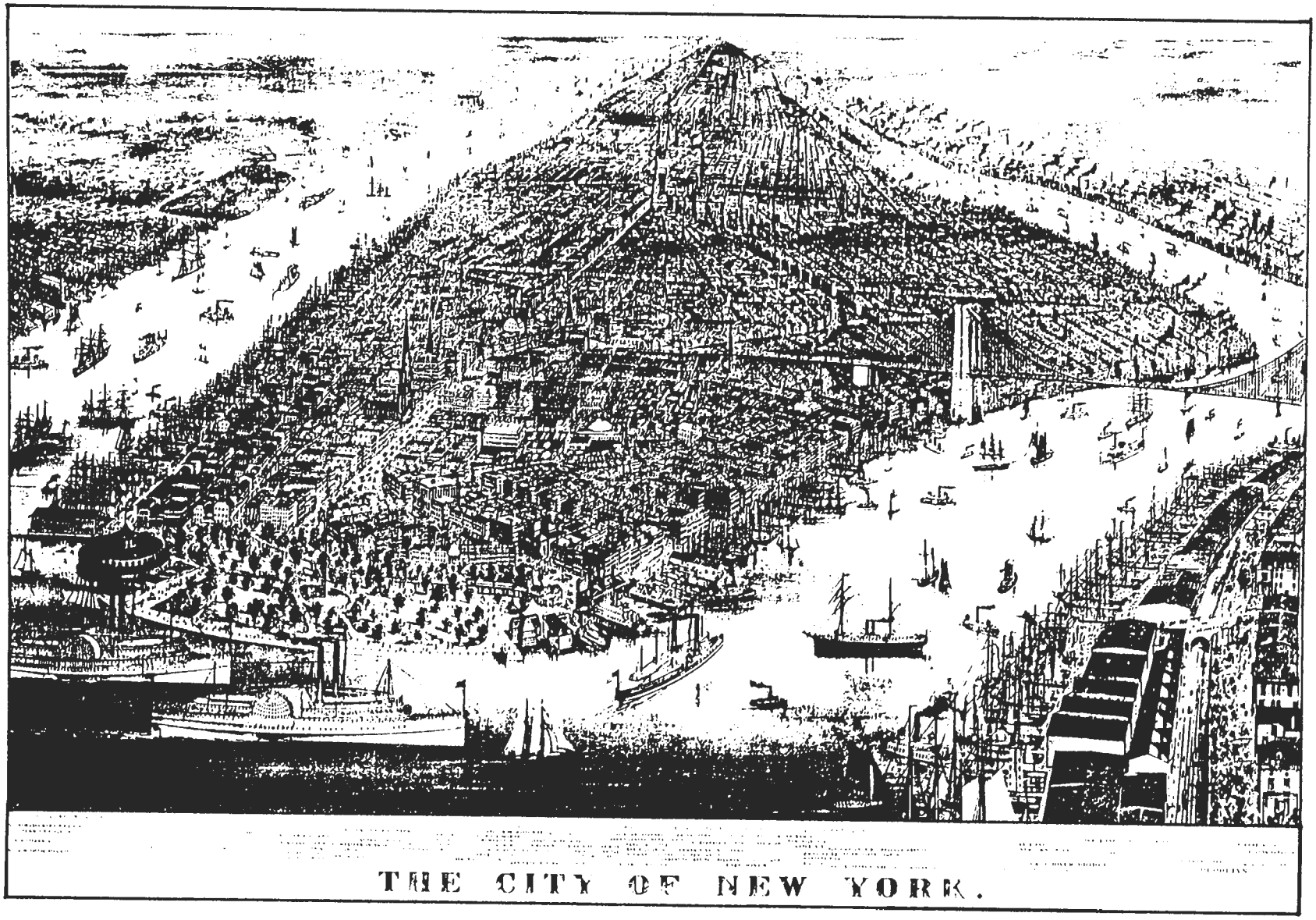



**Figure 2.52: Historic View of New York City**

**Existing System Findings:**

o The New York City Waterborne Transportation Policy of 1986 Provided a Framework for the Modern High Capacity, High Speed Services: The Policy established priorities for publicly owned and operated waterfront terminal locations and for accommodation of new ferries.

o Private Passenger Ferry Services Returned in 1986 when the Landside Network became Overcrowded: The newer generation of New York City ferries provides innovative examples of high volume, privately operated unsubsidized systems on cross-Hudson routes.

o The High Volume Public Ferry Route Continues to Fill Key Transit Functions : The Staten Island Ferry continues to fill multiple roles primarily as a passenger commuter route, as well as being a major tourist and recreational attraction.

o Public Policy to Facilitate Marketable Private Services: Based on the 1986 public policy position on ferry services, the City of New York has provided and managed dock space to serve as a catalyst for new services, recognizing that in the current market some routes may be capable of being self-sustaining without transit subsidies. Other metropolitan municipalities are pursuing similar programs to encourage new or expanded market-driven ferry routes such as Monmouth County and the proposed Bayshore terminal plans.

o Provision of Landside Transit Links and Pedestrian Connections are Critical to Success of Commuter Ferry Links: Such connections are needed as the covered pedestrian walkway from the floating terminal at Battery Park City to the World Financial Center, or the private shuttle bus system connecting the Port Imperial and Lincoln Harbor services from Pier 78 to Midtown and Downtown destinations. NJ-DOT has coordinated transit connections to Hoboken and Port Imperial to facilitate intermodal links.

o Interstate Ferry Routes Must Overcome Distinct Inter-Jurisdictional Issues: Several of the private routes have been able to start quickly and respond to market demand without becoming delayed by complex interstate and interagency agreements. Municipalities and/or state agencies have avoided jurisdictional conflicts by concentrating on terminal and landside assistance while allowing the private routes to bridge state lines. The Port Authority has been particularly helpful as an interstate agency by acting when necessary as a go between with state agencies.

o Innovative Fare Options for Different User Needs: The multiple fare options offered by private operators reflect differing commuter use patterns. These include single trip, multiple trip books and monthly passes.

o Innovative Public Sector Planning Processes have Served as Catalysts for New Private Ferry Services: The Hoboken Trans-Hudson study (1990) by the Port Authority and the Bayshore Ferry Study (1991 by Monmouth County, evaluated cross Hudson commuter trends and identified new or expanded markets and services. Both were intended to provide incremental relief of other congested auto and transit commuter routes, with public investment in terminals and private sector operations.

**Proposed New Routes and Services:**

o The High Speed New York Ferry Plan as an Innovative Multi-Jurisdictional Public-Private

Initiative: The New Ferry Services proposal which was prepared by the New York State Urban Development Corporation (UDC) and the New York City DOT in association with the interstate High Speed Ferry Task Force provided a well documented market analysis. The plan was successfully used to solicit proposals for new services, and is moving towards implementation with three designated operators. The planning and solicitation process was in part modelled on the highly successful Port Authority initiative for the Hoboken service.

o Additional New Privately Operated Commuter Routes are Responsive to Market Demand: The Port Imperial Ferry Bus renamed the NY Waterway in 1994, plans to open service from Newport Center in Jersey City to Battery Park City for commuters in May 1994, based on the successes of their other recent services.

o Future Proposed Services May Require Varying Levels of Subsidy Depending on the Routes Characteristics: Because of factors such as varying route distances, terminal location conditions, landside transit connections, vessel capital funding, and start-up period costs, varying amounts of public financial support may eventually be required. The public agencies appear to favor one-time capital expenditures and to avoid ongoing annual operating subsidies, which can be taxing in the long run.

o Future Waterfront Development Projects May Depend Heavily on Water Transit Links - Based on recent experience such as the success of Lincoln Harbor and its direct midtown and downtown ferry links, similar models may be applicable to future redevelopment sites on the Hudson and East River. The Port Imperial ferry was started in part to precede development and demonstrate the convenience of the site as a residential alternative to Manhattan,

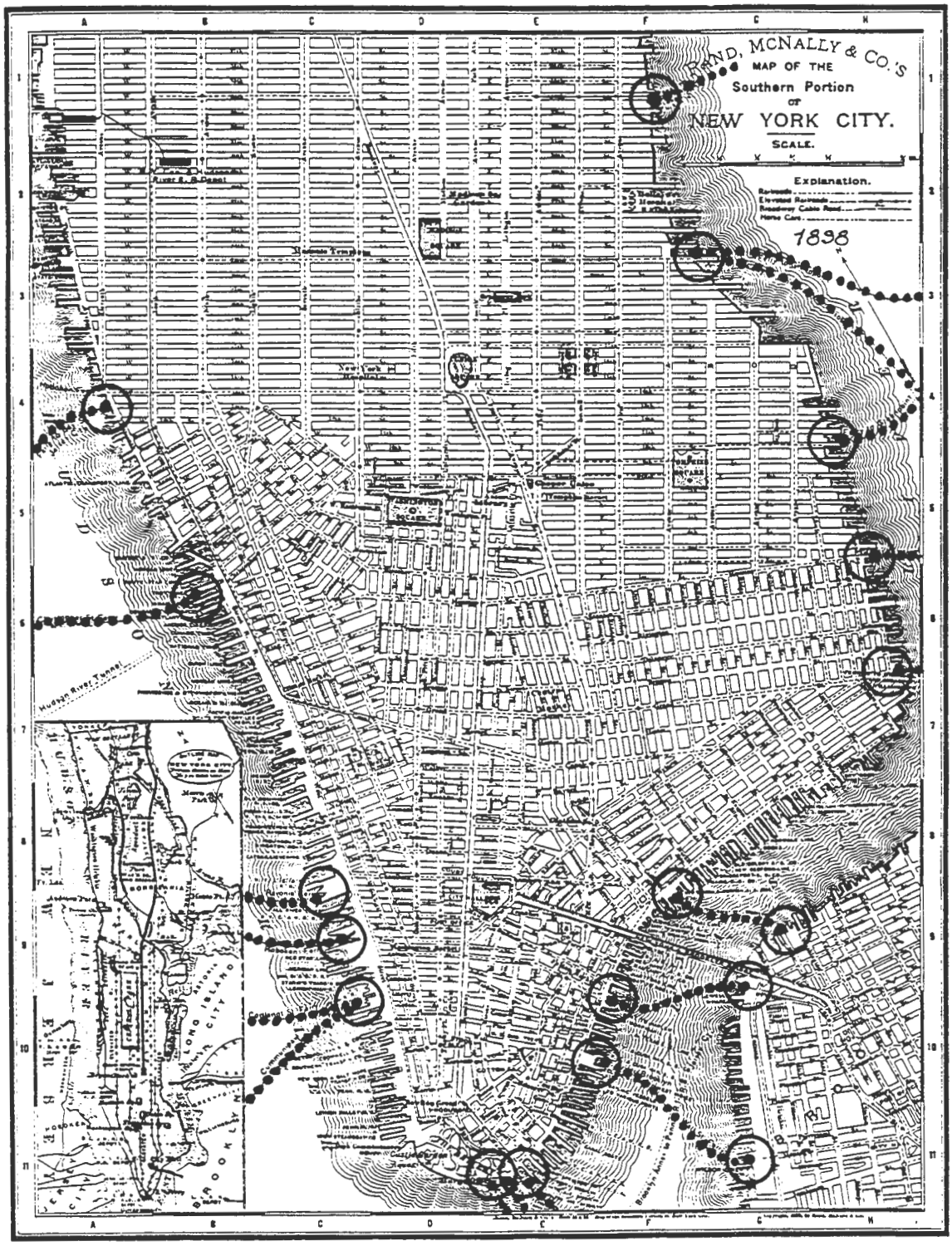
## 2.52 Network History and Context:

For centuries since the earliest Dutch settlements along the Hudson, New York City relied heavily on waterborne transportation for all travel to and from the Island of Manhattan. At the peak of water travel in 1904, there were as many as 150 ferries crossing the Hudson, East River, and New York Harbor. The wide, yet well protected, waterways provided an almost unlimited capacity for a variety of services ranging from rail link ferries to passenger shuttles. As many as 200 million passengers per year were estimated to have crossed at that time. The map of New York in 1898 in figure 2.53 shows the proliferation of ferry routes, including the Staten Island to Whitehall route as well as several others which have been revived recently. The Currier and Ives aerial view in Figure 2.52 shows New York Harbor at peak activity in 1887 with a large number and variety of ferry routes. The disproportionate size of the sidewheeler passenger ferries and the new Brooklyn Bridge are perhaps symbolic of the importance of cross-water transportation at the time in the stylized view.

The long and varied history of passenger water transportation is described by Arthur Adams, in his paper, A Short History of Ferries on the Lower Hudson River prepared for the dedication of a new Hoboken ferry of the Port Imperial fleet in February of 1993. Mr. Adams writes:

> "From the days of earliest European settlement, ferryboats have played a major role on the lower Hudson River and in New York Harbor. The first informal services were provided by Native Americans in their dugout canoes, incidental to their hunting and trading activities. Later settlers acquired small sailing craft of their own, usually with a

**Figure 2.53: Historic Plan of New York City with Ferry Routes - 1898**



single sail as well as oars, known as periaugers---essentially small scows for movement of passengers, goods, and most importantly, cattle. Initially these accommodated travelers on an informal basis. The first recorded regular ferry franchise and service dates from 1642 between lower Manhattan and Brooklyn, with flat bottomed rowboats. In 1694 the Corporation of the City of New York purchased property in Brooklyn to construct a pier, ferry steps, and cattle pens. They later built a substantial brick and stone ferry house. The first route operated from Peck's Slip in Manhattan. Other terminals and routes were added in rapid succession."

The institutional framework of the City owning the waterfront, controlling the docks, and providing ferry landings, dates back to the 17th century and has carried forward to the present day. Mr. Adams continues to describe the initiation of Staten Island and New Jersey services:

"The first charter for a Staten Island Ferry dates from 1712. On the Hudson River the first franchise was granted in 1661 to William Jansen to operate a Periauger ferry from Manhattan to Communipaw (near the present Liberty State Park). In 1764 a franchise was granted to Cornelius Van Voorst to operate a sail and row ferry from Paulus Hook to Mesiers's Dock -- Exchange Place, Jersey City to Cortlandt Street, Manhattan. The first Hoboken Ferry franchise was granted to Hermanus Talman in 1774 and was called Horsimus Ferry. The first informal ferries to Weehawken were operated by Samuel Bayard in 1700, and in 1742 a formal franchise was granted to Francis Kouwenhoven. Routes were added rapidly thereafter and traffic grew with development of the hinterland. In 1811, John Stevens introduced the first steam ferryboat, the Juliana, between Hoboken and Vesey Street. In 1814 Robert Fulton's Paulus Hook Ferry Company introduced the steam ferryboats Jersey and York. During the early years ferryboats powered by horses on treadmills were common for a while, but were quickly superseded by the new steamboats. With growth of traffic they grew in size into a typical configuration of about 200 ft. length with two lanes for wheeled vehicles and ample passenger accommodations for foot travelers, and routes multiplied greatly."

Mr. Adams also describes the rise and fall of the great railroad ferries and the early land-side connections.

"New turnpikes were built to the ferry landings and communities grew up around the docks. The coming of the railroad accelerated development and the various railroad companies built large palatial terminals at their railheads on the waterfront in New Jersey and built fleets of luxurious steam ferryboats for the ever-growing tides of trade. The Central Railroad of New Jersey, the Pennsylvania Railroad, The Erie Railroad, the Delaware, Lackawanna & Western Railroad, and the West Shore Division of the New York Central Railroad operated the major services at Communipaw, Exchange Place, Pavonia Avenue, Hoboken, and Weehawken, respectively. The traffic volume was tremendous. In 1938 the New York Central alone carried 12.4 million passengers from Weehawken. Various other independent operators and streetcar companies also offered supplementary services on innumerable routes, including those emanating from Staten Island, Englewood and Manhattan.... The author has clearly documented at least 47 routes, but there may well have been more."

The multitude of ferry routes and streetcar connections at the turn of the century are illustrated in Figure 2.53. The shift in transportation modes began early in the 20th century with the

construction of rail and subway tunnels, and later vehicular tunnels and bridges. The demise of ferries is traced by Mr. Adams to these new, more attractive land-based alternatives.

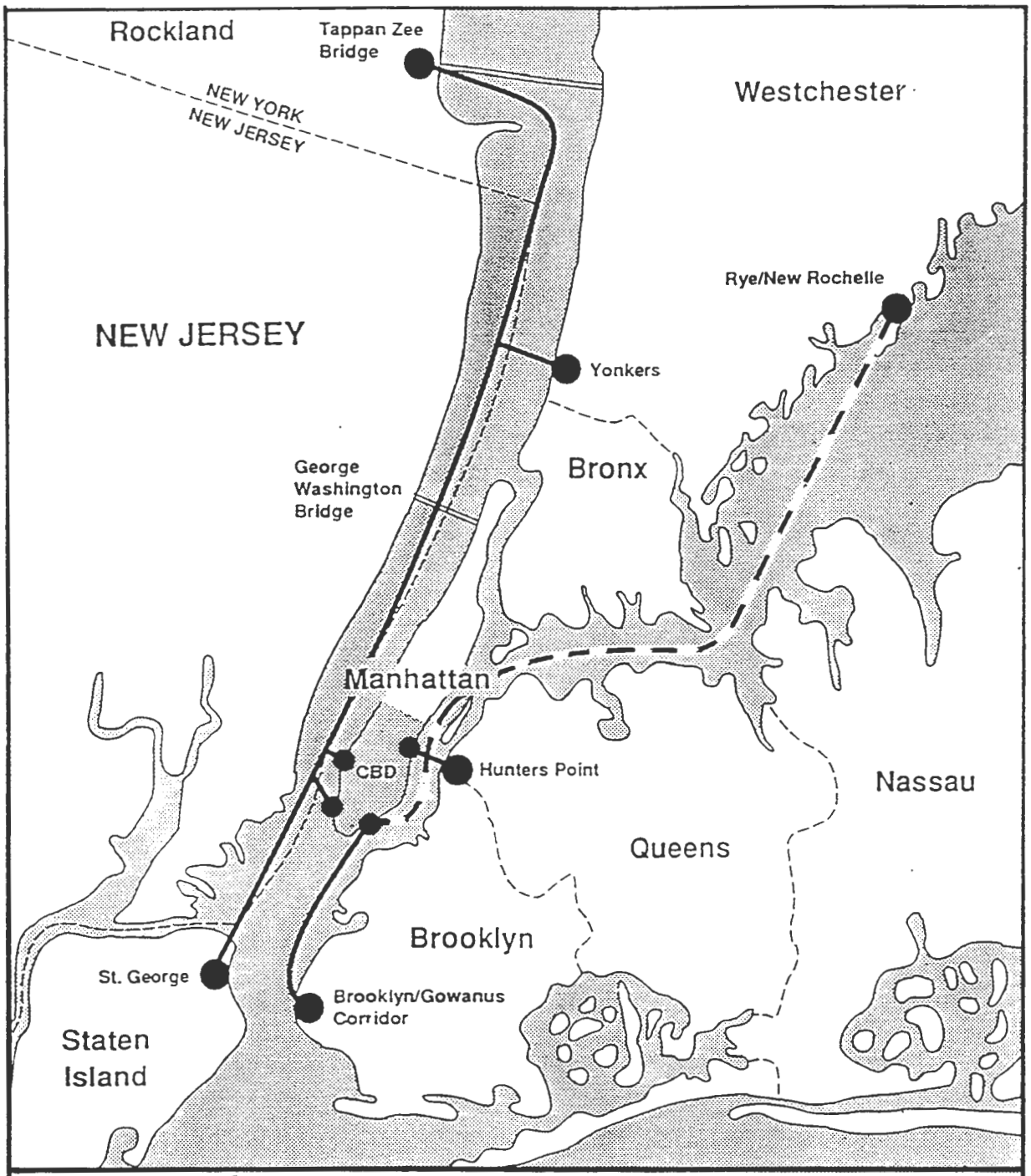
> "The decline began in 1908 when the Hudson & Manhattan Railroad opened its tunnel subway line between Hoboken and Morton Street, Manhattan–now the PATH 33rd Street Line. In 1909, the H&M opened its tunnel to lower Manhattan (now WTC), from Hoboken and jersey City, and the Pennsylvania Railroad completed its tunnel to the new Pennsylvania Station in Manhattan for their regular commuter and long distance trains. However, substantial railroad-connected traffic remained on the boats, other than the Pennsylvania operated ones. The bulk of travelers were commuters. Vehicular traffic began to be diverted with completion of the Holland Tunnel in 1927, the George Washington Bridge in 1931, and the Lincoln Tunnel in 1937 and additional Lincoln Tunnel tubes in 1945 and 1957. Vehicle traffic to the ferries diminished to a trickle. The railroads began discontinuing routes as early as 1941 and gradually services were cut back. The first really major line to be abandoned was the New York Central's West Shore ferry to Weehawken in 1959. Next, that same year the Erie Railroad gave up its Pavonia Ferry to Chambers Street, and combined their operations with the Hoboken Ferry of the Lackawanna. They merged as the Erie-Lackawanna Railway, and operated only from Hoboken to Barclay Street."

> "On April 25,1967 the Jersey Central Railroad, after diverting their commuter trains to Penn Station Newark, abandoned 306 years of service on the Communipaw Ferry to Liberty Street. The last of the old lines to go was the Hoboken to Barclay Street route of the Erie-Lackawanna Railway on November 22, 1967. A bugler played taps on board the Elmira. At 5:45 PM the 62 year old steamboat sailed out of Barclay Street for the last time, ending 156 years of continuous steam ferry operation. There were no more ferryboats on the lower Hudson."

As noted in the history, the completion of train and transit tunnels occurred earlier in the 1900's, while the tunnels, bridges, and high speed highways were completed in the 1950's and 1960's. At about same time the Interstate highway system was completed with connections to the local street network, connecting the various boroughs, New Jersey, Connecticutt and outlying suburbs to Manhattan. As in many other older urban settings, the completion of the Interstate links in the regional transportation networks marked the point when auto and vehicular accessibility were at their peak in terms of routes speed and capacity, and reliance on public transit on all modes declined to the lowest levels of the century. For various environmental and community reasons, the last major highway planned for the city during the 1970's, the West Side Highway, never got off the ground. At about this time, the surface roadway network joined the subgrade railroad transit infrastructure as being effectively complete in the New York urban core. Development and employment density continued to increase in midtown and downtown areas without significant alteration or expansion of the access system, and the commuting patterns began to shift back to the transit system from auto trips from the late 1960's onward. The municipal efforts to adapt transportation services to growing commuter demands were begun almost as soon as the highways were complete. Mr. Adams concludes with the conditions which led to the revival of cross-Hudson ferries some 20 years after the last of the rail ferries was discontinued.

> "However, cross-Hudson traffic kept growing. Downtown Manhattan saw a tremendous resurgence of commercial office development and the New Jersey waterfront was becoming known as the Gold Coast as old abandoned rail yards were replaced by

**Figure 2.54: Proposed New High Speed Passenger Ferry Routes**




**Key to Proposed Routes:**

1. **Staten Island to Mid-town**
2. **Bayshore to Bay Ridge (Brooklyn-Gowanus) to Downtown**
3. **Hunters Point (Queens) to Mid-town**
4. **Tappan Zee (Rockland County) to Yonkers to Mid-town**
5. **Rye/New Rochelle to Midtown (Future Route)**

sparkling new offices, apartments, and stores. The existing vehicular crossings and PATH subways were reaching capacity. However, new tunnels and bridges would be prohibitively expensive. In April 1981 a Proposal For A Land and Water Linear Transportation System was presented to the Hudson River Waterfront Study, Planning and Development Commission, which incorporated suggestions for restoring limited ferry services. Subsequently this concept became favored by ex-Governor Kean of New Jersey and by New Jersey Transit and the Port Authority.

The Staten Island Ferry remained active as a multi-modal link from the island and points south and east in New Jersey, to lower Manhattan for several reasons. All other highway routes were circuitous and time consuming, and the highway link use of the vehicle and passenger ferry actively served Manhattan for business and commuter travel until parking became scarce and expensive. More recently the vehicle transport service was suspended indefinitely after the Whitehall terminal fire of 1991. The continuing intensive use of the ferry by passengers as both a park-and-ride, and transit link for commuting has played an important role in the transportation system, and also provides a well known example for other routes. Because of the low fares, the system has also cost the city heavily in subsidies, which run in excess of 80% of operating costs.

Much of the "modern" ferry system evolved as an outgrowth of two factors. As the metropolitan area continued to grow, the 1970's and 1980,s saw rapidly increasing residential costs in the city and a corresponding expansion of bedroom communities in New Jersey, in New York counties north of the city and on Long Island. This demand for new housing led to major interest in redevelopment of former waterfront industrial sites along the Jersey shore of the Hudson from the George Washington Bridge and Palisades south, as well as rekindled interest in existing residential and office locations in cities such as Hoboken and Jersey City. The large influx of commuting residents to New Jersey required rapid reassessment of the existing transit options including PATH and commuter rail. For developers interested in the potential of waterfront properties along the flats of the river's edge, water shuttles appeared to be an excellent way of providing more direct transit links to midtown and lower Manhattan work destinations as well as a useful marketing device.

Residential developments such as Port Liberte, south of Jersey City, experimented with water transportation links which operated with developer subsidy until it was realized that there were not enough regular patrons to make the system self sufficient. Other sites such as Port Imperial initiated ferry service prior to site development as a marketing device and found that, when opened to the public, there was a sustained demand for the park and ride commuting alternative from Weehawken and the surrounding residential communities. The success of the Port Imperial Ferry Bus seemed largely linked to its location immediately along the path of the Lincoln Tunnel and a large pool of potential users. The failure of the Port Liberte and other private limited use services might be attributed to their limited ridership potential, their somewhat isolated locations, and policies not to be open to public use by other commuters.

The recent revival of the New York City ferry system as a supplementary or optional system for transit commuters must also be considered in relationship to the revival and expansion of other modes of public rapid transit. The New Jersey Transit system and its connections with New York City has undergone substantial expansion in the state's efforts to keep pace with growing demand. Even as the commuter rail system was being revived to capture broader sections of northern New Jersey, a secondary privately operated express bus system was also making inroads during the 80's. As more commuters accepted the practical necessity and personal cost

effectiveness of using public transportation. increasing numbers of bus lines began to fill the highways and bridges, with HOV accommodations where possible. The efforts of the two states and New York City transportation departments were initially focused on these higher capacity modes, and the emerging private ferries were left to fend for themselves. Several important public policy steps were taken however to accommodate the new systems and/or encourage expansion without investing either capital or operating funds.

## 2.53 Route Description and Comparative Analysis:

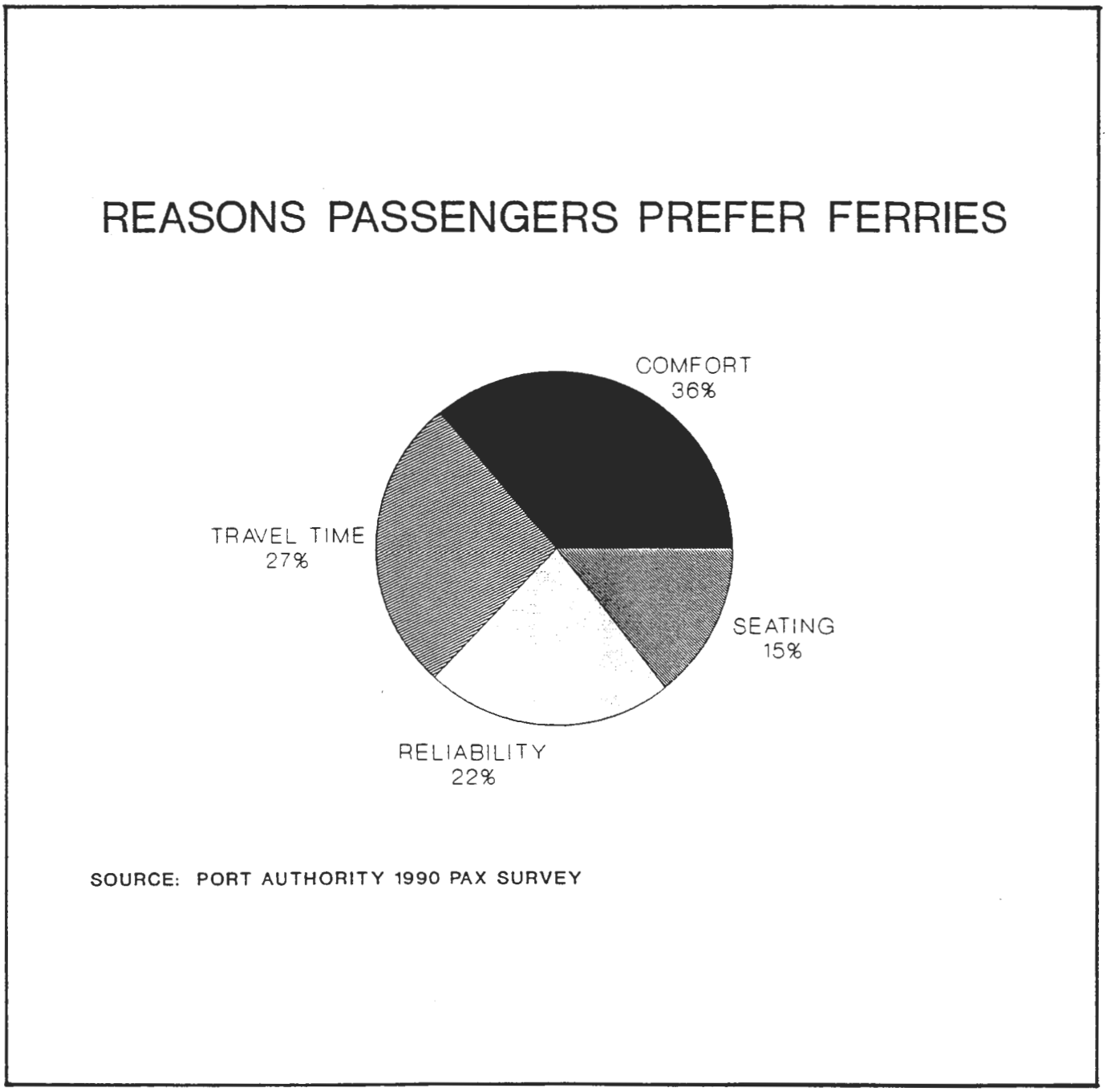
**Route Description:**

The New York ferry network consists of 4 systems providing commuter passenger ferry service. The Staten Island Ferry is the only publicly operated and operation subsidized service providing a complementary daily service with circuitous land-based highway and transit alternatives. The Bayshore to Manhattan service provides weekday high speed commuter service to lower Manhattan via Brooklyn which can be regarded as complementary to rail transit, bus and highway routes. The Port Imperial service from Weehawken provides a short park and ride connection to Mid-town at 38th Street, and downtown, which might be considered complementary or optional depending on individual commuting patterns. The Hoboken to World Financial Center service, although operated by Port Imperial/ARCORP consortium, may be considered a different system because of its lease of franchise arrangements with the Port Authority and New Jersey Transit. It provides an optional service for transit commuters transferring from rail to path, bus connections, pedestrians from Hoboken and limited park-and-ride users. The existing ferry routes are shown in Figure 2.51.

**Existing Routes: ( Figure 2.51 )**

**1. Staten Island Ferry: St. George Terminal (Staten Island) to Whitehall (The Battery/South Ferry) - 1853:** The largest volume single ferry route in the U.S., the Staten Island Ferry carries nearly 70,000 commuters and tourists each day. As other boroughs of New York City were connected to Manhattan by bridges, tunnels, transit and rail, Staten Island remained isolated because of its long distance away from the Battery end of downtown precluded and land based travel links. While the Verazano Narrows Bridge and routes through Brooklyn provide a vehicular connection, it is a slow and circuitous alternative of some 15 congested urban miles as compared with the 5 mile trip by ferry. The ferry has therefore filled the role of marine highway and water transit link for the residents of Staten Island since it became a part of the public transit network in 1905, when the city assumed ownership from the Staten Island Railroad which had operated service since the 1850's. The low fare on the Staten Island Ferry which is now "up to" 25 cents from its traditional nickel is a boon for Staten Island commuters and a major burden for the city which must subsidize this costly service. An unusual statistic of the Staten Island Ferry operation revealed in the new recent New York ferry study was the split in ridership destinations. Of the 70,000 daily commuters only 5,000 are destined for mid-town, while the remaining 9,000 mid-town commuters from Staten Island either drive or ride express buses through Brooklyn. The new fast ferry initiative is aimed at this group, particularly during the time frame of the Gowanus Freeway reconstruction. The route to the Battery will continue to be primarily passenger, and will benefit from the construction of the new Whitehall Terminal and improvements on Staten Island.

**Figure 2.55: Trans-Hudson Ferry User Preference Poll**



## A1.5 Site Visit Fact Sheet - New York City Network

**A. Systems/Routes included in site visit (Sept. 13-14, 1993):**

o Weehawken/Port Imperial - Midtown Manhattan/Pier 78 (38th Street), Port Imperial FerryBus
o Weehawken/Lincoln Harbor - Midtown Manhattan/Pier 78 (38th Street), operated by Port Imperial FerryBus
o Weehawken/Port Imperial - Downtown Manhattan/Slip 5 (South Ferry Terminal), Port Imperial FerryBus
o Hoboken - Downtown Manhattan/Battery Park City, operated by Port Imperial Ferrybus
o Staten Island - Downtown Manhattan/Whitehall Terminal
o Highlands/Atlantic Highlands - Brooklyn/Bay Ridge - Downtown Manhattan/Pier 11, operated by TNT Hydrolines

**B. Interviews Conducted (Sept.13-14, 1993):**

o Thomas F.X. Scullin, Vice President, ARCORP Properties (Port Imperial FerryBus)
o Mark Stanisci, TNT Hydrolines, Inc.
o Henry Nicholson, Director, Department of Transportation, Monmouth County, New Jersey
o George Cancro, Executive Manager, Port Authority of NY & NJ
o Alan Olmsted, Director, NYCDOT Office of Private Ferry Operations
o Peter Hallock, Associate Director, NYCDOT Office of Private Ferry Operations

**C. Document Research Bibliography:**

The Governor's "New" New York Initiative: High Speed Ferry Task Force, 1993.

The Bayshore Ferry Study, prepared by TAMS Consultants, Inc., for the Monmouth County Board of Freeholders, 1991.

Hoboken Ferry Plan, Port Authority of New York and New Jersey, 1988.

The Trans-Hudson Study, NY-DOT, NJ-DOT, Port Authority, 1984.

Waterborne Transportation Policy Statement, Mayor Koch, New York City, and the Waterborne Transportation Task-Force, 1986.

New York City Ferry Guide, NYC Department of Transportation, 1993.

Status of Private Ferry Operations, NYC Department of Transportation, 1993.

**o Bayshore: Highlands (Connors) and Atlantic Highlands (Marina) NJ to Downtown East (Pier 11) - 1986:** One of the first new services was started in 1986 with converted crew boats operating to Pier 11. They were replaced by 2 high-speed catamarans in 1990 which have transported 450 to 600 roundtrip commuters per day depending on the season. The Bayshore Ferry Study conducted by Monmouth County in 1991 recommended a new central terminal location in Belford to improve ridership and access from the county. The service is privately operated and carries approximately 250,000 passengers per year.

**o Weehawken (Port Imperial) NJ to Midtown Westside (Pier 78/W 38th St.) - 1986:** The real pioneer in short distance cross-Hudson service was the new Weehawken ferry started by Arthur Imperatore to provide an alternative commute to the adjacent Lincoln Tunnel and the George Washington Bridge. The service provides ample parking and bus transit on the Jersey side and a private bus connection operated by Port Imperial to midtown on the Manhattan side. The service has become a model for other cross-Hudson routes including the Hoboken and Lincoln Harbor ferries. The Port Imperial system carries nearly 6000 passengers per day (1993). Ridership includes also off-peak daytime and evening users. The 68 buses operating in Manhattan meet arriving vessels and have dramatically increased ridership since being introduced. Mid-day and off-peak ridership has also increased as the system has become more famous and expanded its schedule evenings and weekends.

**o Hoboken Terminal NJ to Downtown World Financial Center/Battery Park City - 1989:** An innovative example of contemporary intermodal ferry and transit service, the passenger only routes were introduced from Hoboken to Battery Park City at World Financial Center. Operated by ARCORP/ Hartz on a franchise from the Port Authority. The route parallels the PATH connection. It was intended to divert riders from an overcrowded PATH transit route and has increased its daily ridership to over 10,000 passengers per day (1993) since it opened in 1989. The planning process for the Hoboken ferry also serves as a model for public/private ferry initiatives.

**Proposed Routes and Terminals:**

A High Speed Ferry Task Force was convened by governor Cuomo in 1992 to explore the possibilities of expanding ferry services along the waterways of the city. The results of a thorough planning process was a plan for new and expanded routes which could utilized a range of high speed vessels. Proposals were to be for privately constructed and operated services along selected corridors which had been screened for demand. The solicitation by the City Department of Transportation and State Urban Development Corporation resulted in the award of 4 new routes to three operators. The proposed routes are shown in Figure 2.54.

**o Staten Island/Midtown Manhattan High Speed (New York Fast Ferry Services):** The passenger route connecting to mid-town would be faster than land-based alternatives and be directed at the 5,000 daily commuters currently going through Brooklyn by car and bus. The new 35 to 40 knot ferries would be a Norwegian design currently franchised and built in the New York City area by a private shipyard.

**o Bayshore/Bay Ridge (TNT Hydrolines):** A second route would be the expansion of current Bayshore service by TNT Hydrolines to pick-up Brooklyn commuters at Bay Ridge, particularly during the reconstruction of the Brooklyn/Gowanus corridor. TNT would add new catamarans to their fleet and increase the number of trips scheduled at peak hours, combining the Bay Ridge

run with increased service from the Bayshore and Monmouth County.

**o Hunters Point/Queens to Midtown (Port Imperial/ARCORP)**
On the East River, Port Imperial/ARCORP was designated to operate a short route to mid-town with connections to the Long Island Commuter rail. The service would also eventually serve the proposed redevelopment of the former rail yards as a mixed use development. The service is scheduled to start by June 1994. In many respects this service is analogous to the Hoboken ferry, and is aimed at relieving the subway congestion as well as attracting park-and-ride commuters.

**o Rockland County/Yonkers to Midtown (Port Imperial/ARCORP)**
Also offered to Port Imperial/ARCORP was the route from Yonkers and Rockland up the Hudson to Mid-town. New fast catamarans are proposed by Port Imperial to provide higher speeds than the existing shuttle fleet. The 25 mile route is the longest of those proposed, and will pose a challenge in terms of vessel technology, schedule and fare structure. The route resembles the existing Bayshore system.

**Vessel Technology:**

The recent routes have proven to be excellent testing grounds for two types of urban ferry. The Bayshore route has proven the viability of longer distance (19 nautical miles), high speed (25 to 30 knots) catamarans. The Weehawken, Lincoln Harbor and Hoboken ferries, all operated by Port Imperial and ARCORP, have introduced a new short distance, medium speed (20 knots) high volume ferry. The innovative Port Imperial ferries have demonstrated the effectiveness of bow loading for gang entry and exit minimizing turn around time for the 300 to 400 passenger vessels, and allowing the Weehawken crossing to operate on rapid headways for the 4 to 5 minute crossing. The only problem incurred to date by the vessel fleet has been some damage to the aluminum hulls backing into ice flows during the particularly cold winter of 1993-1994.

The performance, reliability, and predictability of trip time makes these routes competitive with land based transit and faster than vehicular commuting. Another critical factor in attracting riders has been the level of amenity provided on the catamarans and Port Imperial Fleet. The comfort and security have been cited as important attractions to regular users as indicated in the preference poll of riders conducted by the Port Authority shown in Figure 2.55.

**Comparative Analysis Tables**

The New York ferry routes are compared in Table 2.51 by transportation function and landside alternative. The table includes both existing and proposed routes. Several of the routes are listed as both complementary, offering a shorter trip and optional, offering a more comfortable and reliable trip. The categorization depends in part on the individual commuter destinations, and also to some extent on the perception of the riders regarding time of transfer and other nuances of intermodal travel. For example, the auto commuter taking the Lincoln Tunnel may have a trip time to Manhattan equal to that by ferry considering parking, waiting time and transfers. However the auto commuter may find that his commute is longer at unpredictable intervals owing to traffic congestion, and the ferry on average may take less time. As congestion increases and ferry routes and services become more plentiful, the trip time by ferry may be consistently shorter than by other modes, making more services time efficient. As long as the ferry operations are unsubsidized and uncontrolled, they are likely to charge higher fares than public transit alternatives, as they do at present on average from 30% to 50% higher depending

Table 2.51

New York Harbor Ferry Routes

Comparative Analysis of Individual Routes By Transportation Function and Land-based Alternative

| Location and Route: | 1.Trans. Essential Link | 2.Trans. Comple-ment'ry | 3.Trans. Option'l | Land/ Alts. | Appro. Dist. wat/land | Insti-tutional |
|---|---|---|---|---|---|---|
| Staten Island to Downtown (Whitehall) | - | Yes - Bridge/ Highway | - | Auto, Bus | 4miles v. 12m. | Public - NYCDOT |
| Weehawken to Midtown (Pier 79) | - | Yes - Lincoln Tunnel | Yes - Comm. Rail | Auto, Bus, Rail | 1m. v. 1m. | Private - ARCORP |
| Hoboken to Downtown (Battery Park) | - | Yes - Holland Tunnel | Yes - PATH (Subway) | Auto, Subway Rail | 2m. v. 3m. | Private - ARCORP/ Hartz |
| Bayshore to Brooklyn to Downtown (Pier 11) | - | Yes - Bridge/Tun Com.Rail | - | Auto, Bus, Rail | 20m. v. 35m. | Private - TNT Hydrolines |
| Staten Island to Midtown (Pier 79) | - | Yes - Bridge/ Highway | - | Auto, Bus | 12m. v. 18m. | Private - NY Fast Ferry Con. |
| Brooklyn/Bay Ridge to Downtown (Pier 11) | - | Yes - Bridge/ High Reconst'n | - | Auto, Rail, Subway Bus | 5m. v. 8m. | Private - TNT Hydrolines |
| Hunter's Point to Midtown (E. 38th St.) | - | Yes - Bridge/ Highway | Yes - Com.Rail/ Subway | Auto, Rail, Subway | 1m. v. 3m. | Private - ARCORP |
| Rockland/ Tappan Zee to Yonkers to Midtown | - | - | Yes - Highway/ Com.Rail | Auto, Rail, | 22m. v. 28m. | Private - ARCORP |

on the route.

The routes are differentiated by other characteristics including annual passenger volumes, subsidy levels and costs. The major difference of the New York routes compared to other case studies is the high volume of use, and the absence of subsidy.

## 2.54 System Performance and Decision Factors

### Decision Points Leading to the Current Network

The Trans-Hudson Study was conducted for the Port Authority and interstate transportation agencies in 1983-84 to examine commuting patterns from New Jersey to Manhattan. The findings revealed that virtually all modes and corridors of travel were approaching or already operating beyond capacity. Furthermore the study found that with the substantial growth patterns anticipated increased congestion with no diversion potential, and little capability for infrastructure expansion. A major breaking point for the roadway network was predicted for 1990 if trends continued.

The study concluded that there was an urgent need for achieving a better balance of existing transportation resources on a region-wide basis with more emphasis on developing new transit capacity through greater interstate coordination. One available resource for cross-Hudson travel identified which had not been used since earlier in the century was the waterway. Several of the older ferry terminals and river crossing generally coincided with existing transit terminals such as Hoboken, and the highway corridors such as the Lincoln and Holland tunnels. It was concluded that several major entry corridors could be partially relieved by the addition of high capacity, easily accessed ferry routes. The immediate responses by the Port Authority along with New York and New Jersey transportation officials to address these rather startling study findings constituted the first major decision point for the modern generation of ferries.

The different state and city agencies responded in various ways, as did the private ferry operators. Several new private services were initiated in 1986 including the Direct Lines routes from the Bayshore (Keyport and Highlands) to lower Manhattan, and the Port Imperial Service from Weehawken to midtown. The start-up of these two services marked a second important decision point, with the private sector responding to two specific corridor market needs including one long and one short commuter route.

The planning and start-up of the Hoboken ferry represented the third important decision point. The Port Authority collaborated with the two state transportation agencies to initiate a ferry study for the Hoboken-Manhattan corridor with the intention of relieving congestion on the commuter rail/PATH transit route. After thoroughly studying the types of service and characteristics needed to attract riders, and completing a origin-destination analysis, it was determined that a parallel privately operated service was feasible and a request for proposals was prepared. In 1988 submissions were reviewed, a short list interviewed, and a finalist selected to operate the ferry from the Hoboken/Lackawanna Terminal to World Financial Center at Battery Park City. In 1989 the service was initiated and after a slow start-up period gained momentum and ridership to perform even better than originally projected. By the fall of 1993 the service was attracting so many riders that it was not only relieving the capacity problem on PATH, but was causing concern that it might actually be reducing PATH ridership too much and cutting into revenues.

The net result to date has been that the ferry has served its intended purpose of preserving capacity on PATH and has proven to be a success for both the operators and the transit agencies.

These initiatives set the precedents for the proposed new routes which comprise the fourth generation of contemporary commuter passenger ferries. The recommendations of the New York High-Speed Ferry Plan, which was prepared by a consortium of New York State agencies and the Highspeed Ferry Task Force from 1991 to 1993, are proceeding toward implementation. These include several new routes connecting points in New York State granted to designated private operators in the summer of 1993, the first of which was planned to start in the summer of 1994.

**Transportation System Effectiveness**

The general commuter ridership for private water transit has shown a steady and impressive growth rate from 1987 to 1993 as shown in Figure 2.58. The increasing number of riders is once again becoming a measurable factor in the sizeable daily cross-Hudson commuter trip counts. Since a significant proportion of the ferry riders are diversions from single driver auto commutes, the system of private ferries is having a positive impact on the heaviest traveled highway corridor infrastructure and easing congestion at the tunnels and bridges along the way.

The efficiency of water transit in the New York City regional transportation network can best be measured by the degree to which the various routes serve the evolving interstate goals and policies. New York must be one of the few cities in the U.S. which has recognized the need and benefits of attracting competing private ferry operations to serve overcrowded radial transit corridors such as PATH. It is also the only city which has such a desperate pool of commuters, that some are willing to abandon their cars and spend a transit fare premium of 30% to 50% on those ferries to avoid the land-based alternatives, if only for the short end segment of the trip. The result for private ferries is that they are able to attract enough riders during peak hours to operate at a profit, with market determined fares. Some routes such as Weehawken are also attracting sizeable numbers of off-peak users including shoppers, convention attendees at Javits Center and evening theater goers.

**Environmental Impacts of Ferries**

In the New York Harbor area, the impacts of ferries on the marine environment are generally rather insignificant since the deep water port areas in which the ferries operate are largely man-made with edge conditions designed to resist wake and wash from heavy shipping. The greater areas of environmental concern are in the more remote and fragile shore locations such as those of the Bayshore in New Jersey, portions of Long Island, or up river on the Hudson.

Environmental issues arose in the Bayshore Ferry Plan regarding the proposed location of a new ferry terminal in Compton's Creek for expansion of the commuter service to Manhattan. While all environmental permits were conditionally granted by the NJ Department of Environmental Protection, regarding the widening of the tidal creek and the alteration of degraded wetlands in this shoreline zone of Sandy Hook Bay, the process was excessively time-consuming and indicated how little priority remains for water dependent uses, such as the proposed public ferry transit services. Environmental concern and debate in the immediate residential neighborhood of Belford regarding the proposed park and ride ferry site revolved around several issues; 1) the

**Table 2.52 - New York City:**
**Comparative Analysis of Individual Routes:**

Key:

Type: **1.**Ferry/Bridge or Tunnel Characteristic:
**2.**Ferry/Parallel to High.
**3.**Ferry to Island(s)
**4.**Ferry + Bridge or Tunnel
**5.**Ferry + High. or Rail
**6.**Ro-Ro/Highway Link

**A.**Commuter/Recreation or Tour
**B.**High/Low Volume
**C.**Int'national/Int'state/Int'city
**D.**Public/Private
**E.**New or Expanding System

| Route: | Type | Characteristics | An.Vol Pass. | Fare/ Trip '93 | Yr.Cost | Subsidy /% | Gen'l |
|---|---|---|---|---|---|---|---|
| **Staten Island to Whitehall** | 3,1,6 | Com., High Vol. Pub | 21m. | $.25 | $30m | 80% | **Exist. 1853** |
| **Weehawken to Midtown** | 4,5 | Com/ Rec High Vol Priv. | 2.5m. | $4.50 | NA | -0- | **Exist. 1986** |
| **Hoboken to Battery Park** | 4,5 | " | 2.6m | $2.00 | NA | -0- | **Exist. 1989** |
| **Bayshore to Brooklyn to Downtown** | 4,5 | Com. High Spd. Priv. | .3m | NA | NA | -0- | **Exist. 1990** |
| **Staten Island to Midtown** | 3,1 | New High Spd. Priv. | | NA | NA | -0- | New Service |
| **Hunter's Point to Mid/Down** | 4,5 | New High vol. Priv. | | NA | NA | -0- | New 1994 |
| **Bayshore to Brooklyn to Pier 11** | 4,5 | Expand High Spd. Med vol. Priv. | .7m (est) | NA | NA | -0- | New |
| **Rockland/ Yonk.to Midtown** | 2,4 | New High Spd Med Vol Priv. | | NA | NA | -0- | New |

trade-off between resident concerns about added street traffic in their neighborhood versus county concerns about regional traffic reduction through the expanded ferry ridership, and 2) the rights of a ferry or other commercial vessels to enter a federally maintained, navigable waterway currently used exclusively by a fishing fleet which claimed it was, in effect, a private harbor for their sole use. As exemplified by the continuing debates over the Bayshore ferry, the attempt to locate new ferry terminals in existing communities and/or areas of environmentally sensitive shoreline can be challenging.

Many positive environmental contributions can be made by the new commuter ferries such as improvement of air quality by reduction of auto miles commuted, or VMT's. The existing ferry routes in New York contribute in several different ways. The older Staten Island Ferry provides a route which is simply the shortest distance between two points, where the land side alternatives by car or bus are nearly twice as long as shown in Table 2.51. The cost per rider by ferry is relatively low and the savings of vehicle miles traveled over land-based highways and bridges is considerable. The Bayshore ferry, which primarily diverts auto commuters, saves more VMT'S per rider because of the longer land-side trip, by as much as 400 to 1 when compared to the distance travelled by auto drivers. The shorter Weehawken route saves fewer VMT'S per commuter because of the relatively short crossing, but carries far more riders and therefore helps reduce air pollution, particularly that created by vehicles idling in traffic at the tunnel entrances and approaches.

**Economic Development Influences**

The New York ferry routes individually support a variety economic development initiatives. The Port Imperial ferry was in part started to serve several needs of the site's owner relating to the planned development of the former rail yard as a satellite community to Manhattan. The ferry was started in advance to establish the credibility and convenience of the site to prospective residents, while at the same time producing a revenue stream from the property from parking and ferry fees. The system itself has proven to be successful on its own as a growing transportation business. Port Imperial/ARCORP continues to expand its fleet while branching out to new routes and services. Off peak shuttle and tourism services have also added to the revenues of the system, while contributing to the general tourism economy.

The Bayshore service was taken over by TNT Hydrolines in part to utilize the high-tech catamarans for off-peak weekday and weekend excursion services in and around New York. It was intended that the commuter service would serve as the economic base, and that the excursion activity would prove to be the profit center. Several innovative excursion packages have been initiated including reverse direction tours to Monmouth Raceway in New Jersey from New York, as well as weekend Hudson River trips to West Point.

**Cost Effectiveness**

The New York network provides a sharp contrast in the cost-effectiveness assessment between its publicly and privately operated systems. The Staten Island Ferry with its traditionally low fare structure requires an 80% subsidy for operations, providing an essential transportation service between the two islands. Compared to investments in construction of direct bridge or tunnel infrastructure connections, the ferry would seem to be a cost-effective capital investment, but requires a large ongoing annual operating subsidy. A higher farebox recovery rate could be achieved if the fare was raised to a comparable cost for land side transit. The vessels are

inherently cost-effective with their large capacities, particularly for the passenger-only service now operating.

By contrast the unsubsidized private ferries which contribute to the relief of highway and transit congestion, might be regarded as the most cost effective of all the routes considered in the case studies. the costs of the service are largely paid by the users through the market rate fare structure. The limited public investments are in dock facility construction and management, along with the planning efforts which precipitated much of the present system. The only cost inefficiency of such services may prove to be an indirect social cost in the form of economically stratified transportation options. This may be more characteristic of the longer routes, such as Bayshore for which the monthly fare of more than $400 (1993) was well above the average comparable rail or bus transit fare and may price many users out of the market. By contrast, the rates for the shorter Weehawken or Hoboken service, though proportionately higher when compared to landside options, are still relatively affordable. For example, the Hoboken one way fare of $2.00 is twice the rate of PATH, but still a manageable daily premium for a large number of commuters.

A final note on transportation system cost-effectiveness to the user in the intense commuter environment of the New York metropolitan area. The Bayshore Ferry Study prepared by TAMS Consultants. Inc., for Monmouth County in 1991, uncovered interesting characteristics of mode and route choice while conducting market demand surveys and reviewing the trans-Hudson origin destination data. For the long distance commutes from areas like Monmouth County with multiple transit and highway choices, the users selection of route and travel mode tend to be quite complex and highly selective based on a combination of origin, destination, time and cost. Time was determined to be the dominant route selection factor. A commuter facing a 1 to 1 1/2 hour trip each way to sections of Manhattan, might take very different routes depending on the specific origin in relationship to highway, rail, bus or ferry, and the specific destination at the other end. With travel time as the primary concern, commuters tended to choose the fastest combination of links the individual could afford, often mixing modes as needed. The greater the length of the trip, the more amenity and reliability factors became important. The commuter would definitely select one route/mode combination over another to save as little as 10 minutes each way, even if the monthly cost were considerable more. Hence the Bayshore ferry route was attractive to many Wall Street commuters because it could save 10 to 15 minutes over land-side travel for residents of the north east corner of the county. Enough patrons have been able to pay the higher unsubsidized fare and provide the existing TNT Hydrolines service with a steady and dedicated year round rider base.

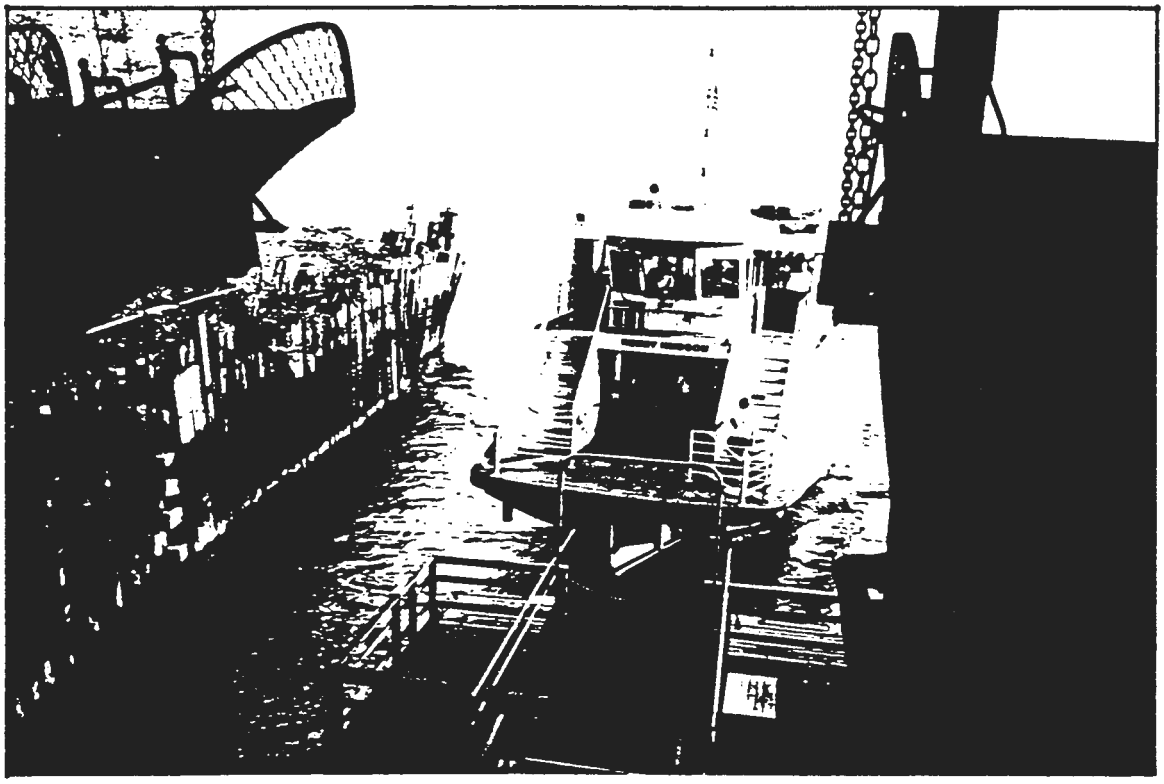
At some point the real measurement of cost-effectiveness in a commuter context such as New york will need to be calculated in terms of comparisons by mode for a particular origin/destination trip by auto, landside transit, ferry, or various combinations. Thus far accurate and credible measures of total costs, including individual and public, have not yet been refined to the point that users are able to make informed choices. New York may provide an excellent context for developing a user friendly transportation cost/choice model.

## 2.55 Case Study Findings

### Lessons From the Big Apple

The recent successes of the New York City ferry network provide a rich array of lessons for other

Figure 2.56: Photos of Existing New York Cross-Hudson Routes



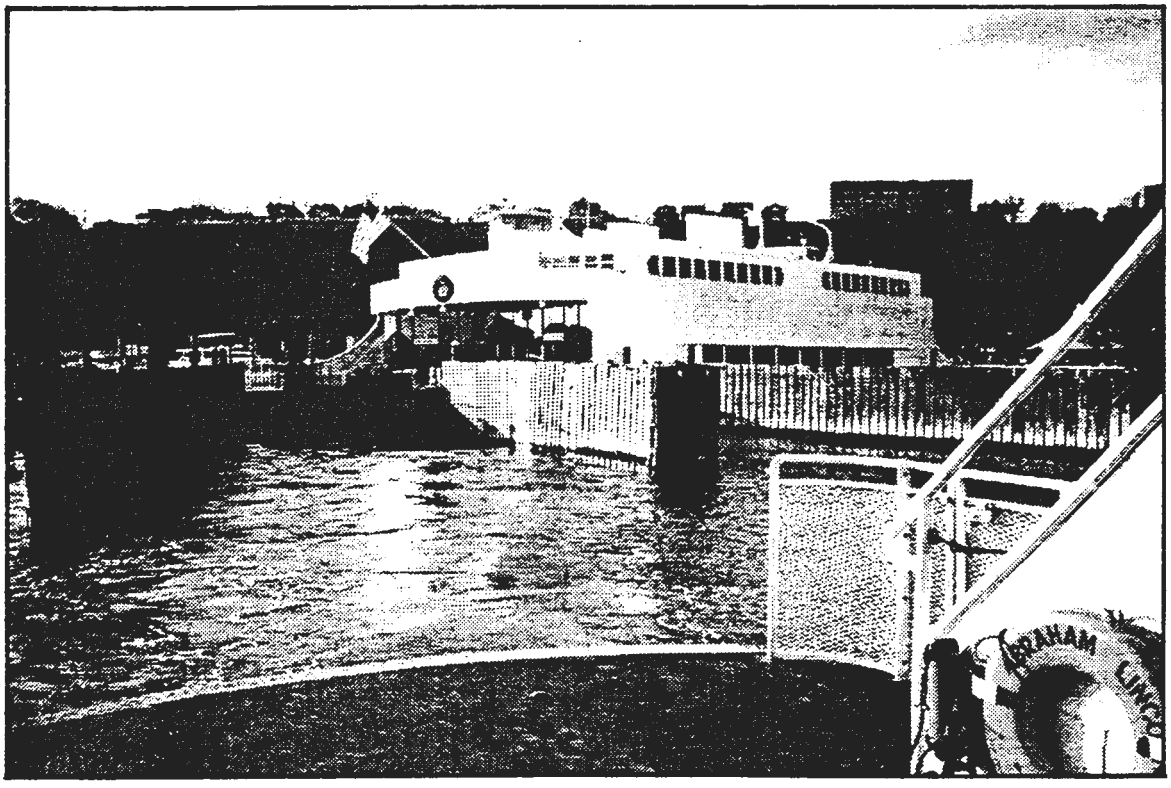
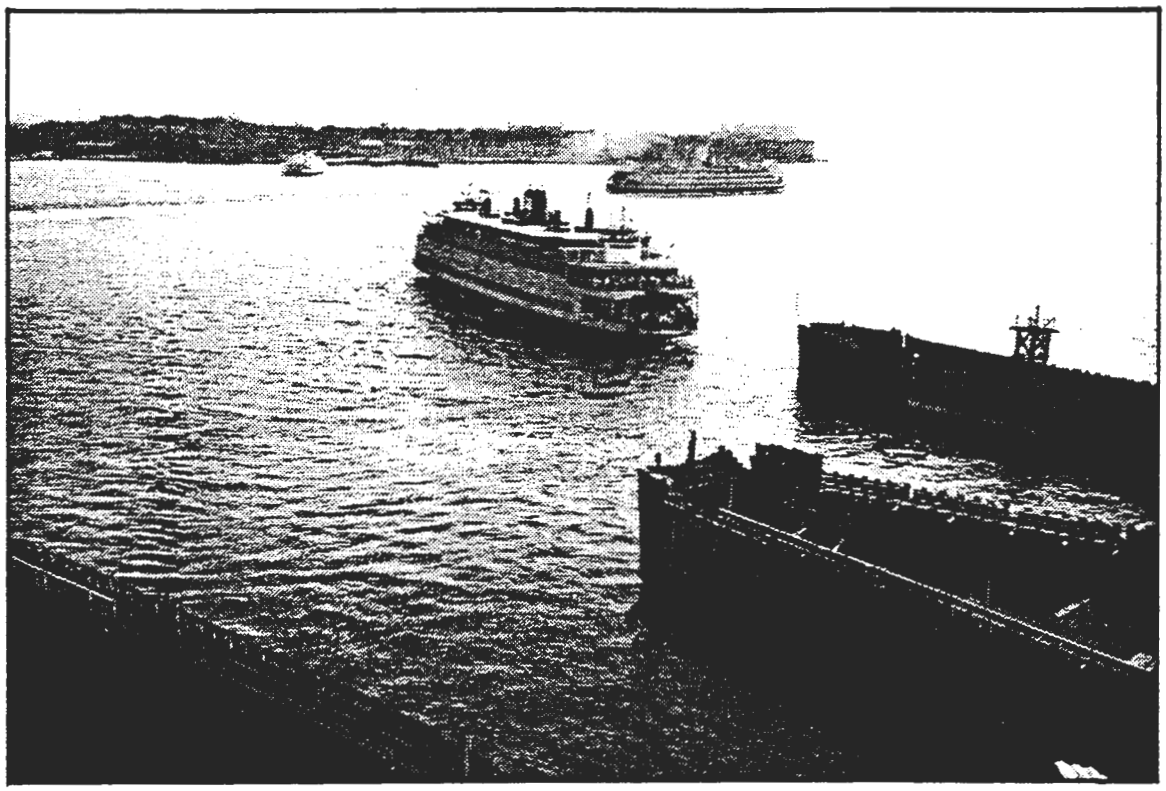
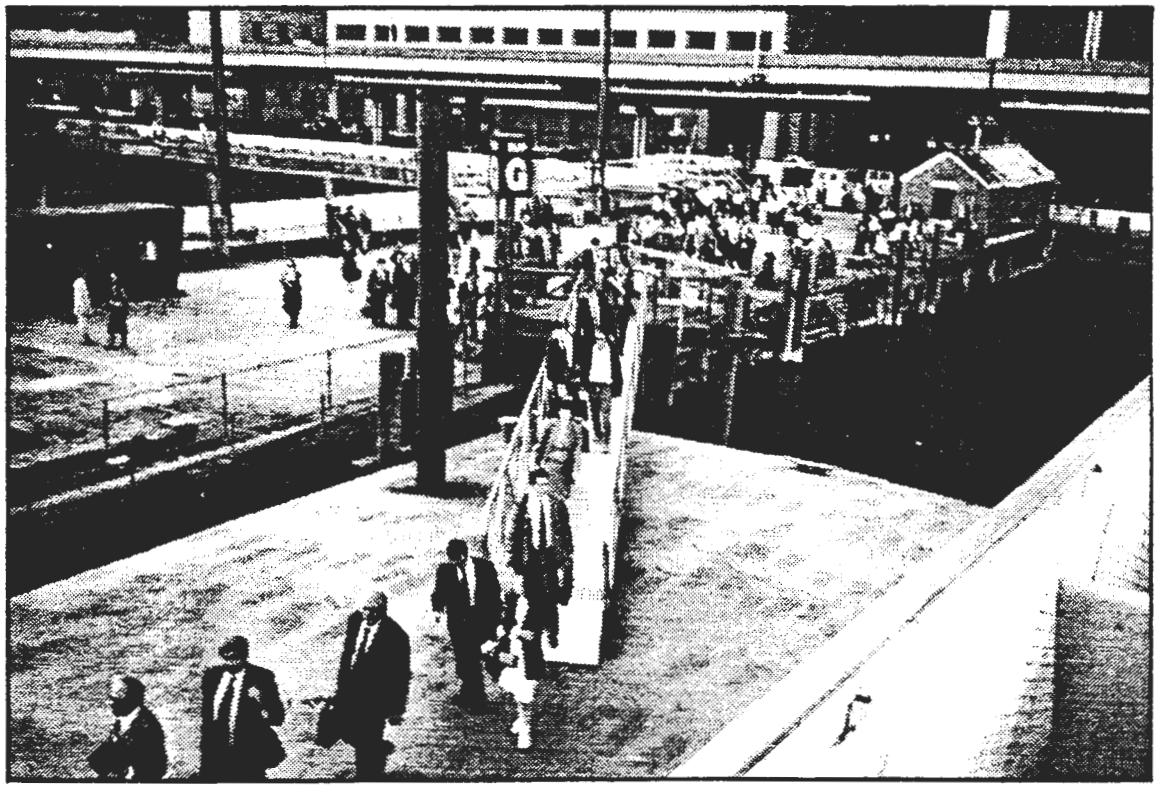


**Figure 2.57: Photos of Existing New York Cross-Hudson Routes**





cities, and also include striking previews of coming urban commuter travel patterns and infrastructure challenges. With respect to the next generation of urban waterborne passenger transit, the evolution of the New York ferry network provides useful examples of various techniques for interagency ferry planning, definitions of public-private sector responsibilities, implementation strategies, private ferry management options, and vessel technology development.

Public Planning to Integrate Ferries in a Regional Transportation Network: A sequence of inter-state, inter-agency planning initiatives acted as catalysts and contributed specific implementation programs for the private commuter ferry system. In sequence the public actions included the Trans-Hudson Study (1984), the Hoboken Ferry Plan (1988), The Bayshore Ferry Plan (1991), and The New York High-Speed Ferry Initiative, (1993). Many innovative analytical and ferry planning techniques have emerged from these studies, and are well documented. Each focused on particular travel corridors and recommended specific courses of action. The first two planning efforts led to the existing private ferry network, and the last two have framed future expansion and new routes.

Public Policy Initiatives to Facilitate Private Ferry Operations: Several coordinated inter-state public transportation policy initiatives were critical to the start-up and success of the private services.

> o New York City Waterborne Transportation Policy (1986); established a ferry terminal policy to secure critical terminal locations in NYC, manage the docks and terminal facilities and guarantee equal access for all ferry operators.
>
> o NJ Transit/NJ DOT; adopted a policy to establish intermodal rail and bus transit connections to ferries at Port Imperial/Weehawken terminal, and Hoboken/Lackawanna Terminal, and also sponsored the Bayshore Ferry Study.
>
> o New York State High Speed Ferry Initiative(1993); coordinated inter-agency policy at state and city levels to establish new ferry services on the public/private Hoboken model for various selected in-state transportation corridors.

These policies were consistent in recognizing the public role as providing planning assistance, terminal control and access, intermodal linkages, coordinated information and marketing, and monthly monitoring of ridership and operations. The public sector has provided start-up energy and provided indirect terminal subsidies, while leaving the "floating" part of operations to the private sector.

Creative Fare Structures and Commuter Transit Incentives: The public agencies in New Jersey and New York City have instituted several commuter voucher programs (Transit-Check and Mail-Tik) through employers which are provided to encourage transit use by contributing to employee commuting costs. The employees are given vouchers of up to $60 per month for any form of public or private transit use. Both employer and employee also receive various state and federal tax benefits as well. The operators have provided multiple ticket packages to accommodate single fare, round-trip, 10 ticket per month, and monthly passes, tailored to the variety of user patterns. NJ Transit offers a combination rail-ferry pass which allows use of the private Hoboken ferry.

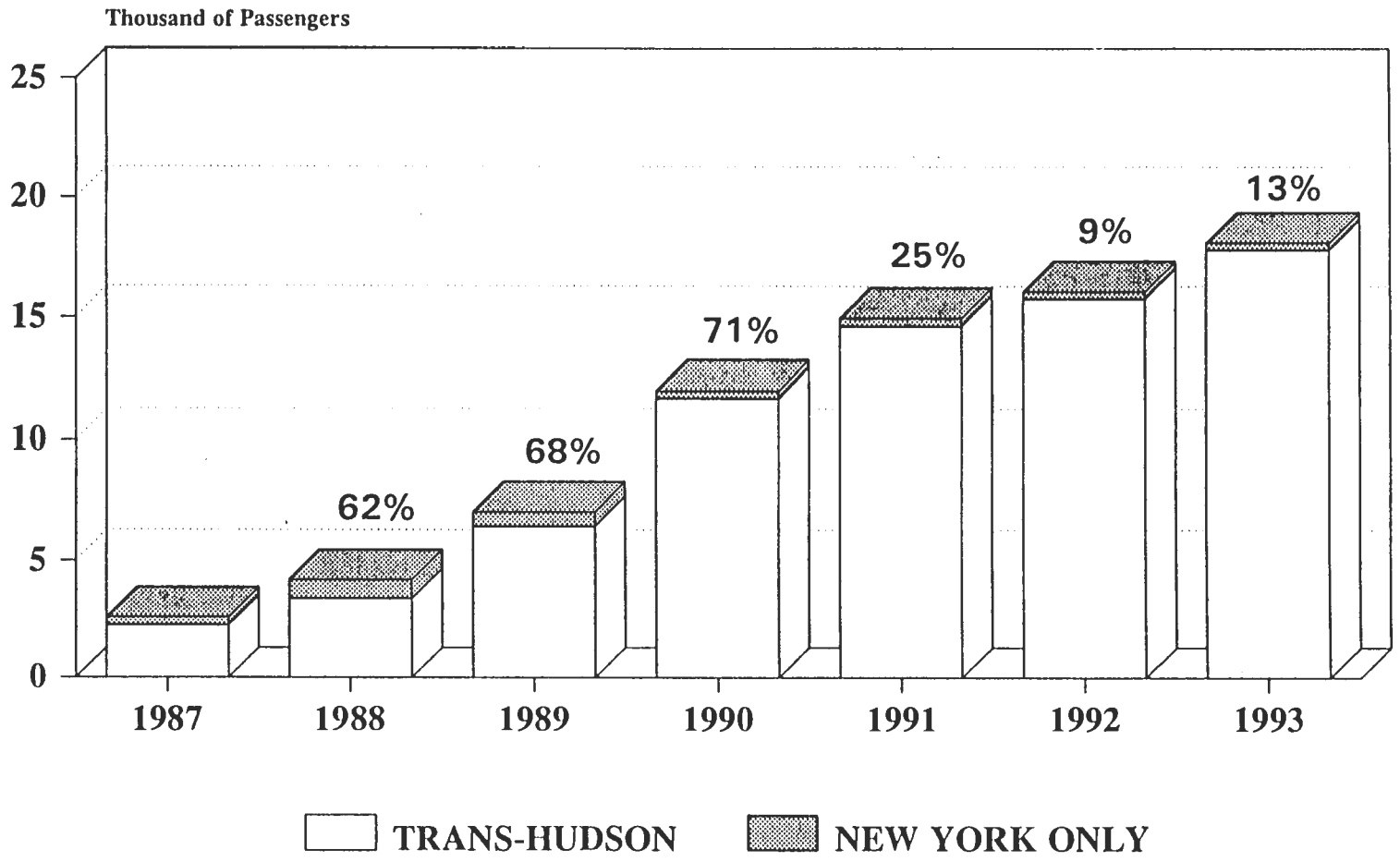
Visionary Private Ferry Operators: The success of the ferries may be attributed to several

exceptionally dedicated private operators and their determination to find and serve the burgeoning ferry commuter markets. Arthur Imperatore has demonstrated the importance of the visionary entrepreneur in start-up, refinement and follow through in the success of the Port Imperial ferry fleet. The founders of Direct Lines including Walter Mihm in the Bayshore played a similar pioneering role for the longer distance commuter ferry option. Without these two determined groups of private entrepreneurs, the new generation of ferries might not have succeeded, and the next generation not have been envisioned.

Preferences of Ferry Users for Optional Water Transit: User polls conducted by the Port Authority and Interstate Transportation Task Force found that the two primary reasons given for ferry choice over other modes for New York Harbor crossings were comfort (36%) and reliability (22%). For the shorter links, travel time and cost savings rated lower as considerations in this complex maze of intermodal choices for commuters.

Need for Funding Flexibility: The encouragement of private ferry service requires more flexible methods of funding, according to Port Authority and NYC DOT officials. The standard Federal programs and channels of funding from FTA through a specific regional public transit agency, do not provide enough latitude to address interstate corridors or collaborative public-private transit operations. The upcoming need for expanding the terminal at Port Imperial, which would legitimately fit ISTEA intermodal policy objectives, may offer a good test of how and when public funding can support facilities needed to expand a public transit oriented private ferry operation.

New York City Region as a Cutting Edge Water Transit Demonstration Context: The extreme commuting conditions and multitude of water crossings combine to create the most challenging context for transit in the U.S. The emerging roles of ferries, the institutional techniques used, and the excellent examples of private operations and vessel technology used are paradigms for new generation ferry services in other urban settings. Once the existing landside transportation infrastructure is at full capacity as was forecast in the Trans-Hudson Study, new sets of transportation inventions and trade-offs must be considered. The past decade has been one of transition towards improving the balance of transit and auto commuting in the New York City area. The emerging role of ferries as options to land-based modes for commuters has been clearly demonstrated in the multi-faceted revival of the New York Harbor network.




* 1987-1993: 598% growth in traffic
* June 1993 average exceeds 21,000

**Figure 2.58: New York Harbor Private Ferry Services: Growth 1987-1993**

## 3.0 COMPARATIVE ANALYSIS OF CASE STUDY SYSTEMS

### Introduction

The five case study networks were assessed in terms of the six major ferry planning determinants identified in the Phase I report. The following summary highlights the contextual issues and major decision points by case study which are described and evaluated in greater detail in the preceding Chapter 2 of this report. The comparative analysis then presents more detailed descriptions of the planning determinants and decision factors identified in the case studies. The observations include relevant examples from the case studies as well as survey systems from the Phase 1 report to elaborate on each. The planning determinants and decision factors are considered in terms which may be of interest for implementation of new systems as well for adapting and expanding existing service.

## 3.1 Summary Description of Case Studies and Key Decision Factors

### Purpose and Objectives

The surveys conducted in Phase 1 were useful in identifying general trends and directions water based transportation systems have taken with respect to land based alternatives in the twentieth century and more specifically in the past 40 years. The more detailed case study analyses considered how older systems survived or were replaced by land-based modes, and why new systems may have emerged as related to each particular context, the routes and operations. They also assessed the particular types and magnitude of shifts in transportation policy and planning which may have influenced choices in the case study examples, and which may be influential in selection of land or water based movement systems in the future. In conducting the case study analyses, it became apparent that a great many factors had influenced choices of land or water-based transportation, and that considerable data collection and field work were required to clearly understand the evolution of the various individual routes and systems.

The initial system surveys indicated that on a nation wide basis, a relatively small number of predominantly urban routes are accounting for the majority of passenger trips. The New York, Seattle and San Francisco systems provide excellent examples of these high volume, predominantly commuter oriented services. Conversely, the larger number of systems, predominantly non-urban, are carrying relatively few passengers on routes for which there are either no landside alternatives, or where those that exist are circuitous. These systems are well represented by the Mississippi River routes, and the Casco Bay Island service. Since both types of systems are likely to continue to play important roles in their respective regional transportation networks, the case studies included detailed evaluations of both the higher volume urban and lower volume non-urban ferry routes.

### Case Study Findings

The following case study findings include critical aspects of each system's history and evolution which have helped to shape present day service, crucial decision points regarding water versus

land based transportation, and future system plans.

## 3.11 Seattle, Washington:

Washington State Ferries (WSF) a division of the Washington State DOT operates a system of cross-Puget Sound commuter and highway link services which have been integral to the regional transportation system since the famed Mosquito Fleet was established at the turn of the century. A fourth set of decisions will need to be made during the next five years regarding future expansion and passenger-only routes as part of the regional transportation system.

The first of three primary decision factors which influenced the start-up of the highly successful passenger and vehicle ferry system occurred when the state acquired most of the remaining privately operated ferry franchises in the late 1940's and early 1950's, when the operators were no longer capable of meeting public demands for Puget Sound crossings.

The Washington State Highway Department initially operated the system as a temporary marine highway link until such time as an extensive bridge and highway program were to be completed. The second critical decision choice occurred in 1959 when the ferries were legislatively declared permanent, as a viable and more cost effective alternative to the ambitious and technologically challenging plan for cross-Sound bridges which was officially abandoned.

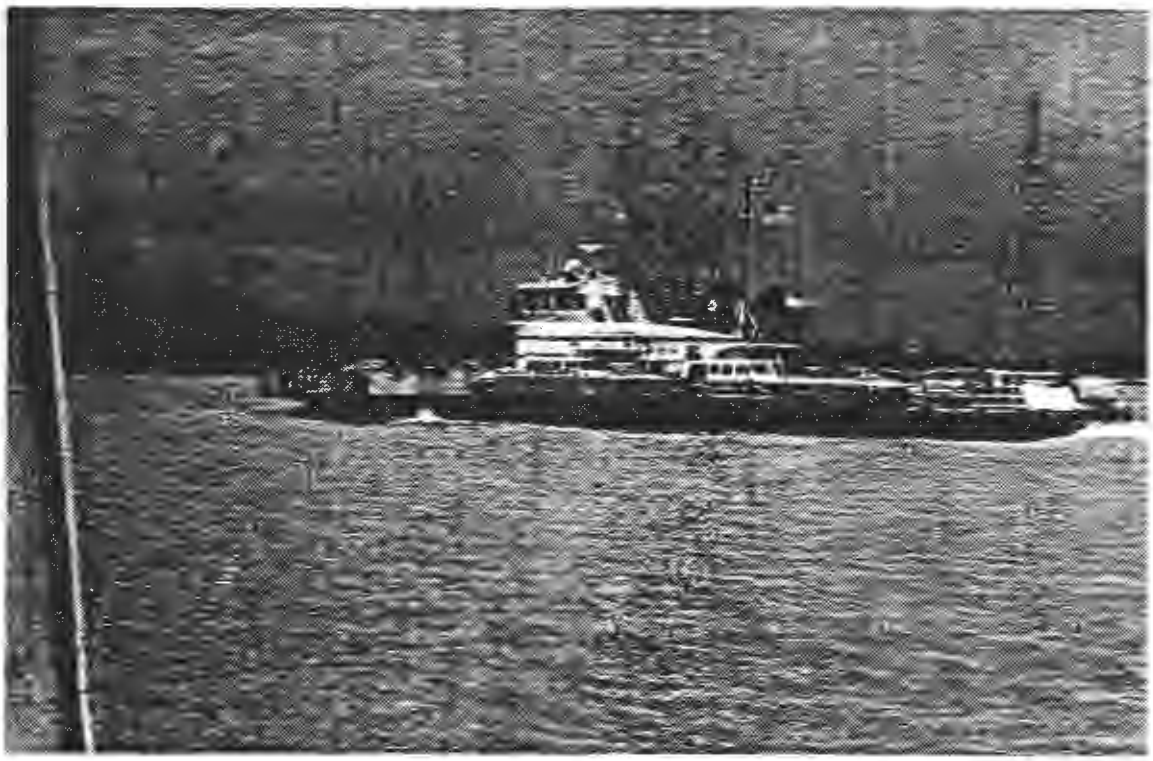
Since then the WSF system has functioned as an essential marine highway link with legislated tax support to contribute to operating and capital costs, with the objective of maintaining an affordable fare structure. The third major set of choices occurred during the period from 1985 to the present as the fleet and routes were expanded to increase capacity and introduce passenger-only service on the Bremerton and Vashon Island routes. These decisions were in response to the growth of commuter and through trips connecting western and eastern shores. The routes serve the Seattle area and carry the largest combined amount volume of any system in the U.S.. With the expanding population in the Seattle metropolitan area and many new residential areas on the west side of the Sound, the system has taken on a rapidly expanding role as a commuter transit link in addition to its other marine highway and recreational functions.

The fourth set of decisions will be finalized during the next five years. Future expansion plans include cross-Sound passenger-only routes, and the construction of new terminals and vessels. Private operators are proposing new high speed commuter services as optional routes parallel to other landside highway and transit alternatives along the eastern Seattle shore, and require cooperation from WFS. For separate cross-Sound routes, WFS is currently seeking legislative funding for new, more efficient and environmentally compatible highspeed passenger service options to their own slower passenger/vehicle routes to try to discourage growth of vehicle commuting. Other characteristics include the following:

- o Two types of water transportation service are currently provided by the WFS for passengers and vehicles:

    1. Essential connections for year round residents of Vashon Island and the San Juan Islands.
    2. Complementary alternatives to lengthy land-based highway routes for east-west travellers across Puget Sound.

**Figure 3.1: Examples of Traditional Existing Vessel Technology**



o Mississippi River Vehicle Ferry (Chalmette - Algiers)


o Converted Crew Boat (Boston Navy Yard Shuttle)

o The proposed new passenger only services across the Sound will offer increased time savings over land-side routes, while the proposed parallel routes along the eastern peninsula will provide optional transportation to highways with qualitative advantages, but not appreciable time savings.

o The WSF is a successful model of a state run, publicly subsidized, high volume, passenger and vehicle ferry system. Economies of scale seem to contribute to the systems relatively cost efficient operations.

o The ferry system has become the largest tourist attraction in the state, with multiple spin-off benefits to the state economy and to system operations.

o After WSF initiated high speed passenger-only routes in 1990, private operators became interested and are now actively planning new, longer routes with advanced vessel technology parallel to land-based systems (Everett, Edmonds, Clinton and Mukilteo to Seattle)

o Seattle's major north-south land-side highway transportation infrastructure is for all intents and purposes complete and overcrowded; new passenger ferries can provide partial relief in some corridors, and with good intermodal connections can reduce reliance on auto commutes.

o WSF, the State DOT, and municipalities coordinate on transportation planning efforts, and have improved park and ride options, HOV use and intermodal connections.

o The proposed expansion of public cross-Sound routes and private parallel passenger services seems consistent with long established state policy to provide all of the essential marine highway and transit links, while leaving new complementary water transit routes to the private sector.

## 3.12 Portland, Maine:

The Casco Bay Lines serve to connect Portland with six (6) islands four (4) of which are within the city limits. The non-profit system is operated by the public Casco Bay Islands Transit District and is accountable to a representative Board of Directors. Maine State DOT assists with capital improvements and the City of Portland provides some indirect operating support through the favorable terminal lease. All island to mainland transportation needs are provided 365 days per year including services for work and school commutes, shopping, vehicle transfer, mail and freight delivery. The comparatively low volume year round service is cross subsidized internally within the system by revenues from peak tourism and excursion use. The vessels are designed to be weather resistant, sea worthy and economical to operate in the harsh northeastern climate.

The critical decision point for the system in the 20th century was reached in the early 1980's when the previously privately operated Casco Bay Lines were sold to a new owner, became bankrupt and unable to provide adequate service. The Casco Bay Islands Transit District was formed to take over the system as an essential public utility with operating expenses to be covered through farebox collection and rates, and the current quasi-public operation was started. There seems to be no evidence that bridges or tunnels were ever seriously considered as

connections to even the closest of the islands, owing to their small size and the need to clear the major shipping lanes to the port.

Future decisions will involve balancing of service levels, fare structure and system income in light of relatively fixed demand and increasing costs of operation. Maintaining affordable year round service, particularly to the more remote and less populated islands may at some point require additional annual operation subsidies to avoid excessive hikes in summer peak season fares. This type of farebox recovery balancing act is faced by all essential island services nationwide, but is complicated in Portland by the use of the system for weekday commuting.

o The service is typical of island ferries which provided essential transportation lifelines for island residents. Without the daily ferry lines the islands would not be able to support year round residential communities.

o Casco Bay Lines are the longest running daily service in the U.S., operating continuously since 1871.

o While annualized upgrading and replacement for vessels and terminals are planned; no expansion is required or anticipated.

o The system is purposely designed for regular operation through extreme weather ranges including severe winter storms, wind, wave and tide conditions, to assure daily service.

o The secession of Long Island from the City of Portland in 1993, and requested secession by two other islands may complicate the future funding balance by city and state, which is indirectly tied to Portland and island real estate taxes.

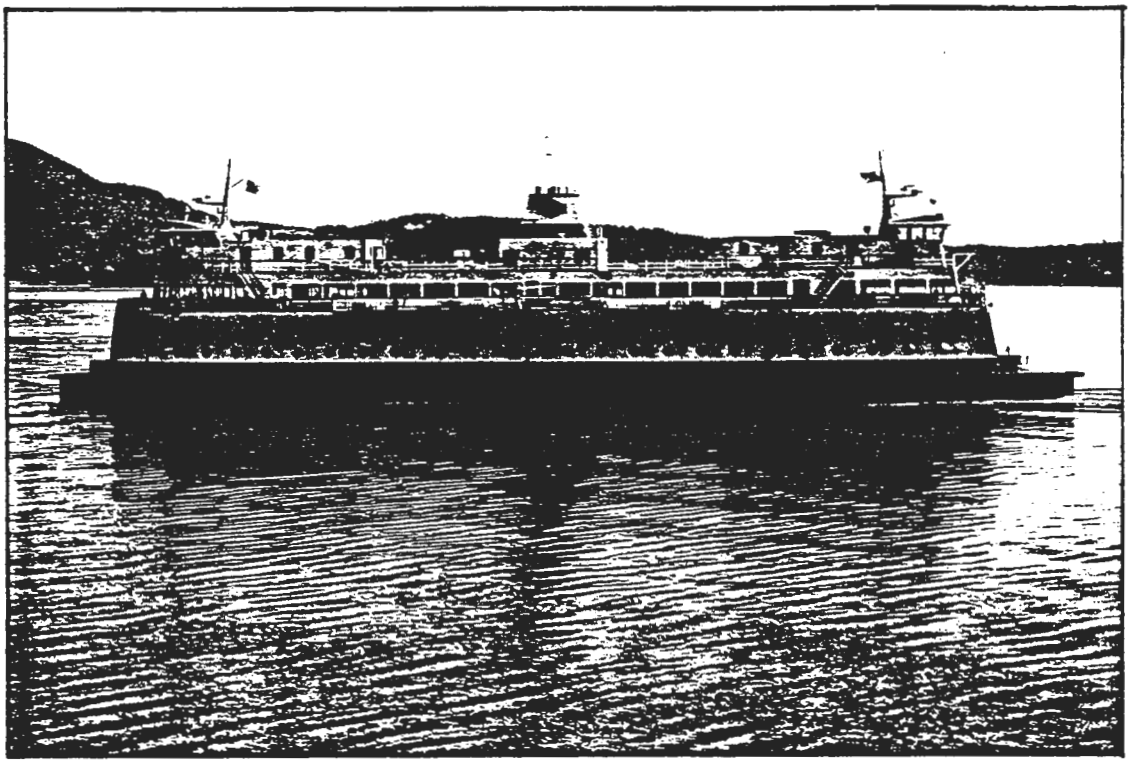
## 3.13 San Francisco, California:

The Bay Area is served by multiple public and private ferry systems and routes, and has been a major innovator in starting contemporary commuter systems over the past 25 years. The Golden Gate Ferry system, which serves the North Bay counties, introduced high speed commuter ferries to the US in 1971 and set an important precedent for new systems as alternatives to land based transportation infrastructure expansion. The size of San Francisco Bay and distances traveled by commuters have led to experiments with implementing increasingly longer distance high speed services such as the second generation Vallejo service started in 1986. With more routes in the planning stages, with more advanced vessels in construction, and with innovative state capital funding programs in place, San Francisco is about to enter its next generation of ferry resurgence.

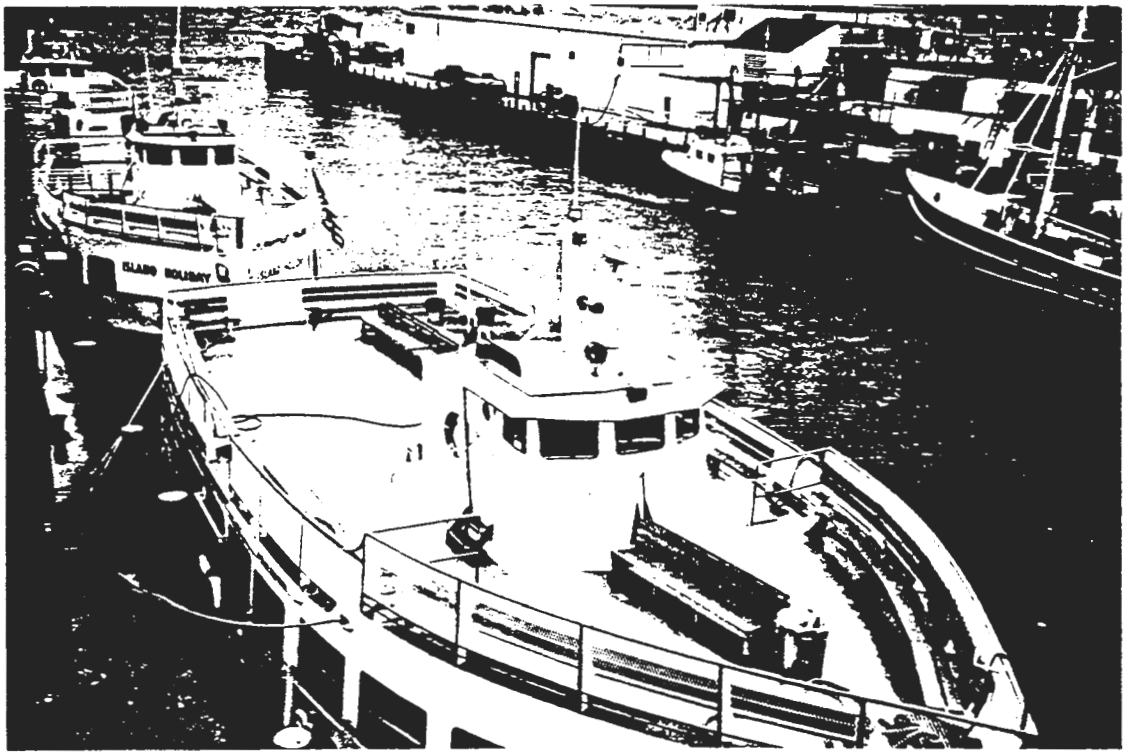
Historically, the primary crossings were from the downtown Embarcadero Ferry Terminal in the heart of the port to the port of Oakland, and to the rail heads connecting to the east, as well as those to Sausalito and the north bay. The first major system decisions came in the late 1930's when most of the car, passenger, and rail ferries were replaced by the two major bay bridges.

The second major turning point came in the early 1970's with the planning and implementation

Figure 3.2: Examples of Traditional Existing Vessel Technology



o Double Ended Passenger/Vehicle Ferry (WSF Puget Sound)



o Heavy Weather Passenger Ferry (Casco Bay Lines)

of the Golden Gate Ferry System which determined that state-of-the-art high speed ferries and an expanded bus system were more cost effective than either a new rapid transit link or second Golden Gate bridge span. The success of the publicly operated services from Larkspur and Sausalito, and the privately operated service from Tiburon to downtown San Francisco established Bay Area and national precedents for the return of passenger ferry service to urban harbors.

The third set of decisions occurred when the next generation of ferries was introduced with the application of highspeed vessel technology by private operators, with the start-up of the Vallejo catamaran route in 1986 and a second to Oakland in 1989. These services demonstrated the viability of the U.S. built/foreign designed highspeed technology to provide new options to parallel landside routes, and new techniques for public-private partnering.

The fourth set of decisions currently being implemented includes expanded existing and new routes in the 1990's with even higher speed, more competitive vessel technologies. These routes are being implemented in accordance with the MTC Regional Ferry Plan, and funded by an innovative state referendum providing capital funding for vessel and terminal construction. The new routes and vessels will provide faster water trips than the landside alternatives, while relieving pressures on the overburdened highway and transit infrastructure.

o The public and private ferry services in San Francisco Bay provide complementary transportation alternatives to land-based highway and transit options, offering varying degrees of time/distance savings. The proposed new ferry routes are intended to increase time savings by use of higher speed vessels.

o The Golden Gate Ferry is the classic example of an early regional transportation planning decision to provide a publicly subsidized high speed ferry system in lieu of expanding land-side and bridge infrastructure. The system was started in 1970, and continues to increase in ridership.

o The Vallejo commuter route marked an early U.S. use of the high speed catamaran for a ferry commute too long for conventional lower speed vessels. Plans are processing to improve and expand this East Bay Service.

o The privately operated, publicly subsidized routes to Vallejo and Oakland rely on off-peak or reverse flow excursion use of vessels to internally cross-subsidize routes, through intersecting contract incentives.

o The recently completed Regional Ferry Plan: San Francisco Bay was an innovative multi-jurisdictional effort by the Metropolitan Transportation Commission (MTC) to explore new ferry options to land-based highways and transit. The planning initiatives were accompanied by legislative funding commitments through state-wide public referendum for route proposals for Vallejo and Alameda.

o The publicly mandated California state funding is dedicated to one-time expenditures for the high capital costs of vessels, but does not subsidize ongoing operations costs.

o The San Francisco landside transportation infrastructure is largely complete. The State DOT along with the Metropolitan Transit Commission are actively promoting multi-modal

mechanisms for transit conversion from single auto commutes where ever possible, to try to lure increasing numbers of Californians away from their cars.

## 3.14 Mississippi River, Louisiana:

The cross-river vehicle ferries in urban New Orleans and rural communities up and down river in the Mississippi Delta area of Louisiana serve primarily as essential highway links for commuters and other business related trips. The peculiarity of the Louisiana towns or parishes straddling the river with linked land-uses on opposite banks has, over several centuries, created the need for cross-river ferry connections. Many connecting state highways are operated by The Louisiana DOT through its regional offices, while other roads are operated by the counties or parishes with town functions on opposite banks. The system is typical of many long operating, low volume ferries serving areas where existing land and bridge trips are circuitous and time consuming, and where construction of new bridges is either environmentally sensitive, or not warranted by travel needs. The typical ferry route saves rural drivers an average of 60 miles and urban drivers up to 45 minutes of travel. The New Orleans ferries combine passenger and vehicle service.

The critical turning points in the ferry history initially occurred in the 1940's and 50's when the first bridges were built across the Mississippi in New Orleans which made many of the ferries redundant. This was accompanied by relocation of the major port related industry and jobs from the central east and west riverbanks to more remote locations down river. Many of the traditional ferry routes in the parishes were maintained as there were fewer and more widely spaced bridges, and the cross-river work opportunities remained. The state purchased the remaining routes in New Orleans and many of the Parish systems and continued their operations as highway links.

A second decision point involved the start-up of the first new ferry service in New Orleans in nearly a century, when a vehicle-only service was instituted by the Crescent City Connection in response to new industrial development downriver and in anticipation of a new highway bridge crossing. The Chalmette-Algiers ferry was introduced in 1969 as a temporary substitute for the then-proposed Dixie Highway, and serves as a downtown commuter by-pass in two directions. The highway is permanently on hold because of environmental constraints, a typical condition along the bayou since NEPA legislation in 1970, and the ferry continues to be the highest volume route in the system.

Future decisions for the Mississippi ferries are related to several variable factors. Environmental legislation may or may not allow new bridge and highway construction along the river edge, which in turn will lead to abandonment or continued ferry routes depending on location. Another determinant of the urban services will be future new uses along the New Orleans east and west banks, such as riverboat gaming, and their impacts on the existing transportation system.

- o Mississippi River ferries are classic examples of complementary services providing low-volume, cross-river highway links, providing users with substantial time/distance and cost savings over circuitous highway/bridge options.

- o Louisiana delta environmental conditions have diminished bridge construction in the past 25 years and are likely to continue to do so, making the continuation of current

ferry services necessary.

o The unique two-sided settlement patterns of parishes combined with more recent industrial employment locations have contributed to commuter vehicle ferry service needs.

o For the three (3) New Orleans routes, ferry operation costs are linked to bridge tolls, and services are connected to land-side transit routes.

o The tourism focus of the New Orleans economy provides off-peak uses for the Algiers Ferry and future opportunities for increased utilization with the establishment of riverboat gambling locations up and down river.

o The Chalmette-Algiers ferry is a good example of an efficient highway link for urban commuters as an efficient substitute for the proposed Dixie Highway bridge which encountered environmental constraints.

## 3.15 New York, New York:

The century-old, predominantly passenger Staten Island Ferry, which currently carries by far the most passengers on any single route in the U.S. More recently, however, in response to the capacity-constrained metropolitan transportation infrastructure and highest transit use pattern of any U.S. city, several new private cross-Hudson services have been successfully started in the region. Since 1986 new services have provided connections to Manhattan along the Weehawken, Bayshore and Hoboken commuting routes. The public sector has served as a catalyst through aggressive market analysis and planning, along with provision of terminal locations for these new routes. The city and state have had to devote limited operating resources to the highly subsidized transit and rail system as well as to the Staten Island Ferry. The fact that commuting is often inter-state and intermodal seems to have fostered, to some extent, the private ferry operations which might otherwise have required complex two-state subsidies, Recent planning for expanded services within New York City by the New York State Urban Development Corporation, New York City DOT and the Port Authority has been innovative and shows signs of success.

Initial historic decision points for New York ferries were much the same as in the other urban ports, with the tunnels and bridges of the 30's, 40's and 50's eventually reducing the 50 or more ferry routes operating in 1910 to only the Staten Island Ferry and one other by 1960. The cross-Hudson ferries finally closed down from Hoboken and Weehawken when the last of the private commuter rail/ferry link lines folded in the 1960's.

The first examples of passenger ferry resurgence didn't occur until the late 1980's with the Port Imperial and Bayshore services, which grew into the active cross-Hudson system which operates today. This second round of decisions resulted from the ever expanding ring of commuter residential areas, the residents of which began to experience increasingly excessive trip times to and from work. The private sector sensed the new interstate market demand for less stressful and more direct services and began experimenting with the new ferry routes.

The third generation was marked by the successful implementation of the Hoboken to Battery

Park City route in 1990, and the advent of publicly planned and privately operated fast ferry options to relieve pressure on an overcrowded transit and tunnel system. An innovative regional transit planning process was led by the Port Authority of New York and New Jersey, which identified the demand and routes, offered a franchise and docking rights, and found an operator.

These initiatives and successes set the precedent for the current and future fourth generation of commuter passenger ferries. The New York High-Speed Ferry Plan promises several new routes granted to a series of private operators in the summer of 1993. Franchises were awarded to three proponents for high speed routes from Staten Island to Midtown, expanded Bayshore/Brooklyn, Hunters Point, and Yonkers/Westchester to Manhattan. The latest generation of ferry services were in response to the increasingly overcrowded highway and transit infrastructure, as well as to provide mitigation during infrastructure repair. Existing routes also continue to expand to meet ever increasing demands by commuters for more convenient and time-efficient options.

o The Staten Island and Bayshore ferries provide complementary services to circuitous and congested landside routes with varying degrees of time savings depending on daily traffic conditions.

o The new generation of New York commuter ferries has served as complimentary transit options to existing tunnel and bridge corridors, with qualitative benefits to the riders. By diverting both auto and transit riders, the routes have prolonged use of existing highway and rail infrastructure capacity. The ferries are providing a stop-gap alternative to building additional bridges and tunnels.

o The proposed new highspeed commuter routes will provide a combination of complementary, time saving services, as well as optional, equal time but high amenity services depending on the route. They will also provide mitigation for commuters during major landside highway reconstruction.

o New York's new commuter ferries are the ultimate current example of private sector systems responding to increasing transit demands created by the fixed and over-extended transportation infrastructure in the largest, most densely developed U.S. city.

o The public roles of facilitator/planner played by the Port Authority, NYC DOT and NYS UDC, backed by city policy to preserve and operate Manhattan ferry terminals, has been successful in attracting market driven private services.

o The Port Imperial Ferry Bus has been innovative in providing new vessel technology, model service, and private intermodal bus connections in Manhattan for its cross Hudson services from Weehawken and Hoboken.

o The TNT Hydrolines Bayshore Service has proven the effectiveness and niche marketability of high speed catamarans over longer distances from Monmouth County, NJ to the Wall Street area in lower Manhattan.

o The new expansion franchises proposed in the New York regional ferry plan are intended to extend route lengths and transit options by use of new high speed commuter passenger ferry service to Manhattan.

o The private ferry networks are demonstrating innovative new ways of relieving commuting pressure on existing highways, bridges, and tunnels as well as transit systems such as the PATH links from New Jersey.

## 3.2 Transportation Planning Context: Three System Types

### Regional Transportation Needs and the Role of the Ferry System

All systems studied were found to be responsive to emerging regional and local transportation needs over varying historical time frames. Transportation requirements and responses varied by location but in most cases included a public transportation function combined with a excursion or recreational component. A hierarchy of transportation needs emerged ranging from services providing the only regular transportation service, to those providing preferred complementary services to other existing landside modes, to optional transportation services providing some advantages to parallel landside alternatives.

**1. Essential Water Transportation Links - Ferries as the Sole Means of Transportation:** Portland's Casco Bay Lines connect islands with mainland and offers the only daily transportation link for year round residents. This example reflects the many island to mainland systems in the U.S. which are described as "marine highways" or "transportation life lines" for off shore communities. The long duration of daily service and evolution from public to private to public operation attest to the shifts in demand, changes in economic viability, and institutional adaptations required during the Portland system's history. While most year round island systems are operated by states or municipalities, there are examples of privately operated routes such as Block Island (Rhode Island) and Bayshore/Long Island (New York). Many of these systems have peak tourist seasons which cross subsidize off-peak operations. Another category of island services includes those which are primarily recreational and are seasonal only, such as Put-in-Bay in Lake Erie. The importance of maintaining the year round systems as marine highway lifelines is reflected in the commitment to such systems by their respective states; Maine for the Maine State Ferry System and Casco Bay Lines, Washington State for the San Juan Islands and Rhode Island in support of the Block Island Ferry. These and other states with island services have in the past effectively used FHWA funding to support their systems, and are now taking advantage of the broader applications of ISTEA programs.

**2. Complementary Water Transportation Links - Ferries as More Efficient Routes than Alternative Land-Based Options:** Many of the systems studied provided examples of daily scheduled water-based transportation which greatly reduced travel time, cost and distance when compared with available land-based alternatives. The Washington State Ferries crossing Puget Sound have provided options for passengers and vehicles to the long and congested bridge/highway routes from the western peninsula through Tacoma to Seattle. Similar systems include the Bayshore (New Jersey) and Staten Island Ferries to Manhattan, the Mississippi River routes serving parishes up and down river from New Orleans, and some of the proposed new high speed ferry routes in New York Harbor and San Francisco. Other older routes in the U.S. serve a similar function such as the Lake Champlain service, and the Cape Hatteras Ferries in North Carolina. The numbers of riders vary dramatically from the high volume WFS system to the Mississippi River ferries carrying a smaller number of vehicles. Attractions to users include

travel time and cost savings, reliability of trip time and enjoyment the ferry experience.

**3. Optional Water Transportation Services - Ferry Routes Serving Transportation Corridors as Transit Options to Parallel Land-based Routes:** Many of the newest generation of private routes fall in this category including recent and proposed services in congested urban areas. The precedent for such passenger water transit routes was established by the Golden Gate Ferries to Marin County in San Francisco and followed in that area by the Tiburon, Oakland/Alameda and Vallejo catamaran services, all of which provide cross-bay residents with alternatives to auto commuting via highway and bridge. Existing services also include the Weehawken and Hoboken services from New Jersey to Manhattan and the passenger-only cross-Puget Sound services provided by the Washington State Ferry System. Proposed services include those new passenger-only services in Puget Sound by WFS and the Mosquito Fleet, and several new routes in New York Harbor including Hunters Point and Jersey City crossings. The importance of this emerging category is that these optional water routes along existing transportation corridors provide alternatives to auto or bus commuting because of reliability, time cost savings, and to transit in terms of amenity and quality of service versus overcrowded commuter rail or subway routes. Such systems become attractive to users when land-based options become unpredictable, too costly (often in terms of parking for auto users) or too congested. The public benefits of water services in such corridors are to relieve pressures on overburdened existing infrastructure and in some cases as mitigation during construction or repair of land-side transportation resources.

Each of these uses of water transportation in particular locations are providing essential public transportation benefits. In service types 1 and 2 the benefits are direct and quantifiable in terms of costs per passenger mile. In type 3, where private services are finding new niches of market demand, the public benefits are sometimes direct and sometimes indirect, but are contributing to regional transportation networks by easing the burden on subsidized public transit systems or by diverting auto users to transit for at least a portion of their ride. All deserve continuation of the support they are receiving by the public sector at Federal, State, metropolitan and municipal levels.

The case study systems are compared by general transportation function in Table 3.1. In addition to the types of service offered by each system route, the table includes the competing landside modes, the approximate savings in distance travelled, and the basic type of operation.

## 3.3 Market Factors: Past, Present and Future

### Emerging Market Factors

Just as the markets for ferry services diminished to near extinction with the linked decline of rail and transit use and the rise of auto travel and commuting in particular from the 1970's through the 1980's, the case studies indicate how particular ferry routes and services survived because of the particular nature of the routes and markets served. In addition, the emerging and new services in different regions indicate that with current urban transportation trends in waterfront cities, ferry services can fill particular travel niches quite effectively and can be operated privately at a profit, or publicly with minimal subsidies where market demands are emerging. The factors making ferry usage increasingly attractive include reliability, predictability of trip time, time

Table 3.1

**Comparative Analysis of Individual Routes by Transportation Function and Land-based Alternative:**

| Location and Route: | 1.Trans. Essent'l Link | 2.Trans. Compli-ment'ry | Trans. Option-al | Land/ Alts. | Approx dist. Ferry/ Land | Instit'l | Gen'l |
|---|---|---|---|---|---|---|---|
| **Seattle** | | | | | | | |
| o Cross Sound | - | Yes | - | Br/High | 10/70m. | Public | Tacoma |
| o San Juan Isls. | Yes | - | - | None | - | Pub/Priv | NoAlts |
| o New HiSpeed | - | Yes | Yes | Br/High Hi/Bus | 10/70m. = | Pub/Priv | Tacoma N.Sea. |
| **Portland/ Casco Bay Isl.** | | | | | | | |
| o Peaks | Yes | - | - | None | - | Public | NoAlts |
| o Outer Isls. | Yes | - | - | None | - | Public | Noalts |
| **San Francisco** | | | | | | | |
| o Golden Gate | - | Yes | - | Br/Bus | = | Public | Upgrad |
| o Vallejo | - | Yes | - | Br/BAR | 6/25m. | Pub/Priv | Upgrad |
| o New HiSpeed | - | Yes | _ | Br/Bus | 25/35m. | Pub/Priv | New |
| **Mississippi River** | | | | | | | |
| o New Orleans | - | Yes | - | Br/High | 1/20m. | Public | NoBr. |
| o Parish Links | - | Yes | - | Br/High | 1/50m. | Public | TolBr. |
| **New York Harbor** | | | | | | | |
| o Staten Island | - | Yes | - | Br/Bus | 5/15m. | Public | |
| o FerryBus | - | - | Yes | AllMode | = | Private | |
| o Bayshore | - | Yes | - | AllMode | 18/40 | Private | |
| o New HiSpeed | - | - | Yes | AllMode | = | Private | |

savings, total commuter trip cost savings, amenity level, and in some cases the high tech aura of a new transit mode which resembles airplane travel.

**1. Past Ferry Markets:** The market appeal often was based on the same factors as described above. The commuter ferry systems were often owned and operated by rail companies and/or transit companies who provided the ferry link as a component of a total trip. For example from New Jersey to New York City, the ferry was part of a comparatively seamless trip which started with commuter rail, shifted to ferry at the Hoboken/Lackawana Terminal for example, and continued with trolley connections in Manhattan to final work destinations. The very model of a privately operated intermodal passenger system, such trips were the most cost and time efficient travel options in their day and differed among operators by class of passage and level of amenity. Land-based vehicular options were either non-existent or extremely time consuming because of lack of bridges, tunnels and highways.

The case study systems which have survived from the heyday of ferry travel include the ferry routes in Casco Bay, the Staten Island Ferry, the New Orleans ferries and the Seattle ferries all of which were once part of continuous regional networks of transit connections. Ironically, current improvements to these services and attraction of new riders are linked to the restoration of landside intermodal transit connections.

**2. Existing Ferry Markets:** Contemporary systems have worked hard to attract new markets to maintain their economic viability in response to rising operating costs. Public and private operators have sought ways to improve their utilization rates relative to fleet capacities by expanding existing markets to fill their vessels on more of their scheduled runs. The methods are often related to the historical factors of reliability, time savings and amenity. By utilizing high speed technologies such as the catamarans used by TNT Hydrolines on the Bayshore routes, and the fast monohull vessels introduced by Golden Gate or more recently by the Port Imperial FerryBus, these ferry routes have been effectively marketed as state-of-the-art transit. The re-introduction of direct land-side transit connections has been successful in many systems from the Golden Gate Larkspur service, to the Weehawken FerryBus and its private Manhattan fleet of landside bus connections. Each system has expanded ridership with improved land-side services.

Marketing and communication of services to the general public has always been a problem for the often narrowly defined niche markets targeted by ferry routes. They seem best served when portrayed as integral with regional transit system descriptions, advertising and maps, particularly where specific water gaps are served. Other successful techniques for marketing both commuter and recreational uses have included extended packaging and linkages to other land-side attractions or destinations. For example, commuter services have been extended through the Transit Fare program wherein private businesses offer state-sponsored transit subsidies to employees, or in the hospitality sector where hotels, restaurants or other waterfront businesses offer reduced fares to their patrons.

**3. Future Ferry Markets:** The emerging markets can be described in several categories. New commuter markets are being generated primarily in urban areas with high density transportation corridors for existing trips, which for some riders can be improved with new water transit links. Proposed services for New York Harbor from Staten Island to mid-town and expansion of the Bayshore to Manhattan operation will seek to divert primarily auto and express bus commuters. A second market involves connecting new communities or new recreation destinations by ferry

to employment centers or central terminals. The Alameda to San Francisco route is intended to serve a new suburban residential population as are some of the other proposed North Bay routes. The Vallejo service expansion is partially based on the two-way use of ferries for taking commuters to San Francisco and returning tourists to new and expanding recreation centers in Vallejo.

The increasing role of tourism is becoming an integral part of both public and private operations. In all of the case study services, marketing of high season and off-peak services as integral to the regular routes has been a major break through for more efficient vessel use, a higher profile for the system, and new economic development opportunities for the terminuses. The WFS system as the major tourist attraction in Washington State is one large scale example, while the marketing of the Algiers Ferry in New Orleans and the Casco Bay Mail Run in Portland are smaller in scale but equally important to their respective systems. The blending of peak hour transit use with seasonal and off-peak recreational markets are keystones to the survival of established systems and start up of new ferry routes.

## 3.4 Environmental Factors: Physical and Social Impacts

### Environmental Factors:

The case studies revealed a variety of broad brush and detailed examples of both the many positive and few negative environmental impacts of ferry systems. In an era when water and air quality have become national priorities, the use of ferry systems in balance would seem to provide many benefits in both categories. Most of the negative impacts of individual routes and vessels appear to be technically capable of resolution, but as with all factors are subject to local condition. Categories of environmental impact which seemed related to the issue of choice between land and water based transportation included physical aspects such as air and water quality, wetland considerations and vessel technologies. Social Factors include such influences as growth management, sustainability, and other community related impacts.

**1. Physical Impacts:** As has been described in detail in the case studies the physical impacts include those on the water and those on the land.

o Air Quality: Based on current national environmental policy objectives, the primary contribution of new ferry systems and many of the older passenger and vehicle ferries related to the improvement of national and urban air quality through the reduction of vehicle miles travelled or "VMT's". All vehicle ferry systems studied reduced auto, bus or truck trips by providing shorter alternate routes. All passenger systems and some vehicle systems such as WSF were strongly oriented to reducing or eliminating auto trips. While total volumes of diverted drivers varied from systems such as the cross Hudson routes which carry over 85,000 passengers per day, to the Casco Bay Lines which carry less than 1,000 per day in the off-season, all contribute significantly in proportion to their local commuting populations, and are important components of their respective regional transit riderships. Even predominantly vehicular routes such as those on the Mississippi provide significantly daily trip/mile reductions for their patrons, saving from 30 to 60 miles driving per person per trip.

o Water Quality and Vessel Technology: Effects of ferries on water quality need to be considered in several ways. While the actual vessel power sources have some negative aspects

in terms of fossil fuel leakage, most vessels are well equipped regarding other categories such as holding tanks for sewage, and have improved dramatically in recent years. Other types of issues such as wake and wash, which cause shore erosion, are often related to hull types and design. While great innovations have been made abroad in highspeed, low-wake/low-wash designs, such as the Sydney Rivercat shown in Figure 3.4, they are only slowly being adopted by the U.S. markets and approved by the Coast Guard. The waterways are certainly under-utilized in most port locations today when compared to earlier times.

Despite some environmental regulations which might suggest the contrary, such as limitations on dredging, pier structures or bulkheads, ferry services are fundamental water dependent uses and should be given reasonable latitude for such activities as needed to provide direct and responsive services. Experiences with state environmental permitting procedures such as those encountered in a Monmouth County, N.J. initiative to combine a ferry terminal with a existing fishing port. can be time consuming, costly to proponents and counter productive. The ferry terminal in this context was treated as if it were a non-water dependent land-based development, and subjected to lengthy and at times contradictory review standards.

o Wetlands Issues: Post NEPA, the impacts of land-based water crossings such as bridges and tunnels on wetlands required much extensive analysis and mitigation for implementation in some areas of greater sensitivity. The lower Mississippi Delta, for example, consists of swamps, bayous and other wetland resources which have precluded major new highway and bridge corridors since the 1970's. The retention of ferry routes in many locations was based on the distance to bridges built. The remaining services, and the new route from Algiers to Chalmette have acted as temporary or permanent substitutes for bridges and highways which are unlikely to be built with current environmental regulations regarding wetlands. The impacts of a ferry terminal are much more localized particularly when connecting with existing access roads along the levees. Similar choices have been forced by environmental concerns in Puget Sound, and parts of San Francisco Bay, where the bridge and highway networks crossing water areas are for the time being complete.

**2. Social Impacts:** The other set of environmental impacts includes those which affect residential or business interests as defined by NEPA. The case study analyses revealed fewer issues by several which were important.

o Ferries as Island Lifelines: The Casco Bay Lines transition from private to public operation was triggered by the response island residents and support by the City and courts when a new private operator went bankrupt and was unable to provide adequate daily service from 1980 to 1982. The resulting takeover by a newly established city transit district indicates how essential island ferry services are to year round users and how their needs were met by the service operations takeover. The franchise and charter commitments, combined with city and community support were strong enough to allow for the whole service to be reorganized.

o Ferries as Mitigation Measures: In several settings the ferry routes have been used for emergency substitute transportation as was the case with the Oakland ferry in San Francisco following the 1990 earthquake, and the Hoboken ferry after the World Trade Center bombing in 1993. Ferries have been used to relieve traffic congestion during highway and bridge construction or repair in New Orleans, Boston, and Coronado, California. In addition ferries are proposed for construction period mitigation for the Gowanus Corridor in the New York High-Speed Ferry plan, by the new Staten Island Ferry to Midtown and the TNT Hydroline expansion

of Brooklyn to Manhattan service. These systems may require subsidies for terminals and operations.

## 3.5 Measuring Cost-Effectiveness of Alternatives

### Cost-Effectiveness of Ferries as Alternatives to Land-based Transportation:

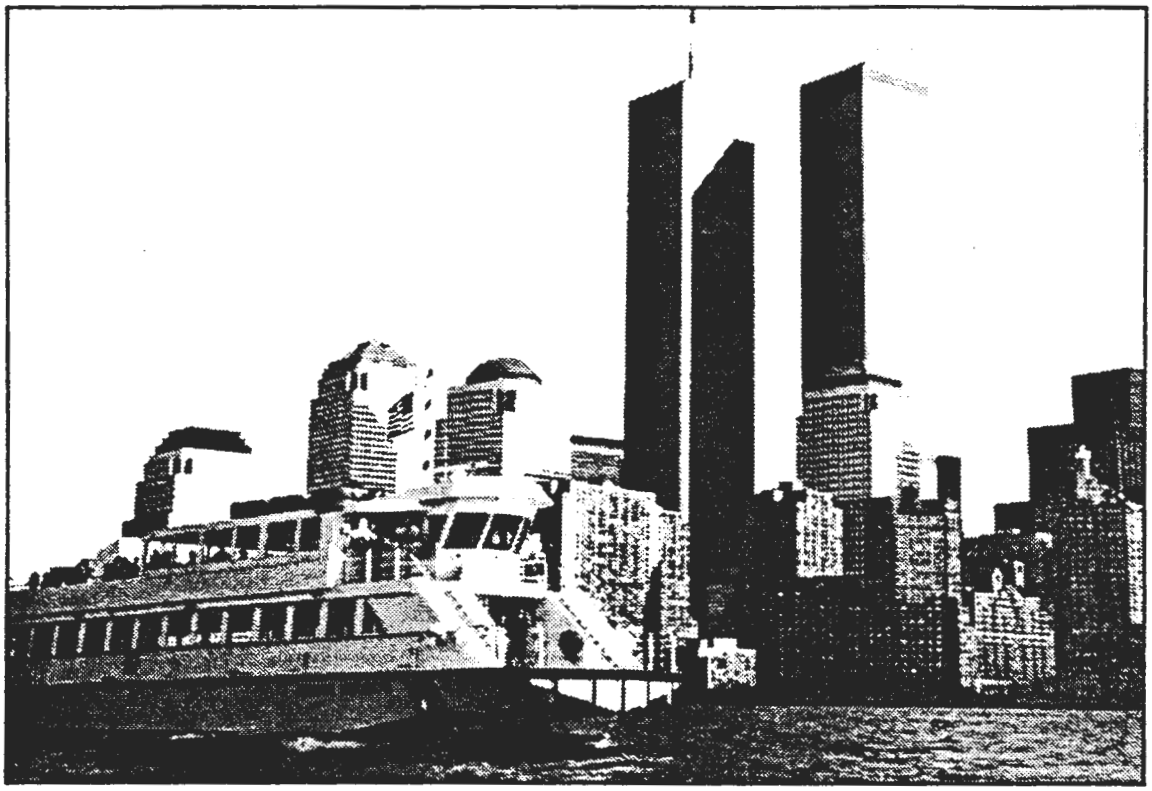
Each ferry system and use would require a separate cost effectiveness analysis because of the different settings, uses and competing modes. One way of comparing systems and subsidized versus non-subsidized service, or public versus private service is to consider examples by the route functions described above in the market analysis discussion. It should be noted that the vast majority of ferry systems used for passenger commuting and public marine highway functions are publicly subsidized and are likely to remain so. However the levels of subsidies are often comparable to or less than land-side transportation options, depending on public or private operation and/or fare structures.

**1. Costs of Marine Highway and Island Lifeline Services:** The most challenging ferry routes financially are those which serve islands daily and year round such as those to Casco Bay Islands and the WSF routes to the San Juan Islands. Each system operates remarkably well in terms of using seasonal tourism revenues to offset lower volume farebox receipts during winter months. There are effectively public subsidies in both systems such as terminal and vessel improvements. In both instances the operating subsidies are minimized by careful peak and off-peak scheduling as well as vessel design and utilization. The high capacity, low speed, energy efficient vessels help keep operating cost to revenue ratios in line.

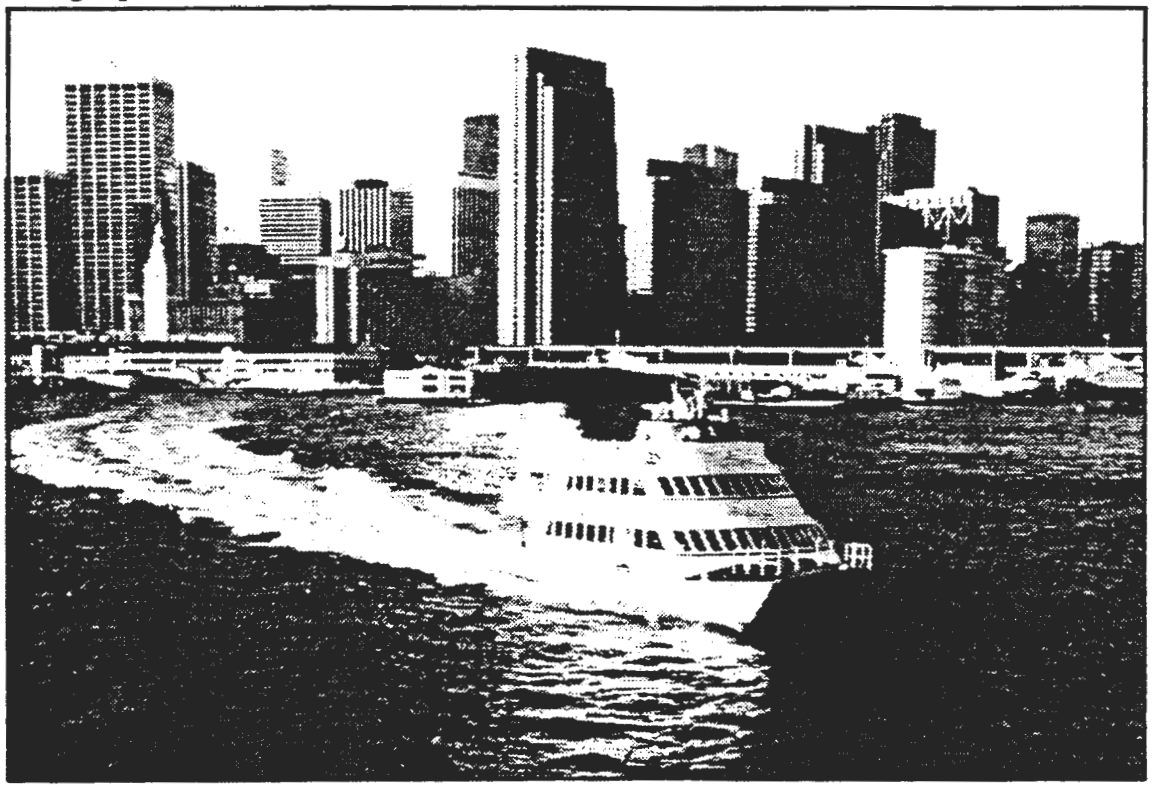
**2. Ferries as Cost Effective Alternatives to Longer Land-Side Routes:** for those systems which offer a preferable water crossing such as the Puget Sound routes to Seattle and the Mississippi River routes kept low to provide all users with access and to encourage system patronage. In these instances the farebox collection ration for operations is 70% for WSF which reflects high utilization, but estimated at less than 30% for various of the Mississippi Routes or Staten Island Ferry, because of low patronage, low fares, and frequent service schedules. Where there are distinct public benefits to the use of these routes, fares are often kept in line with bridge tolls or transit fares, and parking is also keep inexpensive to encourage passenger uses.

**3. Ferries as Options to Existing Land-Based Transportation Modes with Indirect Cost-Benefits:** The emerging new ferries systems in congested commuter corridors were shown to be more cost effective with positive farebox return ratios for several reasons. Systems such as the Bayshore Ferry charge market rate fares for a private, high-speed, high quality commuter trip, and are in business to serve niche markets and be profitable. The $400/per month ticket rate in 1993 was nearly 35% higher than commuter rail and 50% higher than express bus monthly rates. The shorter Hoboken and Weehawken services are more efficient because of the short trip and can charge high market rates relative to transit options ($2.00 fare for Hoboken vs. $1.00 PATH ride) and still attract large numbers of passengers because of the amenity and reliability factors. The high volumes on the 300 to 400 passenger vessels also help. The private services turn profits by offering a high quality travel experience which is analogous to plane service today, or the "luxury" rail or ferry service offered 100 years ago. The market rate fares from 50% to 100% higher than public transit are possible only in high density areas where the land-side alternatives are perceived to be unreliable, longer trip time, or more stressful for long distance

Figure 3.3: Examples of New Vessel Technology



o Highspeed Hudson River FerryBus (Weehawken and Hoboken)



o Highspeed Incat Catamaran (Vallejo and Bayshore)

commuters.

## 3.6 Economic Development Factors: Public and Private Costs, Direct and Indirect Benefits

### Economic Development

The case study systems demonstrated support of economic development in regions in two ways; in some areas ferry services sustained existing land development and real estate patterns, while in other areas the systems supported new land-uses and regional economic development.

**1. Support of Existing Land-Use and Community Patterns:** In the older urban and rural settlements on the east coast and gulf states, the ferries tended to support existing land-use and commuting patterns at various levels from the lower volume examples of the Mississippi River or Casco Bay island routes, to the high volume New York Ferries. The residential areas of parishes in Louisiana tended to be on one side of the river with the work destinations and civic institutions on the other, with the ferries connecting the two for daily travel.

**2. Support of New Waterfront Land-Use and Development:** On the west coast in the newer cities with suburban development continuing to spread further away from the central employment areas and extreme home to work trip distances the norm, the ferries have tended to provide support for new residential development as well as connect older areas to the city centers. The Larkspur to San Francisco ferry provides an example of how an early terminus with little surrounding development has become a mini-center for mixed office, commercial and residential development. The ferry has sustained a more rural low density residential option for those preferring to live on the western peninsula or Vashon Island. The Washington State Ferry System has also sustained portions of the ship repair and construction business, particularly in Winslow, because of the volume of repair and new vessel work generated. A recent initiative by the state in funding a new jumbo ferry construction program has required that all bids be from within the state for the upcoming $270 million program.

**3. Emerging Tourism and Recreation Markets:** The third major area of ferry-induced economic development may prove to be the most important. in all of the case studies, the dramatic increase in tourism use of ferries was most notable both as a means of improving operation revenues, and also assisting regional economies. The increasing trend towards combining commuter transit and transportation services with off-peak and season recreational uses of the vessels has enhanced both public and private farebox recovery while also solidifying the roles of ferry systems. The Sausalito ferry route in San Francisco has since its inception cross subsidized the longer commuter oriented Larkspur service through its heavy patronage year round by tourists. The Vallejo and Oakland ferries have also functioned for their private operators as peak commuter and off-peak reverse ridership show excursion services.

The recognition of the WSF system as the major tourism attraction in Washington State and perhaps in the Northwest is well documented, while its reputation as such and patronage continue to grow. The importance of the tourism function of ferries is that the experience of "sailing" across the water has become either the main attraction, as with the Casco Bay mail run, or the Algiers Ferry in New Orleans, or a primary part of the experience as with the San Juan Islands routes or the off-peak excursions up the Hudson River offered by the Port Imperial FerryBus and TNT Hydrolines. The principle of achieving maximum utilization of the durable

vessels has led to the aggressive expansion of ferries into excursion and recreation services.

## 3.7 Geographical Factors: Ferries Respond to Local Geographical Conditions

### Context: Topography, Navigation, Climate and Ferry Technology

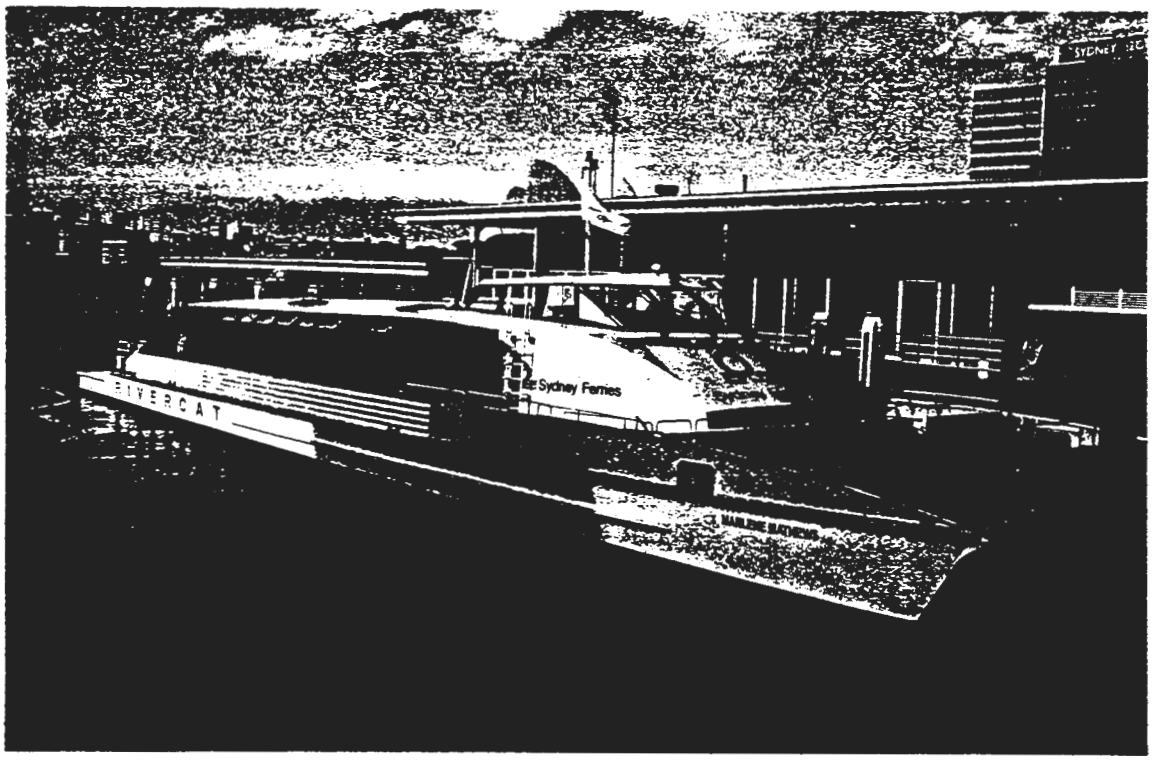
The geographical context is often the primary determinate of a given ferry system; historically in terms of settlement and land-use patterns and contemporaneously in terms of what types of routes and services across water areas are possible and can meet emerging transportation needs. The wide range of contextual settings and their very specific influences on water transportation lead to the finding that all ferry systems are determined in large measure by the local condition, and that the design and operation of most systems is highly particular to given waterway. Factors identified in the case studies which contribute to localized systems and choices between land and water based transportation included water and land topography, navigation conditions, climate and weather patterns, and evolving vessel design responses to these conditions.

**1. Water and Land Topography:** The five case studies represented a wide spectrum of port cities and their respective natural and man-made geography. Each harbor setting was selected historically because of a combination of water access and land development opportunities. The two east coast ports were established in the 17th century as major protected deep-water harbors, strategically situated for coastal and later international trade. The waterways were originally the only medium of transportation and their edges were transformed repeatedly through construction of piers and landfill to accommodate ever larger vessels for trade, and multitudes of smaller craft for transportation. New York Harbor was distinct because it had such exceptional natural protection combined with deep water access. Finger piers and ferry ships could be located freely along the Hudson and East River shores, and vessels needed minimal freeboard in the flat but wide reaches of the river. Portland harbor on the other hand was much more exposed to the open ocean, and winter storms, and the location of piers and vessel designs were determined accordingly. The island piers needed to be on the lee and protected side, and vessels required higher freeboard to contend with the complexity of wave, tide and current patterns.

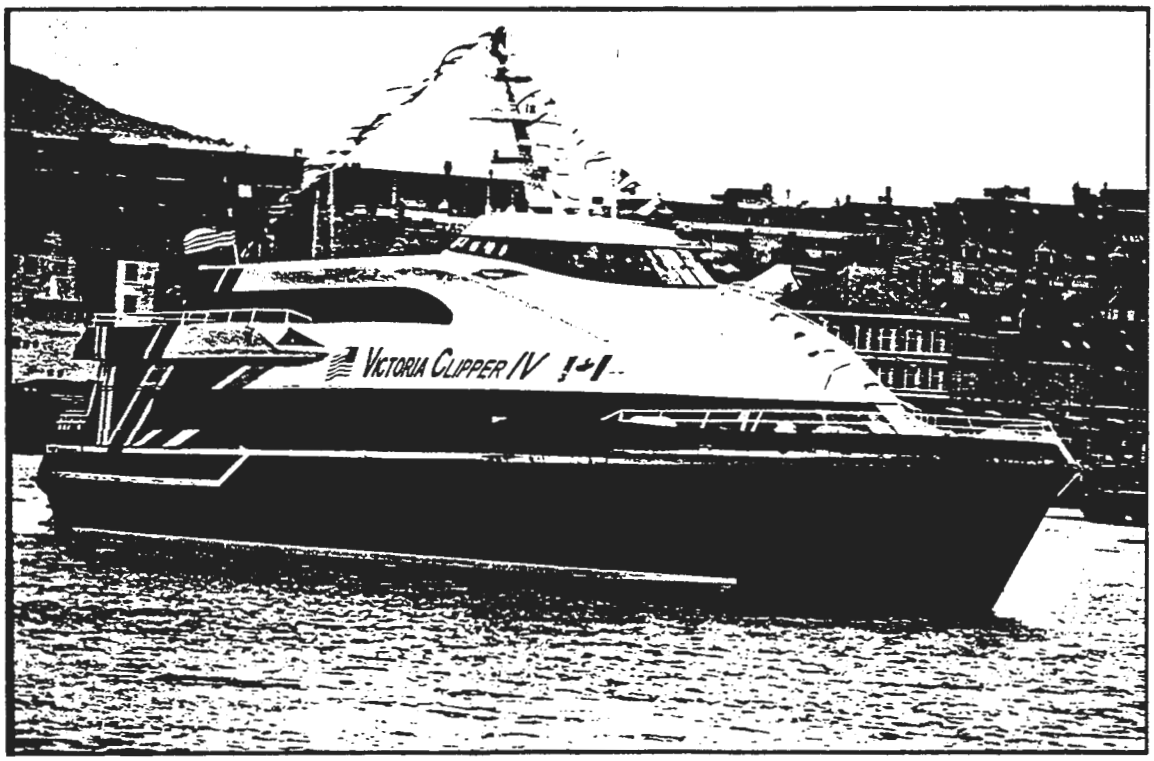
On the Mississippi River the New Orleans ferry routes were initially determined as literal connections of streets which continued across the river on the shifting grid pattern. Some were replaced by bridges, while others were eliminated by the overlay of highway system. The streets contained trolleys and rail lines which served the busy port functions on both sides of the river. The swiftly flowing river and hairpin turns required powerful steam powered vessels capable of carrying freight, vehicles, livestock and passengers. The city itself was forged out of the filling of the bayou with levees built to control flooding and the continual variations in river height.

The topography of the west coast cities was quite different. With few natural harbors along the coast, San Francisco and later Seattle became major trade centers. The ferries of San Francisco initially connected port and trade settlements around the Bay in relative proximity to the central port waterfront, such as Berkeley and Oakland. As those areas grew, the passenger and rail ferries flourished. The later 20th century routes beginning with the Golden Gate services to Sausalito and Larkspur required high-speed passenger ferries to negotiate the longer trips in a competitive commuting time as those working downtown spread further to North Bay suburbs. The next generation of highspeed ferry, the catamarans, were able to make longer trips in shorter travel time in the 1980's, while the future routes propose to use even higher speed vessels for

**Figure 3.4: Examples of New Vessel Technology**




o Highspeed Low Wake Catamaran (Sydney Rivercat)




o Highspeed Stabilized Catamaran (Victoria Clipper)

more distant locations such as Port Sonoma and Benecia.

Seattle by contrast, developed routes across Puget Sound which initially connected to natural resources such as the logging industry, and later to Bremerton and other industrial and port locations. The busy routes across the sound remained at 5 to 10 mile trip lengths suitable for large, high capacity, medium speed vehicle and passenger ferries, many of which have remained in service for decades. The newer private services such as the excursion oriented Victoria Clipper and proposed passenger only services are relying on new high speed technologies to open new markets and provide improved water based commuter transit options. The Puget Sound waterway is well protected and flat.

Each of the geographical contexts has determined custom-built ferry fleets, differing routes lengths, and terminal locations to suit each unique set of requirements. The land-side transportation infrastructure of highways and transit has been differentially influenced by the land and water forms as well. The intensive construction of new highways and bridges in each of the case study cities reached saturation between 1970 and 1980, with no major new additions other than replacement planned for the cities. Most of the highest priority connections were completed; those remaining were either excessively costly or had major environmental constraints. In each of the port cities considering expansion of ferry services, New York, San Francisco and Seattle, the waterways present the only remaining right of way options for expanding transportation, coming full circle to the earliest periods when they were the only transportation option.

**2. Navigation:** The case study systems were also influenced by navigation opportunities and constraints. Varying tide ranges and currents affect all settings. Even the Mississippi River experiences major level changes in excess of 20 feet during the average year. The currents and navigation channels, particularly in more confined harbor locations are also factors which allow or preclude routes. Shoal water conditions such as those on the Larkspur approach may require dredging or slow vessel speeds, thereby affecting route times. Exposure to open ocean at bay entrances such as San Francisco's Golden Gate, or the approaches to Portland Harbor, can affect routes and vessel design. Vessel licenses are also related to the types of water conditions in which vessel operates with protected (New York Harbor), semi-protected (San Francisco) or exposed (Portland) determining the vessel hull and other design factors.

**3. Climate and Seasons:** The case studies also demonstrate the wide range of climate and seasonal ranges which affect ferry operations, design and route selection. The Portland weather conditions represents an extreme in terms of temperature range, and winter storm exposure. Operating conditions in ice and cold present major extremes for vessel design, terminal configuration, and crew skills. The New York harbor, though in a milder climate, can experience icing problems in shoal areas like the New Jersey Bayshore terminal locations. Mississippi River conditions in the summer often include blinding tropical rain squalls which complicate cross river navigation in reaches where heavy shipping is moving down river at considerable speed. The vessels require considerable power, radar and communication devices. Captains are experienced river men and usually stick to a specific crossing route. In San Francisco, fog conditions during the summer can create localized constraints on navigation and discourage full speed operations for the faster vessel designs.

**4. Vessel Technology:** In general the design of vessels and training of skippers and crew are highly responsive to local weather, climate and navigation patterns. Only the catamaran designs

seem to have a degree of transferability between geographical locations. As has been described many of the geographical factors shape vessel design. Other examples include the early applications of catamaran technology for the Mississippi River ferries, which needed to be able to navigate quickly across the swift currents. the catamaran hulls reduced water area resistance, and allowed for the wide platforms needed to accommodate the side loading of vehicles. The high freeboard, monohull designs of the Casco Bay ferries allowed for maximum ability to deal with open ocean wave and wind effects, while also permitting multi-deck loading to deal with tidal variations. The specially designed end-loading for the Port Imperial FerryBus and terminals has reduced boarding time for the 300-400 passenger vessels and allowed for shorter crossing times combined with frequent headways.

It should be noted that foreign vessel technologies have long been recognized as well advanced over contemporary U.S. designs. U.S. construction of franchised foreign vessel designs, as mandated by the Jones Act, are introducing proven high speed technologies to the domestic market such as those proposed for the new Staten Island ferries in the New York regional plan. Much more research is necessary, however, and purpose-built designs for different ports and different regions are likely to continue as evidenced by the case study examples. A major concern in future vessel layouts and terminal designs will be responding to the Americans with Disabilities Act (ADA) access requirements. Regulations for vessels are being formulated nationally, while terminal access requirements are to be set by the states locally.

Examples of established vessel technologies described in the case studies and other sections of the report are shown in Figure 3.1 and 3.2, and new technologies, including both domestic and foreign, are shown in Figures 3.3 and 3.4. Included are vessels which serve widely differing functions and require different levels of capital and operating cost.

## 3.8 Comparative Summary Analysis

The 5 systems are compared based on factors described in the following matrix, as shown in Table 3.2 with summaries for each given in three main evaluative categories; 1) typologies included in the system, 2) dominant distinguishing characteristics, and 3) transportation, environmental, geographical planning determinants.

**Table 3.2 - Comparative Analysis of Systems by Similarities and Differences**

| System | Alt. Routes Yes/ No | Urban Long/ Short | Rural Long/ Short | Existing System | Expanding System | New System | Relevance |
|---|---|---|---|---|---|---|---|
| **1.Seattle** | No | Med.& Short | - | • | • | - | Largest Vol.Syst. /Tourism |
| **2.San Francisco** | Yes | Med.& Short | - | • | • | • | Gold.Gate as High Speed Alt. to Landside |
| **3.New York** | Yes & No | Med.& Short | - | • | • | • | Staten Isl. Commute. /Private Route Success |
| **4.Portland Casco Bay** | No (Islands) | Med.& Short | - | • | - | - | Daily Isl. Commute. /Severe Nav.Cond . |
| **5.Miss.Riv. Ferries** | No | Short | Short | • | - | - | River Ro-Ro as Alt. to Bridge |

## 4.0 EMERGING DECISION FACTORS IN WATER TRANSPORTATION

### 4.1 Transportation Trends Influencing Future Water and Land-Based Choices:

#### Key Trends and Findings

Based on the historical analyses and detailed evaluations of the case study ferry networks as well as more general overview gained from the Phase 1 surveys, decision factors in ferry system planning, as well as patterns of similarities and differences became apparent. Identifiable trends emerged with respect to newer and proposed systems which are critical to understanding how ferry systems are currently serving as alternatives to land-based options and what roles they may be expected to play in the future.

#### Emerging Roles for Ferries

o Increasing Role of Recreation and Tourism for Ferry Systems: During the past 5 to 10 years, the role of expanded seasonal and off-peak use of vessels and operations has become an essential economic component by increasing revenues in most of the ferry systems providing year-round, daily transportation services. Tourists are increasingly planning travel itineraries to include ferry links as integral vacation events, particularly those serving islands. Public and private operators are responding by adapting services and schedules to accommodate and attract these new demands. Such systems as WFS, Victoria Clipper, Golden Gate Ferries, Casco Bay Lines, Martha's Vineyard and Nantucket Steamship Authority, Port Imperial FerryBus, and many other public and private operators have experienced major increases of ridership for off-peak and weekend special services, particularly in the past 5 years.

As fiscal responsibility for publicly operated systems has become a legislated necessity in many states, and as profitability has always been pivotal for private operations, the increasing recreational and excursion uses of the systems have become integral to most examples studied. The Washington State Ferry system has become the primary tourist attraction in the state and has benefitted immensely at the farebox as well as in statewide public support. The public and private systems in New York derive substantial income from tourist business during and after peak hours. The San Francisco commuter ferries carry reverse riding passengers to and from the city avoiding "dead-headed" runs or empty vessels and offer special trips and schedules on weekends. The New Orleans ferry to Algiers is used predominantly by tourists, and the Casco Bay Lines have benefitted by increases in peak seasonal patronage to offset the lower ridership of year round operations. Greater flexibility is needed for tourism and recreational uses of vessels with federal capital or operating subsidies to help offset the daily commuter operations which in most cases require public subsidies.

o Innovative Water Transportation Planning, Public Project Funding through ISTEA, and Private Initiatives: The case studies indicated a high degree of innovation in those locations where ferry system expansion has occurred. Such new routes as the Hoboken to Battery Park City in New York resulted from creative interstate transportation planning efforts conducted by the Port Authority of New York and New Jersey. The Port Authority and advisory committee provided a well documented market analysis and intermodal plan to attract bidders for a new

reconstituted franchise for operations across the Hudson River. The winning team of ARCORP and Hartz was able to respond and implement service rapidly due to an available fleet and prior experience at Weehawken with the Ferry Bus. With no operating subsidies, the service has been an unqualified success, and carries nearly 13,000 passengers per day, well beyond the original projects estimates. None of the intermodal and interagency synergy could have taken place without these coordinated efforts. Similar planning procedures can be extremely helpful in cases of multiple jurisdictions and help martial scarce resources as well as make use of ISTEA funding to the greatest degree possible.

o New Ferry Systems are Being Tailored to Specific Local Conditions: All systems were found to be highly responsive to local conditions and particular market demands, and are uniquely configured to meet specific needs. Vessel technologies and terminal facility designs have responded to variations in climate, navigation requirements, and other waterway characteristics. For example, ferry vessels operating in ocean conditions subject to tides, waves and currents are likely to be very different in design than those designed for river or lake uses which have different design determinants. New vessel technologies are allowing for regularly scheduled routes in water areas which previously would not have been suitable for ferry travel, by use of higher speed, lower wake, more accurate navigation and radar equipment, and computerized ride stabilization. Similarly the types of new operations and services offered are likely to adapt more precisely to market demand factors which may variously favor speed, comfort, weather protection, reliability, and/or fare structure depending on particular route needs. In addition, varying institutional contexts may also influence the character of a given service within public and private operating contexts. Public operations vary from state to metropolitan to city jurisdictions, or may be an independently chartered authority.

Ferry systems continue to be widely dispersed. Many states have no public transit oriented ferry operations at all, while others have their water transportation services concentrated in one or two areas. Accordingly the great majority of state transportation departments are either not in the ferry business at all or only on a localized basis, and state-wide or legislative support of ferry systems is difficult to achieve. Furthermore, most federally supported ferry funding tends to be through FHWA programs, and individual ferry systems must compete all other highway related projects statewide. It is therefore suggested that the specific nature of planning and implementation of ferry services with respect to federal transportation policy may require greater program latitude to respond to localized needs, conditions and design determinants, while still conforming to required long range and annualized procedures required of the state DOT's and the urban Metropolitan Transportation Organizations (MPO's).

**Transportation Service Needs and Market Demand**

The three types of service described in Chapter 3.2 as critical decision factors will continue to define the major public transportation functions served by ferries. However, growth levels for each of the three are likely to be quite different in the next few decades.

o Essential Ferry Services: The first category of water transportation includes those ferry routes which are essential and for which there are no landside alternatives available. These services include ferries to islands or other isolated communities and will continue to be needed as long as the land-uses remain. The ferry life-lines and marine highways will probably remain constant to serve year round populations or expand incrementally where demands warrant, with primary service increases resulting from growth in seasonal use for tourism or vacation-type destinations.

For these essential transportation services, public subsidy of various types will continue to be needed for marine highways, and operation efficiency and cost control will remain the primary goal.

o Complementary Ferry Services: The second category of transportation needs served by ferries would be those locations where alternative land-side routes exist, but are circuitous and less efficient than the water routes for commuting or through traffic. These types of service will also continue, but may be modified by improved vessel technologies, which provide faster trips, thereby increasing travel efficiency and attracting new users. Such a system is the proposed new fast ferry from Staten Island to Mid-town Manhattan, a water route currently not available, which would attract express bus and auto commuters to the shorter trip. current examples such as the Bayshore to Manhattan ferry and the Seattle passenger-only ferries provide time and amenity incentives for new users. The addition of landside intermodal connections, such as those provided by the Port Imperial Ferry Bus at both ends of the trip, can greatly improve the multi-seat trip and attract new patrons. There appear to be more opportunities for new and innovative ferry services in this second category, with substantial increases in ridership possible, particularly along those waterways in urban areas with heavily travelled parallel landside routes.

In this category of water routes as shorter alternatives to land routes, vessel technology advancements and innovations will be the key. Depending on the specific route and waterway, different combinations of speed, hull design (low wake and wash) and cost efficiency may be critical to the success or failure of a particular system. When the new Seattle passenger-only ferries re-placed the Catamarans crossing Puget Sound, the wake problems nullified gains expected in speed, as the vessels had to move more slowly through passages close to shore. The innovative fast catamaran vessel design in Sydney, Australia, called the Rivercat (Figure 3.4), was developed specifically for the Paramatta River and the proposed Olympic site to operate at 20 to 25 knots with minimal wake and maximum maneuverability. Such purposefully designed solutions, developed through state and/or privately sponsored research and capital funding, may represent a process needed for U.S. applications, even if the specific vessel is not itself transferrable. Other recent technology innovations include major advances in off-shore vessel technology all of which increase the operating range for passenger comfort in unprotected open water bodies. These include vessels currently operating in U.S. waters; 1) highspeed SWATH-type vessels, 2) the application of electronic stabilizing devices for conventional catamarans such as the Victoria Clipper (Figure 3.4), and 3) new hull shapes such as the Z-hull for fast Incat-type catamarans.

o Optional Ferry Services: The third category of transportation use is ferries serving cross-water corridors where there are existing transport options available, but where water link demands are high enough to support multiple travel modes. The Weehawken and Hoboken to Manhattan services are outstanding examples of how ferries can provide an option to overcrowded transit, bus, or auto routes. Depending on the length of the route and the intermodal connections available, these ferry routes have demonstrated a capability of providing high volume transit options which can assist in balancing transportation flow through a given corridor. These optional services, whether parallel to land or even other water transit options, have potential for high volume, specific niche markets as part of larger urban transportation systems. Such systems are likely to increase significantly in congested urban settings where land-based water crossings are limited. They are also appearing as privately initiated market driven routes, and in areas of high demand, have proven to be profitable operations.

**Environmental and Regulatory Procedures**

Other trends which may influence water and land, based transit options include the nationally mandated environmental and regulatory procedures. Recent trends in older port cities such as New York and Boston have generally supported new water transportation services and discouraged additional land-based infrastructure construction. At the same time other port cities around the world such as Hong Kong, Pusan, and Osaka are engaging in expansion and development of off-shore islands, with increasing reliance on ferry transportation to levels quite unknown in the U.S.. The international ports are expanding land areas through massive land fill programs and other earth moving techniques which would not in any way be possible in the U.S. under current coastal and environmental regulations.

However, former waterfront industrial sites such as Hunters Point in Queens, the Staten Island Navy Base, and Port Imperial along with other portions of the Hudson shore in New Jersey are being recycled. They will eventually support mixed-use developments and will rely on proposed ferry connections to Manhattan since existing corridors are overloaded and construction of new bridges and tunnels are unlikely. In Boston and New York, downtown ferry terminals are scarce and new sites are needed. Both cities are planning expanded water transportation services with strong support from both environmental regulators and advocates who regard the water transportation uses as compatible with and supportive of waterfront development in general. In Boston, new waterfront development projects are often required to include ferry terminals and ferry services to secure shoreline building permits by state law (Chapter 91 legislation), for private projects such as the World Trade Center expansion and as construction mitigation for public projects such as the Central Artery/Third Harbor Tunnel project, a landside highway infrastructure improvement.

**Institutional and Jurisdictional Issues:**

Other trends worth noting involve various jurisdictional and institutional aspects of ferry system planning, licensing and operation. The two early periods of contemporary ferry development, from 1950-1970, and 1970-1990, described systems which were predominantly publicly owned and operated. The current period, since 1990, has provided many new examples of privately initiated, market responsive ferry systems. The trends regarding public and/or private ferry operations will probably continue along two general courses. It seems likely that essential ferry services which are currently operated by state and municipal governments are likely to continue as public responsibilities. Efforts will be made through capital improvements and management initiatives to maximize passenger use and minimize operating subsidies. For optional systems with landside alternatives the trend will more likely follow the recent New York City initiatives, where the public sector creates an attractive opportunity for desired ferry services through pre-planning, franchise awards, terminal construction and management, and coordination of intermodal connections. The private sector's response to the offering of franchises by the UDC was informative in that two of the three operators awarded routes were already in the ferry business in the harbor and saw opportunities for expansion of services.

It is important to note, however, that the commuting context in New York City is extreme in terms of transit dependence. The public transportation agencies have been able to act as catalysts for the start-up of new privately operated ferry or express bus services along heavily traveled corridors, and make intermodal linkages with minimal or no subsidies because of the immense commuter demands. In other urban settings, new ferry systems may require more

direct public start-up subsidies, advertising campaigns, free parking, or other more aggressive techniques to attract riders to the new and unfamiliar transit mode. Combinations of subsidies for private operators and incentives for patrons may be required to initiate new services, even when there is a clearly demonstrated market. Start-up periods may take one to two years before commuters spread the word that a new ferry system actually works. In other words, in some cities you be able to lead the commuters to water transit, but you can't always make them ride.

## 4.2 Criteria for Selecting Candidate Locations for Expanding Passenger Water Transportation: A Ferry Feasibility Decision Tree

### To Ferry or Not to Ferry

The case studies and surveys have demonstrated a wide variety of successful and effective applications of ferry systems as alternatives to land-based options, and described several historical and contemporary systems which did not survive. The recent growth in ferry systems over the past decade has provided many lessons on where, when and how new water transit services have been successful, as well as some examples of where they have not. The wealth of innovative ferry planning studies during the past decade, several of which have been described in the case studies, have also provided many new insights into market demand patterns, ridership projections, and applications of new technologies. Equipped with the empirical knowledge of specific examples of systems which have succeeded combined with the new planning and analytical techniques, it should be possible to more accurately predict where new systems are more or less likely to work.

However, the case studies and surveys also indicated that there seem to be no universally applicable formulas for implementing ferry transportation systems owing largely to the remarkable individuality and contextual requirements of specific routes. Each particular water corridor and market context seemed to dictate a unique combination of operations, vessels, and terminals. It does seem possible to identify performance criteria which need to be met in specific settings, such as those defined in the recent San Francisco regional ferry plan. It would certainly be useful to communities considering water transportation options to have a checklist of criteria for considering the feasibility of ferry systems as alternatives to other land-based modes. The following types of performance questions surfaced frequently in the case study analyses and might serve as a preliminary decision tree for determining the basic feasibility of water transportation for a given location.

### Ferry Feasibility Decision Tree

**1. Are There Advantages in Providing Ferry Transportation Across a Particular Water Body ?** The initial question which needs to be asked is whether a ferry crossing offers any advantages over land-based alternatives including bridges or tunnels? The types of advantages to be considered might include the following:

- o Time and Distance: would a ferry offer a shorter trip time or more direct route compared to land routes?
- o Capital and Operating Costs: would a ferry service be more cost-effective in terms of initial and ongoing costs?
- o Environmental: Are there compelling environmental advantages of the water route?

o Convenience: would the ferry system be easier or more convenient to use than land-based routes?

**2. Can a Ferry Operate Across the Waterway on a Regular Year Round Schedule ?** Many waterways offer excellent year round navigation and many do not because of such factors as flooding, shallow water, wind and weather, or various seasonal constraints such as ice and cold.

o Is there a suitable navigable channel available connecting the two points?
o Are the docking points accessible to the land-side population origins and destinations?
o Are there intermodal transportation connections available?
o Is there any history of ferry routes operating previously?

**3. What Role would the Ferry Play in the Regional Transportation Network ?** Would the ferry serve as one the basic transportation roles of essential, complementary, or optional service?

o Would the service provide a commuter link, a marine highway or other primary transportation functions.?
o Would there be enough passenger or vehicle capacity to provide the necessary services?
o Would there be major variations in use at different times during the week, or seasonally?

**4. Are There Deficiencies in the Existing or Proposed Land-Based Alternatives ?** What conditions of the alternative routes might make a ferry system more efficient and/or provide "better" transportation service. The two conditions for the location of a ferry connection might need to be considered somewhat differently.

A. Non-Urban Land-based Connection: Might include excessive cost, insufficient demand, or environmental constraints for a higher volume land based bridge, tunnel, or highway.

B. Urban Land-based Connection: Might include excessive cost, congested existing infrastructure without expansion capability, environmental constraints, or temporary disruption of existing or proposed highways, bridges or tunnels.

**5. Do Ferry Options offer Immediate or Long Term Environmental Advantages over Land-Based Routes ?** Environmental policy and regulations have changed the planning approaches to public transportation in many regions, particularly in denser urban areas. As increasing demands require expansion or alteration of regional transportation systems, can ferry systems help resolve some of the growth needs with either lower environmental costs and/or greater environmental benefits than land-based options along a given connecting corridor?

o Can a ferry route be implemented with less physical impacts on a waters edge environment than a bridge, tunnel or highway, and still provide adequate capacity to meet travel demands? This might apply to either a new or expanded land-side option.
o Can a ferry route improve air quality by substantially reducing Vehicle Miles Traveled (VMT's) by either providing a shorter vehicle trip or by providing a transit alternative which reduces auto trips for a given corridor?
o Is a ferry connection to an island preferable to a bridge or tunnel which may permanently alter the character of the island by making it effectively into a peninsula?

**6. Does a Ferry System Offer Other Economic Benefits ?** In some cases ferries can provide a different set of economic benefits than land-side alternatives.

o Land Development: Ferry terminal locations may enhance water's edge land development opportunities by providing a new transportation interface, or by making a site accessible which was previously isolated (such as connecting to an island or across a river from an established activity center).
o Tourism and Recreation: The ferry system may become a tourist attraction itself or open up new tourism connections which previously did not exist.
o Optional Private Transit Service: For high volume urban connections, ferries can sometimes provide self-sustaining transportation links in addition to already subsidized public transit to complement or replace land-side transportation. Included in this category may be shuttles, water taxis, and cultural loop connections, as well as commuter park and ride services.
o Cost Effective Temporary or Mitigation Service: For short term mitigation of land-side construction, reconstruction or maintenance, temporary water transportation links may be more cost effective than land-side detours or temporary structures.

**7. If Proven Feasible, What is the Most Cost-Efficient Approach to Ferry Capital Funding and Operation Costs ?** Ferry system funding sources vary greatly from one state to another.

o Is the system best supported by public or private capital funding or by a combination of the two; for vessels, terminals, and other necessary land or waterside improvements?
o Are the system operations more cost effective through public, private or combined management?
o Are there significant start-up costs for a new system which may require special funding considerations until full utilization is realized?
o For a given location, are there adequate funding opportunities available, public or private, or do new funding sources need to be identified or created?

**8. What Vessel Type and Size is Most Appropriate for a Given Route ?** The ferry schedule needs in terms of frequency of service, total trip time, and comparison to competing landside modes may help determine the best vessel type. Many new technology options are being offered at widely varying capital and operating costs. The fastest or highest technology may not always be required or best suited to a particular service.

o What are the basic transportation performance requirements for a given route to offer better time/cost than landside alternatives, and which vessels meet those needs?
o Are smaller, more frequently cycling vessels preferable to larger, less frequent trips?
o What local navigation and sea keeping extremes are there which will determine various vessel characteristics?
o What comfort and amenity levels are needed for a given route? The longer routes tend to require more amenities. All routes require comfort of ride.
o Will a high speed vessel be needed to be competitive or faster than land-side alternatives, where a conventional vessel can't compete?
o For existing routes, can existing vessels be optimized to improve service or meet new regulations, such as ADA, or are new vessel types needed?
o Does the loading/unloading sequence of vessel and terminal offer the most efficient and effortless path of travel for the user?

o What flexibility of use and layout is needed for the vessel to provide other off-peak services and an opportunity for additional revenue?
o Are low-wake technologies needed for environmentally sensitive areas, or routes passing small boat recreational areas?
o Are there existing operators and vessels available to run the service?

**9. What Communications, Marketing Tools, Fare Structures and Other Techniques can be Applied to Maximize Ridership ?** Once a system has been chosen, it needs to be advertised, marketed, and priced to attract and keep the maximum number of riders possible.

o Existing systems offer many useful techniques for attracting riders, particularly the experienced private operators, and the larger statewide systems such as Washington State Ferries.
o Adjustments to schedule, fare structure, amenities and intermodal connections are often needed during the lifetime of a service to maintain and expand ridership.

**10. Does the Ferry Route Chosen Effectively Compete with Private Auto Trips or Public Transit Positively or Negatively ?** While most regional transportation policies, particularly in urban areas, encourage reduction of single occupant auto traffic, a particular ferry route may also provide competition with public transit alternatives. Systems should seek to find the appropriate balance for the given corridor.

o Does the proposed system offer equal or better trip time and lower cost than a land-based auto route which may attract some proportion of riders?
o If the ferry route competes with a land-based transit route, does that route suffer or benefit from the new option? In some urban corridors, the transit options may also be operating at capacity and may benefit from a new parallel transit option.
o The ferry route role may change over time for a given corridor and may require adjustment and balancing with other transportation modes. Periodic monitoring and adaptation are often needed.

**11. Are There Any Opportunities for Off-Peak or Seasonal Uses for a New Ferry System?** New systems can offer additional recreational, tourism, charter, or transit services during of-peak or seasonal periods and dramatically alter the financial feasibility of the service.

o How many hours of operation are needed to meet the primary transit functions?
o How can the remaining hours and days be best used for other services?
o Are there likely to be seasonal demands which may allow higher fares?
o Do the available funding sources permit non-transit off-peak uses for tourism, charter, or excursion activities?

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Summary of Case Study Findings and Conclusions:

The case study and survey assessments have provided examples of how particular ferry routes serve as alternatives to land-based transportation in a variety of locations and specific applications. The detailed analyses have identified the basic transportation functions provided by the different routes, and interpreted the historical decision-making processes which have resulted in the continuation or expansion of some on-going systems and the start-up of other new ones. The following summary of findings is organized into categories relating to the decision-making processes observed for the five systems evaluated. The conclusions are organized in the following sequence; 1) identification of fundamental and secondary transportation functions provided by ferry systems, 2) historic "generations" of ferry service in the 20th century, 3) common and unique decision factors for water or land-based mode choice, 4) current and future trends for ferry services, and 5) examples of ferry planning and implementation techniques which may be useful to future systems. The findings are illustrated by examples from the case studies augmented by references to other domestic and foreign systems as needed.

### 5.11 Transportation Functions of Ferry Services

Of primary importance in assessing the evolution of a particular ferry service is the determination of its basic transportation function. After comparing the individual routes of the five case study areas, and considering the remaining Phase I survey systems, it was determined that three fundamental types of public transportation were provided by ferries in the U.S. In considering the areas served and the alternative transportation modes available, it was evident that there is a clear hierarchy of importance for the three types in relation to regional transportation networks. In order of transportation priority, the three types include the following.

**1. Essential Ferry Routes with No Viable Land-based Alternatives:** Those ferry routes which provide year round services to islands or other water-isolated locations which cannot be reached by road, bridge or tunnel. They are generally publicly operated and supported by state or municipal governments as integral components of their transportation networks. Such ferries serve as lifelines or "marine highways" to off-shore communities and provide passenger, vehicle, and freight transfer. Essential ferry routes included among the case study systems were the Casco Bay Lines in Portland, and the Vashon Island and San Juan Islands services of the Washington State Ferries. Such routes are often used for some or all of the following trip purposes: commuter, school, medical, supplies, and shopping as well as mail and freight delivery to and from the mainland from the communities served.

**2. Complementary Ferry Routes with Less Efficient Land-based Alternatives:** Ferry routes which provide substantially shorter time and distance trips across water bodies than alternative highways, bridges, tunnels or rail. They are likely to operate year round and are often used for daily commuting. Such systems may be publicly operated, such as the Staten Island Ferry in New York, the parish ferries across the Mississippi River and the cross-Puget Sound routes to Seattle by WSF. Other commuter oriented services may be public/private such as the Oakland-Alameda

ferry in San Francisco, or privately operated such as the Bayshore ferry to Manhattan. These services often provide the most practical commuter travel option, since land-based options are too lengthy and/or too time consuming. Such services have been initiated or supported actively by state and regional transportation entities as integral components of their transit systems.

**3. Optional Ferry Routes with Equivalent Land-based Alternatives:** These routes offer commuters an option to parallel land-based alternatives, and may include one or more benefits such as trip time, cost, amenity, or reliability. Such services have expanded greatly in more dense urban settings in recent years, as local commuting patterns have changed. Publicly operated routes include the Golden Gate services from Larkspur and Sausalito to San Francisco, and the Crescent City routes from Gretna and Algiers to New Orleans. Privately operated routes include the Hoboken and Weehawken ferry routes to Manhattan, as well as several of the proposed New York routes such as Hunters Point to Manhattan. Optional routes are often encouraged and assisted by state and municipal governments to relieve pressures on overcrowded land-based highway and/or transit commuter routes. Such optional routes may also serve as temporary mitigation measures during infrastructure repair.

Other ferry system transportation characteristics were identified in the Phase 1 analysis and were found to be applicable to many of the case study routes. While the case study focus was on weekday commuter type services, many of the routes are also used extensively for recreational transportation at off peak and/or seasonal periods, often as an important economic supplement to the systems. In addition, particularly for private operators, the vessels are often used at off-peak periods for tours and charters. The routes also were differentiated by having passenger-only, passenger and vehicle, or vehicle-only type vessels. The volume of passengers carried and vessel speed characteristics could also be differentiated by route and system age. Route lengths and navigation conditions also varied considerably.

## 5.12 Historic Periods of 20th Century Ferry Service

The second step in understanding how ferry systems evolved is to consider their individual histories and relationships to national and regional transportation trends. Each of the case study settings has a long and varied history of ferry service. All of the historical services were found at one time or another to be critical to their respective transportation networks and regional development patterns. Those locations with essential island ferry services, including Portland and Puget Sound, tend to have had continuous operations, as have some areas with complementary services, such as the Staten Island Ferry and the Mississippi River parish routes. Other complementary and optional ferry services tend to be more recent, either as new routes or as replacements of previously abandoned routes. Some of the newer and proposed future routes were found to be feasible because of high speed vessel technologies which allow them to compete with landside alternatives. Four general periods of modern ferry service evolution were identified and help in understanding the shifting balance of passenger water transportation and land-based alternatives.

**1. The Decline and Fall - 1900 to 1950:** The golden age of ferries may have peaked around the turn of the 20th Century, when the burgeoning urban populations relied primarily on the rail and ferry transit networks largely provided by the rail companies, as evidenced by extensive networks in all of the case study regions. With the construction of bridges, and tunnels initially for the trains and subways and later for cars and trucks, the ferry systems were gradually replaced often along the very same corridors. In New York alone, it is estimated that there were

at least 47 different routes across the Hudson and East Rivers as late as 1910, all of which were linked to trolleys at their Manhattan terminals to deliver commuters to their final work destinations. While a few of the rail ferries continued to serve commuters to New York into the 1960's, the majority had been replaced by 1950, by land-based subway and rail tunnels, and vehicle tunnels and bridges. In San Francisco the ferries were eclipsed by construction of the Golden Gate and Bay Bridges, and in New Orleans, most of the urban river ferries were replaced by two new bridges.

**2. Survival of Remaining Systems - 1950 to 1970:** The only systems which continued in operation tended to be those which provided essential services, such as to islands, or some complementary services with long and circuitous landside alternatives. This period was marked by extensive highway and bridge construction as related to the Interstate Highway program, and a major shift by the american public to auto commuting and away from transit. In 1951 the state of Washington, which had purchased and operated the cross-Puget Sound system as a holding action until an ambitious bridge program could be implemented. Based on cost benefit assessments, it was eventually decided in 1959 to expand the ferry system and abandon the much more costly bridge system. The San Juan Islands service was also taken over by WSF and continued to provide year round service. The Casco Bay service in Portland continued to operate, as did the City-run Staten Island Ferry in New York. With the exception of Tiburon to San Francisco, few new commuter services were introduced during this period.

**3. Initial Expansion Period - 1970 to 1985:** As new highway and bridge programs tapered off or neared completion, some expansion and new ferry networks began to be implemented. in San Francisco, the Golden Gate ferry system was introduced after a precedent setting regional corridor planning process which recommended new high speed ferries and bus routes as an alternative to widening the Golden Gate Bridge or building a northern leg of the new BART transit system. The WSF system was expanded and refined to better serve auto and park-and-ride commuters across the Sound. Of significance during this period were the introduction of the National Environmental Protection Act (NEPA), and the Clean Air Act, both of which set the stage for the next period by beginning to place new environmental constraints on highway and bridge expansion in many of the study regions.

**4. Current and Future Expansion - 1985 to 2000:** The current period has been influenced by three factors; 1) the introduction of new highspeed ferry technology in San Francisco, Seattle and New York, 2) the final completion of remaining segments of the Interstate highway network and other regional transportation systems, and 3) a return to public transit usage by urban commuters. The first generation of reliable new vessel technologies, highspeed catamarans, allowed for longer ferry routes to be competitive time-wise with land-based routes. New water-based commuter links were introduced such as the privately operated Weehawken and Hoboken ferries and provided attractive alternatives to autos or buses in congested tunnels, or overcrowded subway and commuter rail links. The second generation of highspeed ferries is now being built and applied to existing and new routes as faster and more reliable option to parallel land-based options in San Francisco, Seattle and New York. The period was also marked by a series of comprehensive ferry planning processes which considered routes as integral to regional transportation objectives.

## 5.13 Critical Decision Factors

While the assessments of individual case studies chronicle individual decisions on land or water based routes along a particular corridor always seem to differ in detail, each includes combinations of the same set of mode choice factors. It should be noted that for a given waterfront city or town, there are a limited number of possible ferry routes for point to point public transit, while there are often multiple excursion route opportunities for tourism and recreation. The factors influencing the public transportation services are often more narrowly focused and limiting than are the recreational determinates. The following decision factors for public water transportation versus land-based modes seemed to be important to varying degrees depending on the characteristics of the individual location and routes considered.

**1. Transportation Needs:** By definition, the transportation needs were found to be the first and foremost determinate. In each of the systems analyzed, the historical routes were either replaced when more efficient land-based systems were built, or continued to serve when there were no alternatives introduced. For new ferry systems, services have been established either when the land-based alternatives were found to be no longer capable of meeting the daily transportation needs, or when new origins and destinations needed to be connected over water, with or without competing land-side options. Publicly sponsored systems have been created to meet essential and complementary service needs when those routes have been determined to be integral to the regional transportation network. In recent years ferry options have been increasingly considered as alternatives to landside options along heavily traveled transportation corridors with parallel waterways, particularly as they may offer cost or environmental advantages. New, or perhaps re-invented, roles for ferries have been identified in many urban settings to provide water links connecting to transit and/or park-and-ride facilities in intermodal transportation systems.

**2. Geographical Context or "All Ferry Systems are Local":** Historically, individual ferry operations, vessels and routes have always been tailored to localized geographic factors. The case studies represented a broad range of physical settings, including such factors as climate, tide or other water level changes, waterway and navigation conditions, dock or terminal locations, shoreline characteristics, and historic land-use patterns. In discussing with the operators the factors determining their services and narrow margins between success or failure, all indicated that the major decisions had to do with local conditions of the physical environment and fine tuned travel needs of their patrons. Vessel technology design and route characteristics, for example, have always been carefully adapted to the specific setting.

**3. Environmental Priorities:** Since 1970, the NEPA and Clean Air Act have exerted increasing pressure on coordinating transportation and land-use development, which in combination have affected waterfront communities and cross water travel choices. In urbanized port or riverfront communities, new limitations have been placed on building road, bridge or rail connections across wetlands or the waterways themselves, as has been particularly apparent along the Mississippi in Louisiana, and may be even prove to be so after the recent flooding experiences of 1993. Water transportation provides a more benign mode of travel in many contexts, when compared with the construction of new landside infrastructure options. On the other hand, high-speed ferry technologies need to resolve wake and wash impacts when operating in or near areas with sensitive shorelines.

**4. Market Demand:** Market demands for new ferry services are often hard to predict, particularly

in areas which may not have had water transit for 50 to 75 years. However, many of the case study systems have been initiated based on conventional land-based transportation demand modelling and assumptions. Such techniques were applied to identify markets, start-up services and adapt the systems as the specific needs became better known. With an increasing number of contemporary case histories in different locations, the forecasting and planning methods are being refined and put to use in new locations. The data collected on ridership and use patterns has also been useful based on monitoring methods developed in San Francisco starting with the Golden Gate Ferries, and followed by newer routes in Seattle, Boston, and New York. Another method which has proven to work in several cases has been to start systems on a trial basis where there may be a short term mitigation need, and later extend the service if it builds up a large enough dedicated ridership. In comparative cases for varied types of service, several years of operation seem to be required to test the waters, adjust the service if needed, and determine if a solid market exists. The evidence from the case studies seems to indicate that while start-up ridership maybe slow at the outset, that if the system meets a particular transportation market need, a dedicated, regular ridership will develop after several years.

**5. Economic Development and Tourism:** During the same period of recent growth of ferries as integral components of regional transportation systems, a parallel expansion has taken place in the use of ferries for economic development, particularly as it relates to tourism, and often resulted from combining public water transit and recreation services using the same vessels and routes. While the Washington State Ferries represent the most dramatic example of combining peak hour transportation with off-peak tourist use, many other public and private systems have expanded trips and services to serve emerging new recreation demands. The services have multiple economic benefits in bringing new visitors to a region, city or a particular waterfront site. However, the most important direct benefit may be the cross subsidy of the scheduled transit service by the often more lucrative off-peak tourism, helping public systems to break even and private ferries to operate at a profit.

**6. Institutional Context:** The case study states all seem to have different levels of public commitment to ferry system operation and commensurate public financial support, depending on the type of transportation function served, as well as on the history of the operation. Those states which have continuously operated public ferry routes as essential in the state transportation network, such as Maine, Louisiana, and Washington, have tended to develop legislative, funding and institutional frameworks through their state transportation departments to perpetuate and refine the ferry services. Other states such as New York, New Jersey, and California which have historically relied on private ferry services, have recently directed public sector efforts to provide a framework for private operations, and offered indirect financial support through combinations of planning and development incentives, public terminal construction and management, and in some cases contributions to capital construction of vessels.

## 5.14 New Planning Techniques and Institutional Frameworks:

In considering the application of ferries as alternatives to land-side options, the planning and implementation techniques used by public and/or private sector providers can be critical to the success of the system. However, with the exception of those states which have a continuous history of publicly supported water transportation and already have such processes institutionalized, the start-up of ferry routes to provide public transit services can seem like re-inventing the paddle-wheel, since there is not likely to be legislative support or transportation

agency experience with the water transit mode. The case studies provide a variety of good examples of effective planning, funding and implementation approaches. Included planning in the systems considered were planning techniques for growth and change of established ferry systems, transportation corridor planning approaches for new systems, variations of public-private partnering for capital and operating expenses, innovative inter-jurisdictional arrangements for intermodal services, and a wide range of financing and funding mechanisms.

**1. Existing Ferry Expansion as Integral Components of Regional Transportation Plans:** Consistent with the intermodal objectives of ISTEA policy, the inclusion of new ferry routes as components of regional or metropolitan transportation systems has been demonstrated in the recent planning initiatives such as the New York Highspeed Ferry Plan (1993), the Bayshore Ferry Study (1991), the San Francisco Bay Area Regional Ferry Plan (1991), and the Washington State Ferries ongoing biennial planning process. These plans offer a variety of useful techniques for demand forecasting, cost effectiveness analysis, institutional agreements and operational models.

**2. Corridor Planning to Include Ferry Routes as Alternatives to Expanding Land-based Infrastructure:** Similar to the above, but dealing with more limited segments of a system, a corridor analysis is usually needed as a component of the larger regional transportation plan. Examples of multi-modal corridor plans involving ferry options include the plan for the Golden Gate Ferry System, the Trans-Hudson Study/Hoboken Ferry Plan, and the privately initiated Mosquito Fleet plan in Seattle. These studies in various ways evaluated the trade-offs between new ferry service and increased landside infrastructure.

**3. Temporary Ferry Services as Mitigation for Landside Infrastructure Repair or Construction:** One variation of the corridor ferry plan is the use of ferries as mitigation measures during landside construction or for other temporary cross-water transportation services. As one component of the New York Highspeed Ferry Plan, two new routes were identified as providing relief for the planned reconstruction of a parallel highway. In 1980, a new ferry service was planned and implemented from Hingham to Boston to relieve commuter delays during the repair of a parallel major commuter highway. More recently ferries were immediately deployed to move commuters in the aftermath of the San Francisco earthquake of 1990 while damaged bridges and highways were being repaired, as well as for the cross-Hudson Hoboken route when the PATH transit system was disabled following the World Trade Center bombing. The state of Florida maintains a small fleet of vehicle ferries to implement temporary highway links in the event of failure or repair to the state's multitude of bridges.

**4. Institutional Options for Public and Private Partnering for Ferry Services:** During the recent period from 1985 to 1994, several innovative examples have occurred which are worth noting. Combined public and private services have been successfully used in San Francisco on the Vallejo and Oakland/Alameda routes with variable rate operating subsidies provided based on levels of ridership. In New York, the Hoboken service is private but grew out of a public planning and RFP process which granted a conditional license to a single designated operator, and provides public landings and intermodal transit connections.

**5. Innovative Regional Planning and Inter-Jurisdictional Arrangements for Intermodal Services:** Intermodal transit connections are vital for successful commuter ferry operations, as are coordinated vehicular routes for park and ride users. The provision of coordinated intermodal connections to ferry services often requires inter-jurisdictional coordination by separate

transportation districts. All case study systems demonstrated specific applications of the ISTEA policies to increase intermodal travel opportunities.Through the planning initiatives of the Port Authority of New York and New Jersey, the recent cross-Hudson planning effort demonstrates how two states and multiple municipalities have been able to improve transit connections and schedules, providing new transit options for commuters using the Hoboken and Weehawken ferries. The San Francisco Metropolitan Transportation Commission has also initiated efforts to coordinate several key transit connections for the 19 different overlapping regional transportation jurisdictions, including intermodal links for existing and proposed ferry routes.

**6. New Funding and Financial Models:** While the essential ferry systems seem to require state or municipal subsidies, new complementary and optional ferry routes seem to demand more innovative funding and operations approaches. The ferry systems which compete with parallel land-side travel options, particularly transit, often have difficulty attracting operating subsidies from metropolitan transportation programs which are invariably already over-burdened providing essential or required landside transit services carrying higher volumes of riders. In response to these limitations the ferry operations have attracted funds through new combinations of public/private funding. The California water transportation referendum recognized the importance of local public control of the ferry system and high start-up costs by providing state municipal bonding funds for planning and capital construction of terminals and vessels, but no operating subsidies, leaving the private sector and municipalities to negotiate ways of making the routes work economically. The New York Highspeed Ferry planning initiative, after conducting a thorough study, concluded that based on high user demand along selected routes similar to the recently successful Hoboken experience, it was possible to solicit totally private initiatives for capital and operating funding, as long as the operators were given exclusive franchises for the specific routes. Regarding operational funding of ongoing public ferry systems, the Washington State ferries, Casco Bay Lines, Golden Gate Ferries and Crescent City Connection are all increasingly dependent on seasonal tourism to help offset commuter service subsidies, and have sought to improve those services and increase ridership. Financial self-sufficiency will continue to be a major objective for public as well as private services, and an important consideration in assessing cost-effectiveness of ferry routes compared to landside options.

## 5.15 Current and Future Trends for Ferry Services

The case studies and general surveys from Phase 1 have indicated various patterns regarding expansion of existing and proposed ferry networks, as well as suggested trends with respect to the near future of ferry system development in the U.S.. The following observations summarize those patterns and trends.

**1. Vessel Technology Advances are Making High Speed Ferries more Competitive with Land-based Alternatives:** Fast ferries capable of safe, comfortable, long distance trips at 25 to 40 knots have been proven to be operational in many foreign applications in Norway, Hong Kong, and Australia, as well as in several domestic applications such as the San Francisco-Vallejo and Manhattan-Bayshore services. More advanced foreign built catamaran vessels are currently in operation internationally from Seattle to Victoria, and are in construction domestically for Alameda commuter and Maine whale watch services. Offshore stabilized highspeed SWATH technologies operational in Hawaii, and could be applied for open ocean routes in some high speed locations. Proven Norwegian catamaran technologies are proposed for the new Staten Island to Manhattan service. The important technological trend is towards new high tech vessels which can provide faster service over the water than existing transit or auto commutes can

deliver over the land, as proposed in ferry expansion plans in New York, San Francisco and Seattle. Once accepted and proven in those markets, new commuter applications to other urban waterfront cities and routes will be possible. It is likely, however, that some of these technologies may be applied sooner to tourism and excursion routes because the higher returns will offset high vessel capital costs. conventional ferry technologies are also being refined as older vessels are replaced or new ones built for more traditional, short-haul routes such as those in casco bay, Puget Sound, and on the Mississippi River, where fuel efficiency may be more important than speed.

**2. Essential Services will Continue with Incremental Improvements:** Services to islands such as the Casco Bay or San Juan routes will continue to be needed as long as there are resident year round populations. Incremental improvements will continue to improve services through vessel and terminal refinements as well as increased intermodal options. Financial self sufficiency will continue to be the dominant goal and will probably minimize applications of highspeed vessels as being to expensive relative to fare structures required.

**3. Complementary Ferry Routes will Expand to Meet New Demands:** Complementary service for which the landside options are decidedly less efficient than the ferries, including Puget Sound routes to Seattle, will also continue to be in demand, particularly when clean air requirements and/or landside highway congestion so dictate. New highspeed vessel technology will open up new routes where the ferry can provide faster commutes than landside options, and some existing optional ferry routes, such as the Larkspur or Vallejo routes, which could become more time effective with faster, lower wake vessels. Improved and expanded complementary services should attract increasing numbers of riders along specific travel routes.

**4. Optional Ferry Routes will Increase to Fill New Market Niches:** The emergence of opportunities for optional routes in urban areas where landside congestion and infrastructure limitations have created new markets and ferry services, such as the cross-Hudson routes. This trend is likely to expand to other cities. New vessel technologies and increasing demands for off-peak excursion service should contribute to start-up of these new routes. Such routes deserve public sector support when they assist in reducing landside auto congestion, improve air quality, or relieve pressures to expand landside infrastructure at great public cost.

**5. Ferries as Intermodal Transit Links will Increase:** As demonstrated by several of the case study examples, addition of convenient and time saving intermodal connections can improve service and increase ridership. Inter-jurisdictional coordination is often needed to achieve such linkages. In some cases, the private sector operators have successfully provided the intermodal connections, such as the Port Imperial bus network in Manhattan, but still require other public transit linkages, such as the NJ-DOT buses to Weehawken.

**6. Combinations of Public and Private Operations and Capital Investment will be Adapted for Specific Routes and Functions:** The varying types of routes, patrons, and roles of the individual ferry routes will dictate varying combinations of public and private funding. However, even when self-sufficient services are predominantly privately owned and operated, indirect public sector contributions are needed. Examples include the provision of public landings at strategic sites, inclusion of ferry transportation routes as elements of the regional transportation plans, provision of the intermodal connections described above, and periodic capital improvements assistance. Locally adapted types of blended public and private operations will continue to be invented, such as the Alameda publicly owned and privately operated vessels.

New and creative methods to reduce public subsidies are emerging, with incentives offered to private operators for increased ridership such as the current Oakland service, or the fare structure limits set for the Hoboken service.

**7. Ferry System and Route Configurations will Continue to be Locally Determined:** No formulas seem to exist for application of standardized services from one potential ferry location to another. Often the route demands within a given water area differ from one corridor to the next in terms of trip length, environmental conditions, or volume, as exemplified in all of the case study cities. If ferries are indeed to find their niches in complex regional transportation networks, they often need to be tailored to the specific conditions served. In addition, the system histories clearly show how ferry services need to adapt to changing landuse patterns and travel needs over time.

**8. Services Combining Public Transportation and Tourism/Recreation will Continue to Expand:** One of the more dramatic findings from the case studies was the large amount of growth and expansion of water-based recreational services in all geographic regions. While many of the recreational and tourism cruises do not serve conventional passenger or vehicle public transportation needs, an increasing number of the commuter oriented services are expanding into the tourism market. Where such opportunities exist, flexibility should be built in to allow for the maximum use of the vessels and the routes for the broadest range of services, as long as the primary public transportation functions are still met. Financial self-sufficiency of public ferry services will continue to rely heavily in many locations on attracting as many fare paying passengers onto the routes as they can efficiently accommodate.

**9. Ferry System Expansion will Continue Primarily in Urban, Commuter-oriented Settings:** The future ferry growth seems to be primarily with the complementary and optional routes in more urban areas which are experiencing limitations in ground transportation infrastructure particularly relating to commuter trips and secondarily to through vehicular traffic needs. The expansion of services in San Francisco and New York represent the functional types and variety of ferry growth to be expected in other locations.

**10. Two Emerging New Factors Influencing Choice of Mode and Ferry Growth are Transportation Infrastructure Limitations Combined with Environmental Constraints:** Traffic congestion and environmental sensitivity will be increasingly important decision factors in selecting ferries over land-based alternatives in many locations. As exemplified in Mississippi where new bridge and highway construction has been severely constrained during the past 20 years, and where auto use continues to increase within the fixed highway and street network, the proven ferry routes continue to operate as substitutes for new bridges or tunnels. The full environmental benefits of ferries systems have yet to be adequately measured, but will prove to be as efficient or more so than many transit systems in particular applications, and clearly beneficial in reducing Vehicle Miles Traveled (VMT's) where improved air quality and reduced congestion are concerns.

**11. Qualitative Factors will Contribute to Choice of Mode in the Future:** The amenities, comfort of ride, reliability, and quality of experience of ferry commuting rank high in all polls of users in response to new and older systems, even though they often defy clear quantitative measurement. The combined enjoyment and lower stress level of ferry commuting has been fundamental in creating a dedicated ridership in all case study locations, and should be considered as an important factor in the future viability of ferry systems. User amenities should

also be taken into account in vessel and terminal design, as well as in provision of intermodal connections. "Quality of ride" may be considered the hidden dimension in choice of land versus water modes.

## 5.2 The Role of Ferries in National Transportation Policy and Support for Future Ferry Systems

Based on the foregoing case study findings and general conclusions regarding future transportation roles and trends for passenger ferries, the following National Transportation Policy issues have been identified and recommendations for future policy consideration presented. The basic finding is that the case study systems and many other potential new locations can benefit from selective enhancement of existing ferry services or provision of new ones. It is also suggested that implementation of such services may be in many cases prove to be more cost effective than land-based alternatives, and can fill important niche markets that can help relieve pressures on existing land-based transportation infrastructure.

### 5.21 ISTEA and the Case for a National Ferry Policy:

The case studies and surveys have demonstrated how ferry systems contribute in different ways and degrees as integral links in national, regional, and local transportation networks. The ferry systems in Portland, Maine, along the Mississippi River in Louisiana, and in the San Juan Islands in Washington demonstrate the continuing importance of essential ferry links as lifelines and marine highways. The ferry systems in New York City, San Francisco, and Seattle provide compelling examples of how existing ferries are playing increasingly important roles in their respective commuter transit networks, and how new systems are being planned to greatly expand those roles. The case studies also demonstrated how private operations can contribute incrementally along specific corridors to reduce traffic congestion and improve air quality at minimal public expense in high density urban settings. Many other urban waterfront areas including Boston, Baltimore, Jacksonville, and Corpus Christi, are also exploring ways to better utilize water transportation to relieve congestion and ease pressures on fixed transportation infrastructures. As the surveys have shown, many of the most dramatic changes in ferry services nationally have occurred during the past 10 years. It is therefore appropriate and necessary to recognize their substantial contributions to date and their potential to play an increasing role in intermodal regional transportation in the coming years by making explicit their role in National Transportation Policy.

### 5.22 Ferry Policy Issues and Needs:

The need for a National Ferry Policy has been raised by the Transportation Research Board (TRB) Ferry Transportation Sub-Committee (AIBOSC) during the past several years, and was described in a draft statement prepared by Dr. Charles T. Jahren, P.E., at their January 1994 meeting. The case study and survey findings strongly support the need for establishing a specific ferry transit component of National Transportation Policy. As the current ISTEA legislation is slated for revision and re-enactment as ISTEA II by 1997, the opportunity exists to recognize the role of ferries as essential links in intermodal passenger transportation. The following recommendations begin with the 5 point core program based on the draft proposed by the TRB Ferry Transportation Sub-Committee, to establish a National Ferry Policy. The recommendations conclude with 8 additional policy suggestions which evolved from the case studies.

**Establishment of a National Ferry Policy (Based on a 5-Point program advocated by The TRB Sub-Committee on Ferry Transportation).**

**1. Recognition of Ferries as Integral Components of the National Transportation System:** The case studies identified three fundamental transportation functions of ferry systems contributing to regional transportation networks including essential, complementary optional services, and numerous examples of each type. Currently ferry systems tend to be identified as either marine highways for vehicle transport or waterborne transit systems for passengers. With the current emphasis on intermodal transportation, ferry routes should be recognized as providing integral links in specific travel corridors.

**2. Encourage More Efficient Use of Ferries Within National, Regional and Local Transportation Systems:** By utilizing ferries more effectively in their respective transportation roles, they can provide enhanced intermodal passenger and vehicular travel options, and relieve increasing pressures on existing land-side infrastructure. The case studies demonstrated how the more successful routes have expanded intermodal connections to attract new riders including park-and-ride facilities, transit connections, safe pedestrian paths and bicycle links. New vessel technologies have also increased ferry efficiency, particularly on medium and longer routes.

**3. Establish Industry Standards for Vessels, Terminals and Operations:** The specific design characteristics of different ferry systems vary widely depending on geographic, climate, waterbody conditions and other local factors. However, there are enough commonalities among successful systems of the three functional types to develop performance standards which may be used commonly for most systems. Currently standards are set by Coast Guard vessel regulations and general industry conventions regarding passenger vessel operations. New standards will be established for vessels and terminals as a result of ADA regulations, and revised Coast Guard requirements. The new standards should recognize two important aspects of ferry operations: 1) the wide range of contextual settings in which ferries operate requiring specific and customized design responses for terminals and vessels, and 2) the importance of grand-fathering critical aspects of the many older systems operating in the nation today, many of which have older but serviceable vessels and terminals.

**4. Establish Safety Regulations and Procedures:** Just as the Federal Aeronautics Administration (FAA) sets clear standards for public air travel, a National Ferry Board could be responsible for coordinating overlapping (and sometimes contradictory) regulatory requirements and ensuring continued safety in ferry operations. It should be noted that in the 20th Century, ferry passenger safety records have been outstanding, and should be required to maintain that record with the marked expansion of the ferry industry nationwide.

**5. Encourage and Facilitate Coordinated Ferry Research on a National Level:** The case studies have attempted to show how useful examples of regional ferry experience can be documented nationally, and to demonstrate how useful such system lessons can be to other emerging or evolving systems. For example vessel technology, terminal access, and operations cross-subsidy techniques can be exchanged readily from one system to another to the benefit of both. A central research center and information network would be of great benefit. Organizations such as the International Marine Transit Association (IMTA) and the Passenger Vessel Association (PVA) and the TRB sub-committee capably fill this function if present, but could use assistance in the future. ISTEA has assisted in funding of a number of excellent planning efforts during the past 5 years for different cities and regions. These should be

collected in a central location and made available to the ferry community along with periodic information exchanges. Research and development programs and incentives for new vessel types and equipment should also be encouraged at a national level, and explicitly included in ISTEA II.

**Recommendations for Supplementary Policy Actions**

**1. Establish a Joint FHWA/FTA Office of Ferry Transportation:** Since ferry systems have been funded from both branches of the Department of Transportation, it might be appropriate to establish a joint office to review projects, collect data, and provide assistance as potential applicants.

**2. Clarify the Role of Ferries in National Transportation Policy:** Incorporate the Ferry Role into Current and Future ISTEA Policies: The case studies have shown how ferry systems fulfill many of the intermodal and environmental policy objectives of ISTEA. Several of the more innovative planning and implementation examples from the case studies also demonstrate how future routes can expand their roles as intermodal links in larger regional transportation systems in the future. ISTEA II policy direction and programs could be much more explicit in recognizing these expanding roles, through broadened eligibility guidelines within existing programs, introduction of new programs specifically for ferry services, and through guidelines which recognize the potential of ferries and encourage their inclusion when appropriate in corridor alternatives analysis procedures.

**3. Provide Expanded Ferry Project Funding Programs for Ferry Service Implementation:** Because capital and operating funding now falls under general highway and transit programs and is competing with higher state or regional priorities, regular or annualized ferry funding was found to be established only in the few states where the systems provided essential marine highway services, such as Maine, Washington and Louisiana. For states or municipalities where ferry links are isolated and not integral with state-wide transportation policy, acquiring funding through normal program application is politically and practically difficult. Similarly for interstate services such as New York, New Jersey, inter-jurisdictional funding is difficult to secure. If ferry systems are to be fully integrated with state and regional public transportation programs, more flexibility and perhaps higher priority in discretionary funding programs are needed than currently available, and should include the following categories.

1) Planning: many existing and new locales can benefit from the type of feasibility and implementation plans complete with ISTEA and/or state assistance from 1988 to the present. Examples include ferry studies for Narragansett Bay (1993), and New York Highspeed Ferries ('93), the Bayshore in New Jersey ('91), Corpus Christi ('89), and the San Francisco Regional Ferry Plan ('92).

2) Research and Development: The U.S. lags far behind other ferry-oriented countries such as Norway, Great Britain, and Australia in terms of new vessel technology, construction and operation. While these countries export vessels around the world, the Jones Act precludes acquisition of foreign-built ferries for use on domestic U.S. routes, and makes U.S. construction of foreign-designed vessels more expensive. The combined technological expertise of U.S. naval architects and shipbuilders provides full capability for creating new vessel designs for domestic use and export. In order to capitalize on these resources, the industry is in need of research and development incentives and support.

3) Demonstration Grants: As a logical extension of the above proposed R.& D. programs, provision of demonstration grants for new U.S. technologies would help expedite applications to domestic ferry markets as well as for export to other global markets. Of particular need at present are innovations in highspeed/low wake vessels which meet ADA requirements, for mid to long range routes. Thus far only Alameda, California has commissioned such a vessel through the state referendum. Similar attention is needed for terminals, both for converting existing facilities and for building new state-of-the-art intermodal facilities.

4) Capital Improvement Funding for Vessels and Terminals: With emerging requirements for fleet conversions and terminal upgrades, an increasing need for long term capital funding will be needed for passenger-only as well as passenger and vehicle facilities. The recent priority of FHWA for funding vehicle/highway ferry connections such as the as for the Martha's Vineyard and Nantucket Steamship Authority, and Maine State Ferry System needs to broaden to include passenger-only ferry routes as water transit connections.

5) Intermodal Connections: Ferry route funding should be extended to include the intermodal transit facilities and vehicles to maximize the efficiency of ferry links. If funding were made available for buses, rail, bike trails and park-and-ride facilities in combination with other capital grants, greater incentives would exist for improving intermodal systems.

6) Operations: While the trends in funding have been towards one-time capital improvements and away from ferry operations for most systems, a recognition of the burden of start-up costs and provision of term-limited funding for 1 to 2 years would greatly assist in the implementation and success of new systems. Guarantees of start-up funding can also encourage private operations by easing the burden of substantial start-up costs.

**5. Provide New Funding Application Procedures to Match The Multi-modal Character of Ferry Systems:** While many of the above described funding assistance is technically available through ISTEA programs in varying appropriation amounts, the securing of such funds is often exceedingly difficult because of political jurisdiction conflicts and funding priorities of FTA and FHWA. The jurisdictional constraints arise from the frequently local nature of operations, other than state run systems, and the conflict between MPO to FTA versus state to FHWA application requirements. The intermodal nature of ferry systems might lend itself readily to either new application procedure/funding programs or to joint FHWA/FTA applications. Ferry systems in most areas can't compete with higher capacity transit systems, or with the multitude of highway/bridge/tunnel reconstruction and maintenance projects facing most states. The multiple jurisdictions needing to be coordinated for submission of applications is often excessive and may include interstate, state, county, MPO, and municipality in varying combinations. More options are needed for various separate jurisdictional applications to avoid the horse-trading which often exists between state and MPO, or requires special legislative earmarks to bypass those types of negotiations.

**6. Expedite Environmental Assessment Procedures for Approved Water Transportation Projects:** Experience has shown in states with effective shoreline environmental regulation and reviews, that public oriented water transportation projects often take as long or longer to receive

approval than non-water-dependent private development, as was the case in the Bayshore Ferry Plan for expanding terminal facilities. While all appropriate procedures need to be observed regarding wetlands and other sensitive community and environmental concerns, a more equitable set of cost-benefit assessments needs to be accepted, and a national recognition of the fundamental purpose of waterways for vessel uses and the water dependency of terminal facilities. Similar recognition is needed for associated dredging of navigation channels and accelerated approval processes. Since many state environmental procedures are based on federal requirements, federal guidelines may be needed to expedite project review for recognized transportation policy priorities. Ferries recognized as being preferred travel routes should not have to meet higher environmental standards than land-based alternatives, and should not be treated as non-water dependent activities in environmental review procedures.

**7. Provide Guidelines and Assistance for Ferry System Planning and Transportation Corridor Evaluation:** Consideration should be given to preparing a hand book to assist water-based communities in including and assessing the feasibility of ferries with other intermodal choices for various transit and vehicle corridors. Case studies and technical guidelines could be assembled. Knowledge professional assistance might also be made available through an Office of Ferry Transportation.

**8. Federal and State ADA Access Standards and Guidelines Should be Completed for Vessels and Marine Terminals:** New capital investments in vessels and terminals in many states are on hold or at future risk because of the present uncertainty of ADA requirements regarding marine facilities. While the geographical differences may dictate varying responses by different states, and sometimes within a given state, there is also currently a lack of consensus about basic principles. The continuing uncertainty and lack of state adoption of such regulations may inhibit implementation of new ferry services, since regulations for land-side transit and highway travel are much more clearly defined. The access issues are most acute in locations with major fluctuations in water level, such as the Mississippi River, as well as the Northeast and Northwest coastal regions.

## 5.3 Back to the Stay: Ferries Will Continue to Provide Cost-Effective Alternatives to Land-Based Transportation

The vast majority of cities and towns in the United States and around the world were settled on or around navigable waterways. For centuries these cities relied on their waterways for all types of commerce and passenger travel. It has only been in 20th century that these patterns have been altered in favor of a complex system of high speed land transportation. Indeed, the historical analyses traced the shift from reliance on high volume waterborne transit in the regions studied, to alternative land-side transportation networks, except in those cases where island ferry connections were needed. Recent experience indicates, however, that the ferry systems have returned to many waterways, and have proven once again that the shortest distance and travel time is a straight voyage across the water. On the one hand, ferry systems have continuously provided essential transportation services to islands where no alternatives existed, and will continue to do so as long as there are populations and activities to be served. On the other hand ferries are filling ever expanding new roles and niches in the urban and rural transportation system by offering more cost-effective and environmentally preferred alternatives to congested or otherwise constrained land-based travel corridors. Although the vessel technologies have changed, and intermodal connections have in many locations shifted from rail to auto or bus,

the new ferry routes are often returning to the same corridors as those operating at the turn of the century.

While the new ferry systems are not likely to be as numerous or carry the volume of passengers as their predecessors, they have definitely established themselves in many settings as integral components of their regional transportation systems. New high speed vessel technologies have opened up longer water routes and made the ferries competitive with parallel ground transportation options. In many cases the new ferry systems have relieved pressure on congested fixed land-side highways, bridges, tunnels or rail lines. The water routes have proven in many cases to add new transit capacity without adverse environmental side effects. In high density commuter cities such as New York, ferries have been able to repeat another turn-of-the-century transit feat, by demonstrating how ferries can provide profitable, privately operated public transportation services.

The contemporary ferry services are providing three distinct types of transportation; essential water connections to islands, complementary services which are more efficient than land-side alternatives, and optional ferry routes which offer qualitative benefits to other parallel land-based choices. A clear understanding of the particular transportation functions filled by a ferry route can be useful in assessing its relative merit and assist in planning for its most effective utilization.

The conclusion is that ferry systems are back to stay, and can provide a variety of cost-effective alternatives to land-based transportation modes. It has been shown how essential services to islands such as Casco Bay and the San Juan Islands can provide lifelines to year round residents, while cross-subsidizing low volume year round operations with high volume tourism and recreation surges during summer months. Ferry routes providing shorter time and distance connections across water have attracted increasing numbers of auto commuters away from circuitous and environmentally costly highways such as the Puget Sound, San Francisco Bay, and Louisiana ferry systems. A new generation of market responsive, privately operated ferries has proven to be an increasingly popular option for New York City commuters as the final link to Manhattan, as opposed to the congested bridge, tunnel or transit routes. All of these commuter-oriented systems are vital components of their respective regional transportation systems and are demonstrating the benefits of intermodal travel.

# Phase 2: CASE STUDIES OF FIVE FERRY NETWORKS

## APPENDIX

## A1.1 Site Visit Fact Sheet - Seattle and Puget Sound

**A. Systems/Routes included in site visit (July 20-22, 1993):**

1. Washington State Ferries:

o Fauntleroy - Vashon Heights (Vashon Island) - Southworth (vehicle(v.) and passenger(p.))
o Seattle - Vashon Heights (p. only)
o Seattle - Bremerton (v. + p.)
o Seattle - Bremerton (p. only)
o Seattle - Bainbridge Island (v. + p.)
o Edmonds - Kingston (v. + p.)
o Mukilteo - Clinton (Whidbey Island), (v. + p.)
o Anacortes - San Juan Islands - Victoria BC (v. + p.)

2. Victoria Clipper/Clipper Navigation Inc.

o Seattle - Victoria BC

**B. Interviews Conducted (July 20-22,1993):**

o Ray Deardorf, Chief Planner, Washington State Ferries, 8/21.
o Leonard Tall and Darrell Bryan, Clipper Navigation Co., 8/21.
o Martin Behr, Mosquito Fleet, 8/22.
o Ken Fox, Art Anderson/Naval Architects, 8/22.
o Barry Knight and Ari Steinberg, TAMS Consultants,Inc., 8/20, 8/22.

**C. Document Review:**

Washington State Ferries Two Year Operations Report - 1989/1991 Biennium; Washington State Department of Transportation, Marine Division, prepared by Parsons Brinckerhoff Quade & Douglas, Inc.; 1992.

Washington State Ferries Two Year Operations Report - 1987/1989 Biennium; Washington State Department of Transportation, Marine Division, prepared by Parsons Brinckerhoff Quade & Douglas, Inc; 1990.

Empirical Analysis and Evaluation of the Travel Behavior of Seattle/Vashon Passenger-Only Ferry Commuters; Mark Gabel, Masters Thesis (CE), University of Washington, 1991.

Tales of Six Sisters; The Steel Electric Ferries of San Francisco Bay and Puget Sound; Barry W. Eager, published in Steamboat Bill, No. 205, 1993.

Operational Challenges of the 1990's; Armand Tiberio, Director of Marine Operatioins, Washington State Ferries, paper presented at the 18th Annual International Marine Transit Association Conference, 1993.

Ferry Travel Guide; Dan Yourba, Olympic Publishing, 1993.

Mosquito Fleet: High Capacity/High Speed Passenger Ferry Between North Puget Sound & Seattle; Mosquito Fleet, Everett WA; 1992.

## A1.2 Site Visit Fact Sheet - Portland Casco Bay Ferries

**A. Systems/Routes included in site visit (December 26,1990 - October ,1993):**

o Portland - Peaks Island
o Portland - Little Diamond Isl. - Great Diamond Isl. - Long Isl. - Chebeague Isl. - Cliff Isl.

**B. Interviews Conducted (December 26, 1990 and November 1,1993):**

o Pat Christian, General Manager, " ", 11/1/93
o Bill Neilly, Operations Manager, Casco Bay Island Transit District (CBITD), 11/1/93
o Tom Valleau, Director , City of Portland Waterfront Office, (to be interviewed)

**C. Documents Reviewed:**

o Transportation to the Year 2000: A Capital Improvement Plan for Maine, prepared by Maine Tomorrow with TAMS,Consultants,Inc. for the Maine Transportation Capital Improvement Planning Commission, 1990.

o 1989 to 1993 Financial Projection for the Casco Bay Island Transportation District, by the greater Portland Council Of Governments, 1988.

o L.D.136: An Act to Provide Operating Funds for the Casco Bay Island Ferry District, 116th Maine Legislature, presented by Representative Rand of Portland, January 25,1993

o Casco Bay's Ferries, case study prepared by Professor Jose A. Gomez-Ibanez, Kennedy School of Government, Harvard University, 1992.

o A Study of the Casco Bay Ferry Services, prepared by Martin O'Connell Associates, 1988.

o LP 136, An Act to Provide Operating Funds for the Casco Bay Island Ferry District, 116th Maine State Legislature, 1993.

## A1.3 SAN FRANCISCO BAY: Site Visit Fact Sheet

**A. Systems/Routes included in site visit (July 17 - 20, 1993):**

1. Golden Gate Ferry System

- o San Francisco - Larkspur
- o San Francisco - Sausalito

2. Alameda/Oakland - San Francisco, (Blue and Gold Fleet)
3. Vallejo - San Francisco, (Red and White Fleet)
4. Tiburon - San Francisco, (Red and White Fleet)

**B. Interviews Conducted (July 17 - 20):**

o Roger Murphy, Vice President and General Manager, Blue and Gold Fleet, 8/19.
o Gene Rexrode, Secretary of the District, Golden Gate Bridge, Highway and Transportation District, 8/19.
o Carolyn Horgan, Manager of Marine Operations, Red and White Fleet, 8/19.
o Willard Thau, Captain on Tiburon Route,Red and White Fleet, 8/20.
o Rodney McMillan, Transportation Planner, Metropolitan Transportation Commission (MTC), 8/20

**3. Documents Reviewed:**

Golden Gate Corridor Transportation Facilities Plan; Report to the California State Legislature, prepared by the Golden Gate Bridge, Highway and Transportation District, April 3, 1971.

Golden Gate Ferry; S.M. Kowleski: Manager, Ferry Transit Division, Golden Gate Bridge, Highway and Transit District; 1979.

Regional Ferry Plan: San Francisco Bay Area; Prepared by Pacific Transit Management, for Metropolitan Transportation Commission, 1992. (2 Vols.)

Short Range Transit Plan: Fiscal Years 1992/93 - 2000/2001; Golden Gate Bridge, Highway and Transit District; 1992.

Bus and Ferry Transit Guide; Golden Gate Transit, First Edition, summer 1993.

Regional Transit Guide: San Francisco Bay Area; Metropolitan Transit Commission, 1993.

Bay Area Emergency Ferry Service: Transportation Relief After the October 17, 1989 Earthquake; Richard M. Fahey and George E. Gray, Calafornia Department of Transportation, 1990.

The following papers were presented at the 18th Annual International Marine Transit Association (IMTA) Conference, San Francisco, October, 1993:

Back To The Future: Ferry Operations as Part of a Regional Transportation Network; Rod McMillan, Senior Transportation Planner, Metropolitan Transportation Commission, 1993.

Environmental Considerations for Ferry Transit Systems on San Francisco Bay; Gene P. Rexrode, Secretary of the District, Golden Gate Bridge, Highway and Transit District, 1993.

Marine Transportation as a Marketing Tool for Land Development; _____ ; Harbor Isle Bay Development Bay Farm Island, Alameda CA. 1993.

Blending Commuter and Visitor Attraction Services; Terry F. Koenig, Marketing Manager, Red & White Fleet, 1993.

The Oakland-Alameda Ferry: Competing with Cars, Buses and Light Rail Mass Transit; Roger Murphy, Vice President and Generaql Manager, Blue & Gold Fleet, 1993.

## A1.4 Site Visit Fact Sheet - Mississippi River (LA) Ferry Routes

**A. Systems/Routes included in site visit (June 26-29, 1993):**

o New Orleans/Crescent City Connection (LA-DOT)

- Canal Street to Algiers
- Algiers to Chalmette
- Jackson Avenue to Gretna

o Edgard to Reserve (LA-DOT)
o Lutcher to Vacherie (St. James Parish)
o Belle Chasse to Scarsdale (Plaquemines Parish)

**B. Interviews Conducted (June 28,29):**

o Lynn Ed Coyne, Gretna Town Regulations Officer (June 28)
o Randall M. Paisant, Assistant Executive Director - LA-DOTD/Crescent City Division (June 29)
o Capt. Dorman, Captain of the Canal Street/Algiers vehicular ferry (June 29)
o Algiers Sandwich Shop Operators (June 29)

**C. Document Review**

Tales of the Mississippi; R. Samuel, L. Huber, W. Ogden; Hastings House, NY, 1955.

Ferries of America; Sarah Bird Wright; Peachtree Publishers, LTD.; Atlanta; 1987.

New Orleans: A Pictorial History; Leonard V. Huber; Crown Publishers, NY; 1971.

The Streetcars of New Orleans: Louisiana - Its Street and Interurban Railways; Luis C. Hennick and E. Harper Charlton; Louis C. Hennick, Publisher; 1965.

Special thanks to The Historic New Orleans Collection, 533 Royal Street, New Orleans LA, 70130, for their assistance and use of several of the above references.

## A1.5 Site Visit Fact Sheet - New York City Network

**A. Systems/Routes included in site visit (Sept. 13-14, 1993):**

o Weehawken/Port Imperial - Midtown Manhattan/Pier 78 (38th Street), Port Imperial FerryBus
o Weehawken/Lincoln Harbor - Midtown Manhattan/Pier 78 (38th Street), operated by Port Imperial FerryBus
o Weehawken/Port Imperial - Downtown Manhattan/Slip 5 (South Ferry Terminal), Port Imperial FerryBus
o Hoboken - Downtown Manhattan/Battery Park City, operated by Port Imperial Ferrybus
o Staten Island - Downtown Manhattan/Whitehall Terminal
o Highlands/Atlantic Highlands - Brooklyn/Bay Ridge - Downtown Manhattan/Pier 11, operated by TNT Hydrolines

**B. Interviews Conducted (Sept.13-14, 1993):**

o Thomas F.X. Scullin, Vice President, ARCORP Properties (Port Imperial FerryBus)
o Mark Stanisci, TNT Hydrolines, Inc.
o Henry Nicholson, Director, Department of Transportation, Monmouth County, New Jersey
o George Cancro, Executive Manager, Port Authority of NY & NJ
o Alan Olmsted, Director, NYCDOT Office of Private Ferry Operations
o Peter Hallock, Associate Director, NYCDOT Office of Private Ferry Operations

**C. Document Research Bibliography:**

The Governor's "New" New York Initiative: High Speed Ferry Task Force, 1993.

The Bayshore Ferry Study, prepared by TAMS Consultants, Inc., for the Monmouth County Board of Freeholders, 1991.

Hoboken Ferry Plan, Port Authority of New York and New Jersey, 1988.

The Trans-Hudson Study, NY-DOT, NJ-DOT, Port Authority, 1984.

Waterborne Transportation Policy Statement, Mayor Koch, New York City, and the Waterborne Transportation Task-Force, 1986.

New York City Ferry Guide, NYC Department of Transportation, 1993.

Status of Private Ferry Operations, NYC Department of Transportation, 1993.