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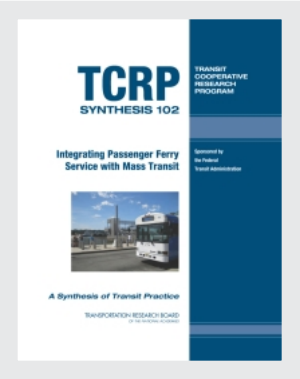

Integrating Passenger Ferry Service with Mass Transit

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TRANSIT COOPERATIVE RESEARCH PROGRAM

TCRP SYNTHESIS 102

Integrating Passenger Ferry Service with Mass Transit

A Synthesis of Transit Practice

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Research Sponsored by the Federal Transit Administration in Cooperation with
the Transit Development Corporation

TRANSPORTATION RESEARCH BOARD

WASHINGTON, D.C.
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TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA, the National Academy of Sciences, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

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The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

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Cover Photo: The West Midtown Ferry Terminal located in Hudson River Park at West 39th Street in Midtown Manhattan (New York City). Courtesy of Nelson\Nygaard Consulting Associates.

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FOREWORD

Transit administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the transit industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire transit community, the Transit Cooperative Research Program Oversight and Project Selection (TOPS) Committee authorized the Transportation Research Board to undertake a continuing study. This study, TCRP Project J-7, "Synthesis of Information Related to Transit Problems," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a TCRP report series, *Synthesis of Transit Practice.*

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

By Donna L. Vlasak
Senior Program Officer
Transportation Research Board

The purpose of this synthesis was to document the state of the practice of integration between land- and water-based transit systems and to explore successful aspects of seamless integration. The report assembles and presents information in numerous locations around the United States, supplemented with examples from Canada, Australia, and Bermuda.

To accomplish this effort a literature review was undertaken that received limited results. However, a selected survey of 46 respondents out of 57 transit and ferry agencies, as well as agencies and companies in Canada, Australia, and the United Kingdom, including Bermuda, received an 80% response rate. The respondents represent a geographically representative sample—varying in size and age of system, degree of coordination between ferry and transit, and type of community served. The synthesis summarizes findings from 60 different ferry-to-land-based transit interfaces. Case examples of key factors of land- and water-based integration are offered for Long Wharf in Boston, Massachusetts; TransLink's SeaBus in Vancouver, British Columbia; New York Waterway's Hoboken Terminal; and Washington State Ferries and Kitsap Transit in Bremerton, Washington.

Tim Payne, Danielle Rose, and Hazel Scher, Nelson\Nygaard Consulting Associates, Inc., Seattle, Washington, collected and synthesized the information and wrote the report, under the guidance of a panel of experts in the subject area. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

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INTEGRATING PASSENGER FERRY SERVICE WITH MASS TRANSIT

SUMMARY

In several urban areas of North America, and in many international settings, ferry transportation provides critical connections for communities of all sizes and serves a variety of needs. Many of these ferry systems have been coordinating with land-based transit services for decades, ensuring that passengers can easily reach their destinations without using a private automobile. At the same time, many communities with historic ports are finding the addition of ferries to the transportation network to be an effective tool in managing transportation demand and, in some cases, providing new capacity to overburdened roadway networks. In an increasingly interconnected world, users of water-based transit often rely on the integration of ferry service with land-based public transit to reach their destinations. However, it is not known to what degree ferry services are coordinated with land-based transit in North America, and in what scenarios it is most advantageous for water- and land-based providers to integrate their services. The purpose of this synthesis is to document the state of practice of integration between land- and water-based transit systems and explore successful aspects of seamless integration.

The report assembles and presents information about the state of water- and land-based transit collaboration in numerous locations around the United States, supplemented with examples from Canada, Australia, and Bermuda. The information in this synthesis can be used as a resource to improve ferry–transit interfaces and assist communities in establishing new coordination between ferry and transit service. Practical information is provided for transit agencies of all sizes by profiling innovative and successful practices, lessons learned, and gaps in information for future research.

There are many forms and varying degrees of coordination between (or within) agencies that contribute to a seamless experience for passengers transferring between modes. Agencies that report a high level of integration between services included the following elements:

- Ferry and transit connections are in the same terminal building or nearby.
- Schedules are coordinated to enable passengers to plan a seamless trip using both modes.
- Schedule and fare information are available on the Internet, mobile applications, and in paper form on both the ferry and the bus or train.
- One ticket (or card) covers the fare(s) for both the ferry and transit on both ends of the journey.
- Ferries and buses have operational coordination and will wait for each other when there is a delay.

All of these elements contribute to integration between water- and land-based transit.

The information in this synthesis was gathered by means of a survey distributed to selected transit and ferry agencies and companies around the United States; the survey was also distributed to agencies and companies in Canada, Australia, and the United Kingdom (including Bermuda). The survey received an 80% response rate (46 of 57 agencies and companies), and respondents represented a geographically distributed sample—varying in size and age of system, degree of coordination between ferry and transit, and type of community served.

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The survey responses provided several key findings about the coordination of ferries and transit and the main findings are summarized here:

- The appropriate degree of water- to land-based transit service integration varies based on a number of factors related to geography, land use, and travel markets. Essentially the following four motivating factors were reported that give rise to ferry–transit integration. One or more of these factors may be present in each aspect of integration:
  - The land-based transit service is coordinated to the ferry schedule because the transit service is located on an island or remote location, and thus the ferry dock is a good ridership market.
  - The sheer volume of passengers transferring between ferry and land-based transit demands the attention of the agency, or agencies, involved.
  - Coordination is present in the initial development of services and the ferry–transit interface is fully integrated from the beginning or is developed as part of a new or added connection or increased capacity.
  - Coordination is a result of regional or local transportation demand management and/or congestion management strategies. In many cases, ferry–bus integration serves to mitigate vehicle congestion and capacity issues for limited ferry vessel and terminal capacity or to address the capacity and congestion on a parallel roadway or transit line.
- The degree of coordination is heavily linked to the frequency of ferry or transit service. High frequencies of ferry or transit service generally coincide with a decreased need to coordinate schedules and operations. Lower frequencies of service are more common, particularly for ferry service, and demand more creative solutions to facilitating integrated ferry–transit activity, such as matching headways between land- and water-based systems, facilitating operational communications, and integrating facilities.
- Operational integration requires inter-agency coordination and is mostly applicable where the primary transit market is ferry riders. To avoid inconveniencing non-ferry-riding passengers, operational integration will sometimes only exist for limited routes, which are called a dedicated bus or train service in this report. In contrast, service designed to meet many traveler destinations, called multi-purpose service in this report, is less appropriate for operational integration because of other schedule coordination needs along the route.
- Some ferry agencies are well established in their region and have successfully developed a strong ridership base along key travel routes. However, this does not necessarily indicate the presence of integration with land-based transit services.
- In this synthesis survey complete fare integration, where riders are granted a full fare transfer from one mode to the other, predominantly exists only within agencies that operate both land- and water-based modes.
- Schedule and real-time information, accessible online and optimized for mobile devices, allows users to plan trips remotely and facilitates the communication of information across agencies, presenting a more unified service.
- The physical nature of a ferry terminal may present obstacles to creating integrated facilities. Ferry docks are often long, adding distance required for foot passengers to connect between transit services. In addition, buses require space to queue, load, unload, and maneuver, which is not always available on the pier or in the immediate vicinity at the base of the pier. In these situations, wayfinding systems (such as signage) are used to create a more successful land- and water-based transit interface.

This report summarizes findings from more than 60 different ferry-to-land-based transit interfaces (many agencies reported data for more than one interface). Each interface is unique; the precise methods and strategies used to coordinate in one location are not necessarily applicable in another. Many ferry routes are met by different transit agencies on either end of the route, and the ferry terminals connect different sizes of communities and types of land uses. Integration practices range from informal arrangements between field staff, ferry crews, terminal personnel, and bus operators, to a few umbrella policies established between the transit and ferry operators. The following chapters discuss the information gathered in the survey and provide case examples of key factors of land- and water-based transit integration.

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CHAPTER ONE

INTRODUCTION

The purpose of this study is to document the current state of the practice in water- and land-based transit integration, including coordination of schedules, fares, facilities, and communication of passenger information. In North America, many waterside cities and towns have used ferries as a critical commuter connection and valuable tourist attraction. These ferry services are managed and operated in a variety of ways, and are often not considered part of the public transit network. This results in ferry services that are sometimes not well-coordinated with land-based transit services. This synthesis explores to what degree and in what scenarios ferries are currently integrated in the public transit matrix across North America and internationally.

PROJECT BACKGROUND, PURPOSE, AND OBJECTIVES

In the history of many North American cities, waterborne transit was used as a matter of necessity when land routes were undeveloped or unavailable. In many respects, short of walking and horseback, ferries are one of the oldest forms of transport known in human history, predating the invention of the wheel.

The integration of passenger ferries and transit is not a new problem. In waterfront cities, early forms of land-based transit were often focused on a terminal at the water's edge, because that is where the central activity of the city was found. Today, water- and land-based transit systems continue to be in the hands of both public and private operators, each with their own set of motivations and target markets. The interests of land and waterborne systems, of private and public operators, appear to be only occasionally focused on ensuring a seamless trip between land- and water-based transit (Figure 1).

Passenger ferry services are operated by public agencies, private operators, and in public–private partnerships throughout the country. Often ferry operators are motivated to fulfill only what is viewed as their primary mission: to provide a service that moves passengers, freight, and automobiles over bodies of water. Land-based transit agencies appear to focus on serving extensive and diverse destinations with an array of routing and modal options. Neither group, typically, is focused on the complete end-to-end trip of foot passengers. This basic difference is one of the key factors that continue to impact the integration of water- and land-based transit systems.

The integration of water- and land-based transit services can increase the flexibility, resiliency, and vibrancy of a region. Ferries can provide an important and immediate connection, as service can be implemented comparatively quickly and is not affected by traffic congestion. The flexibility of ferry service is especially attractive for a region that is prone to natural disasters or that relies extensively on several congested bridges or tunnels to access major metropolitan centers. A water transit system can provide vital transportation resources for emergency planners in the event of an earthquake or other disasters or maintenance scenarios that disable roads, tunnels, or bridges (Metropolitan Transportation Commission 2007).

As development pressures continue to mount in many urban waterfront areas, economic and environmental issues become key objectives of our current transportation system. This synthesis report provides information that may help broaden the understanding of the use of waterways as a tool in expanding mobility options. It explores existing systems that enable movement between activity centers by means of an integrated system of land-based and waterborne modes. The report also explores successful practices and case examples, and identifies the elements that make ferry and land transit operations seamless, which may prove useful to many communities revitalizing their waterfronts with transit-oriented development or transforming their waterways into a part of the public transportation system.

TECHNICAL APPROACH TO PROJECT

This synthesis used an online survey (also made available in paper format) and literature review to collect information about the integration of ferries and land-based transit in the United States and internationally.

In this report, land- and water-based transit operators were surveyed. The survey was distributed to 57 agencies and companies, and 46 responses were received, either online or by means of a phone survey. Respondents were asked questions relating to ferry and transit transfers, ferry

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FIGURE 1 Passenger access to ferry in Boston transit network (*Courtesy*: Joseph Cosgrove).

operations and background, and questions about the transit riding population. The survey and report are divided into the following four topics:

1. Multimodal schedule coordination,
2. Fare coordination,
3. Facilities coordination, and
4. Passenger communications.

Aside from these subject areas, the survey sought to gather and display information about successful practices, innovations, challenges, and solutions.

ORGANIZATION OF REPORT

For the purpose of this report the term "interface" is used to describe the physical and operational proximity between water-based transit (ferries and water taxis are also used interchangeably with the term "water-based transit" in this report) and land-based transit services (buses, streetcars, light rail, and heavy rail are also used in place of "land-based transit" in this report).

Interface is also used to describe physical locations where there are passenger trips that are completed by using both water- and land-based modes of public transportation ("public transportation" and "transit" are used interchangeably in this report).

The information in this report is summarized both in terms of the operating/managing agency and in terms of the interface. The report includes a summary of surveyed agencies and interfaces, several case studies documenting the state of the art in North America, and chapters addressing multimodal schedule coordination, fare coordination, facilities coordination, and passenger communication.

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CHAPTER TWO

PROFILE OF SURVEYED AGENCIES

TYPES OF INSTITUTIONS

The survey for this report yielded responses from 46 public and private transportation agencies that provided information on a total of 68 different interfaces where ferries and land-based transit meet. All of the information provided in this report is based on the results of the survey unless otherwise noted. The intent of the survey was not to collect a representative sample; therefore, the conclusions of this report should only be used for reference.

The tables in Appendix C list each interface described in the survey, the land- and water-based transit agencies servicing that interface, and several other key details of the public transportation services at the interface. Of the surveyed agencies, nine operate both land- and water-based modes of transit. Figure 2 summarizes the types of modes operated by the surveyed transportation agencies (note: agencies could select more than one). Participating agencies were also asked to identify whether or not they receive public funding. As shown in Figure 3, the majority of surveyed operators are state and/or federally supported. All agencies that reported receiving no public funding are agencies that primarily operate ferries. Only three of the surveyed interfaces are served by seasonal ferry service (summer); all others operate year round.

DEMOGRAPHIC, GEOGRAPHIC, AND COMMUNITY CHARACTERISTICS

Ferries primarily serve commuters and tourists, although some agencies reported that community travelers, such as those on shopping, medical, and entertainment trips, occasionally make up a significant percentage of the ridership. Ferry service is most critical in providing connections to communities that are entirely isolated on an island or between communities for which the land-based connection is a significantly longer driving or transit trip. Ferries often provide a connection to locations that cannot be reached by an overland route. In those rural and island communities, the land-use patterns, residential and employment density, and street network are particularly critical in influencing the availability, frequency, and coordination of land-based transit service. In addition, in areas where auto ownership rates are high, the transit market generally declines. Parking availability and the pedestrian environment at the interface will also influence the perceived usability and appeal of transit services.

Low frequency transit service may discourage ridership and encourage ferry riders to drive to the interface instead of using transit, and possibly bring their own car onto the boat if it is not a passenger-only ferry. Development density, residential and retail/commercial development, surrounding transit, and the absence of major arterials were found to be the most important factors influencing walking trips around transit hubs (Coffel et al. 2012).

Interfaces surveyed for this report are situated in communities that vary widely in population size, as shown in Figure 4. The most frequent land-use and community size reported in the survey responses was dense urban downtowns in metropolitan areas with populations greater than one million people. Twenty interfaces fall into this category, and range geographically from New York City, New York; Seattle, Washington; Vancouver, British Columbia; San Francisco, California; Boston, Massachusetts; and Sydney, Australia. The one airport reported as being served by a ferry is Boston Logan Airport, which is connected to downtown Boston by the Inner Harbor Ferry. This is a unique connection, served by a free shuttle on the airport side and by numerous transit connections on the downtown Boston side (Boston is discussed in more detail in chapter three).

The geographic distribution of surveyed agencies in North America is displayed in Figure 5. Most responses were concentrated in the Pacific Northwest and the Mid-Atlantic/New England regions. Survey responses were also received for three interfaces operated by Transport for New South Wales in Sydney, Australia, and three interfaces operated by Public Transportation Bermuda. A list of all interfaces for which survey information was received can be found in Appendix B, and includes the name of each of the 68 interfaces, agencies responsible for water- and land-based transit, and several other key characteristics. Some surveyed agencies reported that they do not serve interfaces where ferries and land-based transit meet. These agencies do not appear on the map.

RIDERSHIP CHARACTERISTICS

Surveyed agencies were asked to report measured or estimated numbers of daily trips made by passengers using both land- and water-based transit at each interface. Most commonly, agencies reported a low or moderate intensity of exchange. In a low-intensity exchange, fewer than 50 people transfer from

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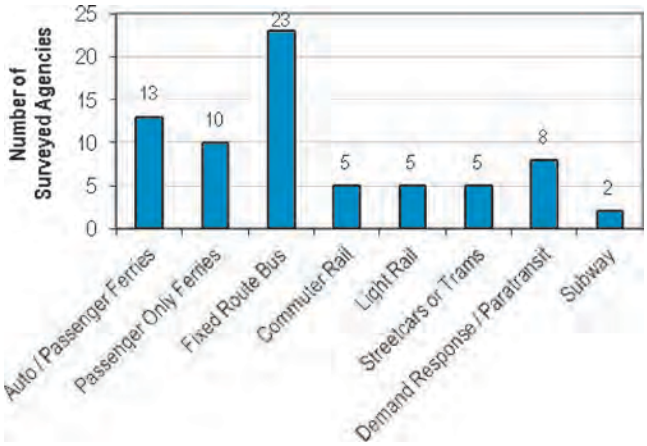

FIGURE 2 Number of surveyed agencies operating different transit modes.

transit to ferries or vice versa on a daily basis. Nine interfaces surveyed experience a very intense exchange, with more than 1,000 passengers transferring on a daily basis. Figure 6 displays the distribution of intensities of daily ferry–transit transfers reported at surveyed interfaces.

TRAVEL MARKETS SERVED, PURPOSE, AND MAGNITUDE

A significant number of interfaces surveyed are part of a ferry route connecting an outlying island community and an urban area; therefore, the ferry services are primarily used by commuters dwelling in these suburban island areas. Ferry travel tends to provide access for commuters who value a pleasant journey, while also appealing to tourists looking for a sightseeing opportunity. In cases where ferry travel provides a viable transportation option that appeals to a broad range of commuters, ferry service usually provides both a time and cost savings over other modes (including the personal automobile). Where ferry service is currently applied most widely informs an understanding of potential market growth and the future of water-based transit.

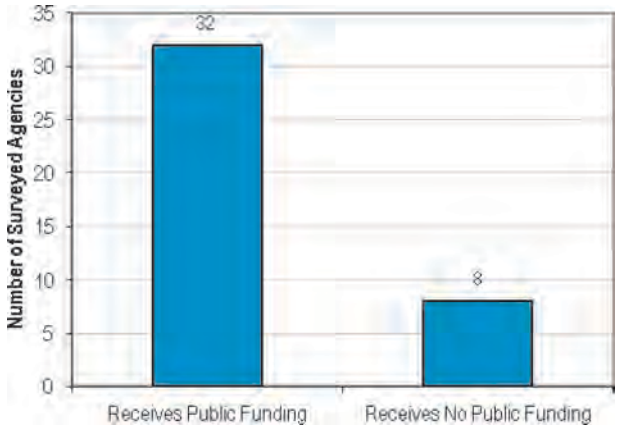

FIGURE 3 Number of entities that receive public funding.

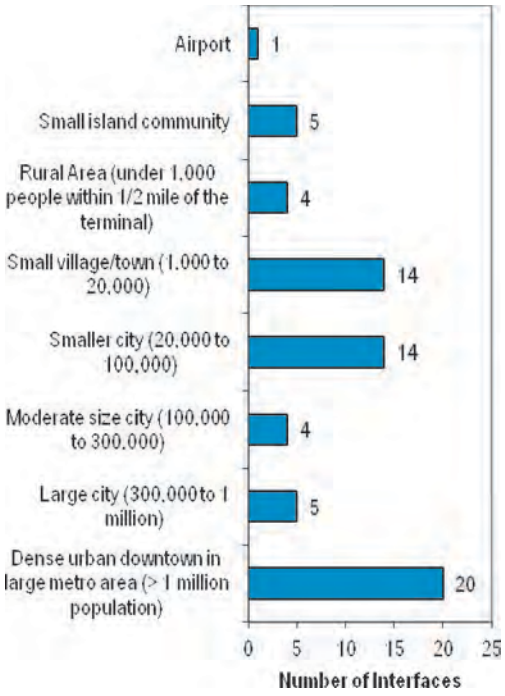

FIGURE 4 Land use and population of surveyed interfaces.

For ferry service to popular tourist locations that also have a high residential component, such as Martha's Vineyard, transit service that is well-oriented to the ferry schedule and desired destinations may work in conjunction with the high cost of bringing an automobile onboard the ferry to encourage a relatively high rate of transfer between land- and water-based transit. Martha's Vineyard Regional Transit Authority operates a seasonally adjusted schedule to coordinate with seasonally adjusted ferry services, predominantly those of the Steamship Authority, where both services are designed to meet the diverse travel needs of varying volumes of tourists, commuters, and residents. Vineyard Transit reported that many passengers transfer from bus to ferry, approximately 1,000 per day, at each of the two interfaces on the island, Vineyard Haven, Tisbury and Oak Bluffs. However, it was reported that fewer passengers transfer from ferry to bus at these interfaces. This travel characteristic was not researched further in terms of understanding why this directional bias exists. However, it is important to understand that three other ferry services (Seastreak to New Bedford, New York and New Jersey; Vineyard Fast Ferry to North Kingstown, Rhode Island; and Hy-Line Cruises to Nantucket), all seasonal private operators, also serve Martha's Vineyard at these interface points. These other ferry services, as well as a number of other land-based transportation options on the island, such as extensive taxi services, may contribute to a more complicated travel market that does not necessarily create mirror image patterns for people arriving and leaving Martha's Vineyard.

Many interfaces in New York and New England benefit from the presence of multiple rail lines. The rail–ferry inter-

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FIGURE 5 Geographic distribution of agencies surveyed in North America.

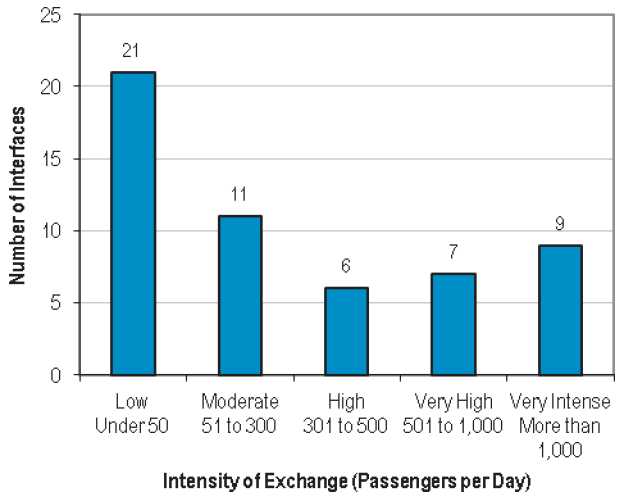

FIGURE 6 Intensity of exchange between ferries and transit (passengers per day).

face appears to function similarly to a bus–ferry interface; however, a rail–ferry interface appears to provide a greater range of travel options to ferry passengers. In Bridgeport, Connecticut, travelers who transfer to or from the Bridgeport & Port Jefferson Steamboat Company between Connecticut and Long Island have a choice of three rail services immediately adjacent to the ferry terminal: Amtrak, Metro–North, and Shoreline East Railroad. Similar conditions exist in New London, Connecticut, between Amtrak and Shoreline East, with connections to Cross Sound Ferries to Long Island and Block Island Express Ferry (seasonal). Although more research is necessary to understand the difference between interface modes, the presence of a heavy rail station adjacent to a ferry terminal may be more appealing to commuters and long-distance travelers than bus services.

Ferry service can provide a temporary solution to a bridge closure in the case of an emergency or maintenance. In Addison County, Vermont, the transit provider Addison County Transit Resources responded to a temporary closure of the Champlain Bridge, which provides a crucial connection over Lake Champlain to many residents in the area who

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reside in New York and are employed in Vermont. A half-hour commute was transformed into a two-and-a-half-hour commute, which posed a challenge for these residents. The agency responded with temporary ferry service across Lake Champlain, and complementary shuttles to key destinations that met the ferry on the Vermont side of the crossing (Forbes et al. 2012). Although designed to be temporary, the use of combined land- and water-based transit service proves the importance of flexible solutions such as this. The availability of landside transit is an important factor in the success of temporary or planned new ferry routes in capturing potential travel markets.

Some ferry agencies have implemented innovative mechanisms to coordinate ferry service within a region or to secure federal highway funding or emergency response funding, such as the Water Emergency Transportation Authority (WETA) in the San Francisco Bay Area, which was formed in response to the 1989 Loma Prieta earthquake to coordinate and strengthen Bay Area ferry service.

INTER-AGENCY COORDINATION

Survey responses indicated that only nine of the 46 responding agencies operate both ferry and land-based transit at interfaces. Most interfaces are served by multiple agencies and thus require cooperation and communication between agencies to improve and maintain good connections between modes. The following case example describes the policy and operational arrangements put in place by Kitsap Transit to provide integrated service, from the customer perspective, despite the obstacles associated with coordinating service across modes and transit agencies.

Kitsap Transit and Washington State Ferries

In Kitsap County, Washington, there are four interfaces between Kitsap Transit and Washington State Ferries (WSF). Bremerton, Bainbridge Island, and Southworth are all served by Kitsap Transit bus routes that are intentionally scheduled to meet arriving and departing ferries. Kingston is served by Kitsap Transit routes, although there is no intentional schedule coordination. Additionally, Kitsap Transit operates a foot ferry between Port Orchard and Bremerton, which is served by Kitsap Transit buses at both Port Orchard and Bremerton. Aside from the city of Bremerton, which has a population of just under 40,000 residents, Kitsap County is characterized by suburban and rural development. The convenient connections provided by Kitsap Transit between ferries and bus service significantly increase transportation options for residents and commuters traveling within Kitsap County, as well as to Seattle and other parts of the Puget Sound region. Supporting Kitsap Transit's commitment to serving ferry interfaces is a combination of planning policy, financial incentives, and market demand.

Kitsap Transit has prioritized ferry terminal service in its primary planning document, the 2010–2016 Transit Development Plan for Kitsap Transit. This plan states that Kitsap Transit will "Continue connection standards with WSF, public and private ferry operators, Mason, Jefferson, and Pierce County transit systems at 2010 levels." Although these standards are not explicitly defined, this planning directive ensures that future operational and system design decisions include consideration of connections with WSF. Also stated in the Plan is that Kitsap Transit will continue to respond to all ferry system breakdowns with extra between-terminal service, such as that between Bainbridge Island and Bremerton, in the case that one ferry route is inoperative.

In addition to planning policy, there are financial incentives that encourage Kitsap Transit to maintain service to the Bremerton Transportation Center, where WSF routes depart for Seattle. The WSF route between Bremerton and Seattle is officially designated as a segment of State Route 304. Because of this classification, Kitsap Transit receives toll credits annually for use as the local match for grant funding for transportation projects that connect to WSF.

Historically, Kitsap Transit has demonstrated a commitment to maintaining ferry service as a travel option, as shown in the case of the Kitsap Foot Ferry, which operates between Port Orchard and Bremerton. Foot ferry service was operated by a private company until 2004, when Kitsap Transit purchased the service to ensure that it remained available to the public as a viable alternative to State Highway 3, a congested corridor that is almost four times the distance by land versus water between Port Orchard and Bremerton. The foot ferry is fully integrated into the pulse schedule of bus routes at the Port Orchard Marina, and serves the Bremerton Transportation Center, which is shared with Washington State Ferries (Figure 7).

FIGURE 7 Port Orchard Dock of Kitsap Foot Ferry (*Courtesy*: Oran Viriyincy).

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Finally, within Kitsap County, WSF riders are a major market for bus transit owing to the concentration of large employment sites in Seattle. Commuters who want to avoid the high fare for driving onto the ferries, the risk of missing the ferry as a result of limited auto capacity onboard, traffic congestion, and parking costs in Seattle may use Kitsap Transit to access the ferry terminals. Although it is possible to drive from Bremerton to Seattle, the time and cost savings provided by using transit and ferry service make it a preferable option for many commuters. Kitsap Transit's policy goals include reducing vehicle-miles traveled and providing sustainable transportation options, which are supported by linking bus service with WSF.

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CHAPTER THREE

STATE OF THE ART IN NORTH AMERICA

The following case studies of Long Wharf in Boston, Massachusetts, and TransLink's SeaBus service between Lonsdale Quay and Waterfront Station in Vancouver, British Columbia, exemplify interfaces with high levels of integration between land- and water-based transit in the United States and Canada (see Table 1). These cases were chosen to illustrate high levels of integration as a result of multimodal operation by one agency and high levels of transit service frequency that make schedule coordination unnecessary. Other cases are discussed in the following chapters of this report that exemplify interfaces with inter-agency coordination on schedules, operations, fares, facilities, and passenger information in communities ranging from low-density-rural to high-density-urban centers.

BOSTON LONG WHARF—INNER HARBOR FERRY AND COMMUTER BOATS, MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

The Massachusetts Bay Transportation Authority (MBTA) operates both land- and water-based transit in the Boston area. The MBTA ferry boats operate three routes, which connect eight distinct interface points. Ferries departing from Long Wharf serve Quincy, Hull, and Logan Airport. There are several other ferry services operated out of Long Wharf; a National Park Service ferry to the Harbor Islands, a private ferry to Salem, and harbor tours. Just south of Long Wharf, Central Wharf and Rowes Wharf serve the Charleston Navy Yard and Hingham. The ferry routings operated by MBTA (shown in Figure 8) are:

- Charlestown Navy Yard–Boston
- Hingham–Boston
- Quincy–Boston–Logan Airport–Hull.

Long Wharf is a land- and water-based interface in downtown Boston. Aquarium Station, served by the Blue Line of Boston's subway (also operated by MBTA), is located roughly 500 ft from the ferry slip. Additionally, the Route 4 bus operates on Atlantic Avenue, which runs perpendicular to the wharf. The following sections describe aspects of the ferry interface at Long Wharf that facilitate integration between ferry and transit service.

Land-based transit service at the Long Wharf interface is provided by a single agency, the MBTA; between 51 and 300 passengers transfer to and from water- and land-based transit at this location on a daily basis. The MBTA reports that 10% of passengers transfer from a ferry boat to a land-based transit service. In 2010, 1.29 million individuals rode on MBTA boats. Ferry boat ridership made up less than 1% of total systemwide ridership, which for 2010, including subway, bus, trackless trolley, commuter rail, and paratransit, was 375 million passengers (MBTA 2010). Although ferry boat ridership represents only a small portion of the systemwide ridership, the communities connected by this service have a much longer overland route to Boston than the ferry ride. The presence of this service likely keeps a significant number of vehicles off Boston's already burdened road network. There is connecting bus service at each of the interfaces in the MBTA ferry boat system, and the degree of coordination at Long Wharf, located in a dense urban core with plentiful transit service, is discussed here.

Service Coordination

Because of the high frequency of service on the subway, which operates at headways between 5 and 13 min, the degree of schedule or operational integration between land- and water-based transit is minimal. Ferries operate at 30- and 60-min frequencies depending on the time of day. Although there is no dedicated service or timed coordination, the frequency of the subway makes the connection from water- to land-based destinations more convenient. Long Wharf is an example of a common practice in urban centers, where, owing to the variety of destinations and frequency of transit service, little service coordination is needed. However, this does not appear to necessarily increase the challenge of multimodal transfers owing to the frequency and intensity of available land-based connection opportunities.

Fare Coordination

There are several fare levels and forms of payment valid for land- and water-based transit services in Boston. The Inner Harbor Ferry Zone 1A Pass (Inner Harbor Ferry serves Charlestown and Central Wharf) is also valid for unlimited travel on the local bus, subway, and Zone 1A of the Commuter Rail. The Commuter Boat Pass, which serves Hingham–Boston (Rowes Wharf) and Quincy/Hull–Boston (Long Wharf), is also valid for unlimited travel on the local bus, subway, express bus, Inner Harbor Ferry, and Zones 1–4 of the Commuter Rail. Both the Inner Harbor Ferry Zone 1A Pass and the Commuter

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TABLE 1
CHARACTERISTICS OF BOSTON LONG WHARF AND VANCOUVER SEABUS

	Service Coordination	Fare Coordination	Facilities Integration	Passenger Information
Long Wharf, Boston		✓	✓	✓
Vancouver, BC SeaBus	✓	✓	✓	✓

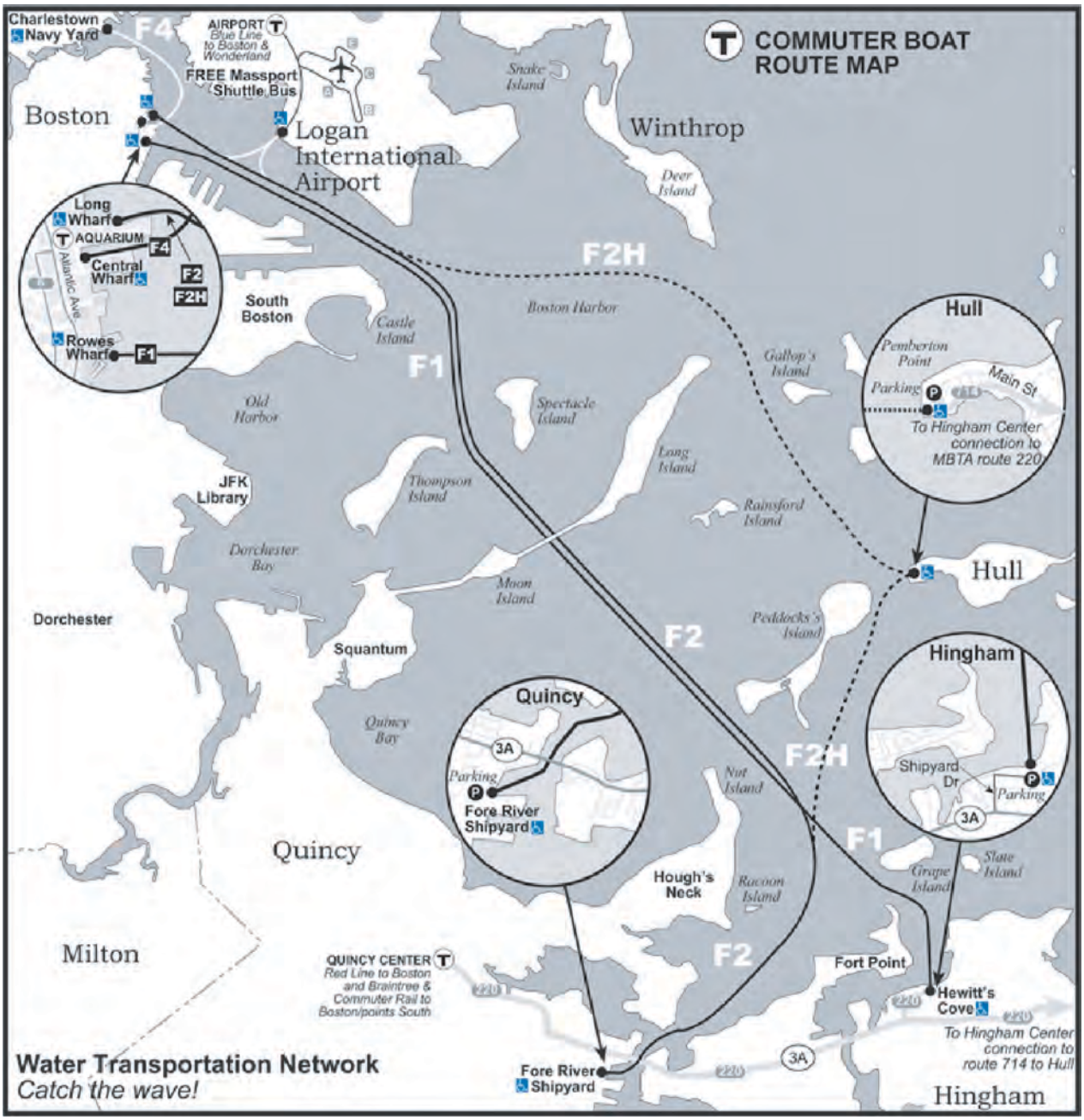

FIGURE 8 MBTA Commuter Boat and Inner Harbor Ferry route map (*Courtesy*: MBTA).

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Boat Pass can be purchased as a single ride, monthly, or multi-ride pass.

Tickets for the Cross Harbor Ferry that serves Boston–Logan Airport are sold only as single-ride tickets. There is also a Commuter Boat that serves Quincy/Hull–Logan Airport that can be purchased as a single ride or monthly pass. That pass is valid for unlimited travel on the local bus, subway, express bus, Inner Harbor Ferry, and Zones 1–4 on the Commuter Rail.

The CharlieCard is a contactless smart card that can be used to load passes and pay the fare for ferry, subway, and bus routes throughout the MBTA system. It allows one to store value for single or multiple rides, as well as a T-pass (MBTA's monthly transit pass). This is a relatively new service that has not yet been fully expanded to boat and commuter trains. In April 2012, the MBTA initiated a trial run of a smart phone application that will allow electronic redemption of single and multi-ride passes for the commuter rail service in Boston. The application will be linked to the CharlieCard to allow transfers between the other modes in the system, including the ferry (Moskowitz 2012).

At Long Wharf, tickets for all modes served by the MBTA can be purchased at the ticket sales booth for the ferry. There are also other passenger ferry services available from Long Wharf, which can be purchased from the same ticket sales booth, as shown in Figure 9. These ferries serve Salem (operated by Municipal Ferry) and Provincetown (operated by various private companies), as well as the Boston Harbor Islands National Recreation Area (operated by the National Park Service).

Facilities Integration

Long Wharf is a high-quality pedestrian environment, with restricted automobile access and signage for land- and water-based transit that is easily visible between the ferry dock, the bus stop, and the entrance to Aquarium Station. Although the facilities are not physically integrated, passengers transferring from the subway or bus to ferry and vice versa have a clear path to reach one mode from the other. The ferries that service Long Wharf are passenger-only, and the wharf itself is also home to tour kiosks and restaurants. The proximity of transit facilities, such as the subway and MBTA buses, along with the pedestrian-friendly environment, contributes to the integrated interface. As can be seen in Figure 10, ferry boat stops are clearly marked with the MBTA "T" branding system.

FIGURE 9 Long Wharf ticket sales kiosk (*Courtesy*: Nelson\Nygaard Consulting Associates).

FIGURE 10 Passenger wayfinding signage on Long Wharf (*Courtesy*: Joseph Cosgrove).

Passenger Information

In addition to a website and posted information at stations that provide passengers with information about all modes within the MBTA, including the Boston Harbor Ferries, there are a number of mobile applications that have been built (by independent developers) to provide location and schedule information. Real-time, land-based transit information is available through these applications; however, real-time information about the ferries is not available.

VANCOUVER WATERFRONT STATION AND LONSDALE QUAY—SEABUS, TRANSLINK

The Vancouver SeaBus operates between Waterfront Station in downtown Vancouver, British Columbia, and Lonsdale Quay in North Vancouver. Service has been provided over this crossing for most of Vancouver's history, but the current iteration of this service was initiated in 1977. Ferry and land-based transit services at these interfaces are provided by a single agency, TransLink. At each SeaBus terminal between 500 and 1,000 passengers transfer between water- and land-based transit on a daily basis. At Waterfront Station, TransLink estimates that 75% of the passengers transfer from the SeaBus

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to a land-based transit service. At Lonsdale Quay, TransLink estimates that 85% of passengers transfer to land-based transit. The following sections describe aspects of the SeaBus interfaces at Waterfront Station and Lonsdale Quay that create integration between ferry and transit service.

Service Coordination

Both SeaBus interfaces are served by transit, but the level of service varies and so does the level of service coordination between ferries and land transit. At Waterfront Station, Vancouver's high-capacity transit rail lines, Expo, Millennium, and Canada Line, as well as many high frequency bus routes serve the SeaBus terminal. SeaBus operates every 15 or 30 min depending on the time of day. Because of the large number of transit options at this terminal, multimodal connections depend on service frequency, rather than schedule coordination, to make seamless transfers.

The Lonsdale Quay terminal in North Vancouver is in the heart of a smaller urban environment, with less frequent transit connections. There are seven bus transit routes that serve Lonsdale Quay. The bus routes have arrivals and departures scheduled to align with SeaBus arrivals and departures. Additionally, there is operational coordination between ferry and transit operators for ferry to land transfers. Buses serving Lonsdale Quay will wait for arriving SeaBus passengers if there is a delay. Whether passengers are traveling to downtown Vancouver or to North Vancouver, land-based connections are facilitated with high levels of connecting transit service, as well as schedule and operational integration.

Fare Coordination

The SeaBus is within the Metro Vancouver transit system, owned by TransLink and operated by the Coast Mountain Bus Company. A single or return trip ride on the SeaBus can be purchased with a two-zone ticket. Zone boundaries do not apply after 6:30 p.m. on weekdays and all day Saturday, Sunday, and holidays. During that time, a one-zone ticket allows passengers to travel on the SeaBus between North Vancouver (Lonsdale Quay) and downtown Vancouver (Waterfront Station) and utilize bus services on both sides of the route.

There are numerous local and express bus routes, bus rapid transit, three exclusive transit rail lines, and one commuter rail line within Metro Vancouver. Fares for TransLink can be purchased in the form of a single fare ticket, FareSaver tickets (a book of ten TransLink tickets that offers a discount and is sold in 1, 2, or 3 zone packs), a day pass, or a monthly pass. Fares are available in adult and concession (discounts for older individuals and people with disabilities) tickets. Tickets for the SeaBus cannot be purchased individually, as the fares are fully integrated with the TransLink system. That a SeaBus ticket is automatically valid for almost all land-based transit service on both sides of the SeaBus route may contribute to the high water-to-land-based passenger transfers. A transfer is can be applied for all modes if it is in the same zone and is valid for 90 min.

The SeaBus is the only ferry operated as part of the TransLink system. There are also small water taxi ferries in the False Creek Inlet that are operated by a private company and were not surveyed in this synthesis. TransLink interfaces with ferry services operated by BC Ferries in North Vancouver at Horseshoe Bay and in Tsawwassen that provide connections to several other British Columbia communities.

Facilities Integration

Waterfront Station is a highly integrated multimodal facility served by the SeaBus, SkyTrain Expo, and Millennium Lines, the Canada Line (which provides a connection to Vancouver's airport, in addition to communities south of downtown Vancouver), West Coast Express (commuter rail line), and regional and local buses. Connections to the ferry are made by a covered walkway that aligns with the ground level of the station, where the bus exchange platforms are located. Connections are approximately 150 ft apart. Rail platforms are on the upper level of the station, accessible by stairs or elevators. Lonsdale Quay integrates the SeaBus terminal with a ten-bay bus exchange through a covered walkway that provides access to a dedicated bus terminal on the ground level of a parking garage. Access to both modes is located on the same level, with a tide-level adjusting ramp providing accessible and clear connections between land- and water-based travel.

Passenger Information

Schedule and route information for the SeaBus and entire TransLink system is available on the Internet, in paper schedules, and on posted wayfinding signs throughout Vancouver. Real-time information is available on a mobile and web application called Next Bus, and key transit stops have electronic status signs for arrivals.

Because the SeaBus runs on headways rather than scheduled times, it is not necessary to provide real-time information for delays in ferry departures, since a passenger is guaranteed to wait only a few minutes for the next available ferry. Operating status information and incident and weather alerts for the SeaBus are available on the website. There are departure countdown signs in the Waterfront Terminal and Lonsdale Quay stations. Maps and wayfinding signs are shown in Figures 11 and 12.

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FIGURE 11 Wayfinding signs at Waterfront Station (*Courtesy*: Oran Viriyincy).

FIGURE 12 Transit connections map from Lonsdale Quay SeaBus Station (*Courtesy*: Oran Viriyincy).

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CHAPTER FOUR

MULTIMODAL SERVICE COORDINATION

BACKGROUND

Service design that allows users to transfer from one mode to another at an interface requires deliberate planning between agencies or within agencies that operate multiple modes. The alignment of ferry and land-based transit schedules in a way that allows users to transfer with a minimal amount of waiting (provided that both modes are running on time) is referred to in this report as schedule integration. Operational integration is a heightened level of service coordination in which an operator of one mode may alert the connecting mode of delays to ensure that passengers intending to transfer do not miss their connections. Varying degrees of service coordination exist at ferry–transit interfaces. Some interfaces contain no coordination, with ferries operating completely independent of transit and vice versa. Other interfaces contain complete operational integration in that transit and ferry services are scheduled to meet, and will wait for each other in cases of delay.

The degree to which an interface has service coordination depends on three primary factors: the level of service of each mode at the interface; the level of communication between agencies or between operators of different modes within one agency; and the perceived, or actual, intensity of need for passengers to transfer between modes. In some cases, such as interfaces in large urban centers with frequent service by both ferry and land-based transit, schedule or operational integration is not necessary for passengers to be able to make convenient transfers. In other settings, such as a small island or rural community, the alignment of ferry and transit schedules is essential for providing convenient service. This chapter describes the different levels of service coordination and provides examples of implementation.

No Coordination

When survey respondents were asked whether or not transfers between ferries and land-based transit were intentionally scheduled, more than half responded that there is no intentional schedule alignment. Interfaces that have low levels of service on one or both modes may be inconvenient for passengers making multimodal trips if there is no schedule or operational integration. However, a high level of service, such as a ferry or bus that operates on headways under ten minutes, can reduce the need for deliberate coordination.

Schedule Integration

Schedule integration occurs when ferry and transit operators align their schedules so that passengers may transfer between modes, assuming that both are operating on time. Considering that weather and traffic can cause delays for ferries and transit, schedule coordination will not always allow passengers to make their intended connections. In some communities the transit route serving the ferry terminal is a multi-purpose route, serving a number of destinations and activity centers in addition to the ferry terminal. It is understandable in these cases that a transit operator would adhere to scheduled arrival and departure times regardless of ferry delays in order to avoid inconveniencing passengers using the bus for non-ferry purposes.

Sound Transit's Sounder commuter train runs between Everett, Washington, and Seattle, Washington, on weekdays during peak times. Sounder trains interface with WSF in Mukilteo, Washington, where passengers can reach the mainland from Whidbey Island. The Sounder train also interfaces with WSF in Edmonds, Washington. At Mukilteo, the Sounder schedule has been aligned with the ferry schedule, which has a regular 30-min headway, so that in the morning commuters from Whidbey Island can disembark the ferry and immediately board the Sounder train to reach Seattle. Service is aligned in the opposite direction in the afternoon to match commuter travel patterns. The train, which serves markets besides ferry travelers, will not wait for a delayed ferry, but under normal circumstances multimodal trips are fairly convenient. At the Edmonds terminal, the ferry service does not operate on a regular headway. In this case, WSF has modified the operating schedule to facilitate connections with the Sounder Train, which could not be rescheduled to align with the Edmonds–Kingston ferry given that its schedule is already anchored to ferry operations in Mukilteo. Service design considerations on the part of both Sound Transit and WSF allow for schedule integration at Edmonds and Mukilteo that serves the predominant travel direction (Seattle-bound in the morning, and reverse in the afternoon).

The need for schedule integration emerges as the frequency of land-based transit and ferry service decreases. In Manhattan, New York, Whitehall Terminal is the interface between the Staten Island Ferry and several subway trains and buses operated by the Metropolitan Transportation Authority (MTA). During the day, the subway line that serves the ferry

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terminal operates at short headways, between four and six minutes, and the ferry operates every 30 min. After midnight, the subway reduces service to 20-min headways and the ferry operates every hour. Although there is no daytime schedule coordination, MTA has coordinated its late-night schedule with the Staten Island Ferry so that a subway train arrives approximately ten minutes before each ferry departure, giving passengers a reasonable opportunity to make connections on their multimodal trip.

Operational Integration

Operational integration occurs when ferries and land transit provide real-time coordination for multimodal trips, with operators of each mode communicating with each other and delaying departures to ensure that transfer connections are made. Survey responses indicated that there is operational integration at 20 (30%) of the 68 interfaces. In general, if operational integration exists, it is employed at interfaces with relatively low levels of service, for the first and/or last trip of the day, or in cases where dedicated land transit is provided by ferry or transit operators.

Where there is infrequent bus and/or ferry service, some agencies allow their buses or ferries to wait for an incoming trip so that passengers may transfer. In most cases of operational integration, the transit operator will wait for an incoming ferry to ensure that passengers can make a connection. Fewer relationships exist in which a ferry operator will wait for an incoming train or bus. For example, Whatcom County Public Works operates a ferry, the Whatcom Chief, between Lummi Island and Gooseberry Point in rural Whatcom County, Washington. If the ferry is delayed, passengers aboard the Whatcom Chief who wish to connect to a bus on the mainland can request that the ferry operator contact Whatcom Transit and ask the bus operator to wait. Signs aboard the ferry notify passengers of this service. Whatcom Transit serves Gooseberry Point only eight times each day, making this type of integration important for those residents of Lummi Island who need to connect to the mainland by means of public transit.

As some respondents to the survey reported, ferry and transit services with coordinated schedules that do not integrate their operations throughout the day may nevertheless integrate the first and/or last trip of the day to ensure that travelers do not get stranded. One example is the interface of BC Transit and BC Ferries at Swartz Bay, Vancouver Island, British Columbia (about 17 miles north of Victoria). Four transit routes are scheduled to service the arrival and departure of ferries traveling to Tsawwassen (about 20 miles south of Vancouver). Although buses do not wait for delayed ferries on most trips during the day, transit operators will delay their departure in the event that the last arriving ferry is late.

The highest level of operational integration reported in the survey exists at interfaces served by ferries and dedicated land transit, often operated by the same agency or company. New York City and the surrounding area possess a wealth of land- and water-based transit service; however, little information was obtained through the survey about these interfaces. This is likely because, in part, many agencies are responsible for these services (and most did not respond to the survey), and inter-agency coordination is less critical in areas with frequent and abundant transit service.

New York Waterway (NY Waterway), a private operator, provides ferries from several terminals in New York City and New Jersey, including Pier 79 at West 39th Street in Manhattan. NY Waterway provides a free shuttle bus service from Pier 79 that connects ferry passengers to destinations on 57th Street, 50th Street, 42nd Street, 34th Street, and downtown Manhattan. These buses are dedicated solely to ferry passengers, and will wait for incoming ferries. Additionally, shuttles can notify the ferry operator that they are delayed so that the ferry will wait. Similarly, Seastreak, also private, operates ferries from the Monmouth/Middlesex County area of New Jersey into the Financial District, Pier 11 just east of Whitehall terminal, and midtown Manhattan at the West 39th Street Terminal. On trips popular with daily commuters Seastreak offers a dedicated shuttle bus from Pier 11 to the World Financial Center.

SNUG COVE, BRITISH COLUMBIA

Snug Cove is located on rural Bowen Island in British Columbia, and is served by two TransLink shuttles that interface with one ferry route operated by BC Ferries to Horseshoe Bay, located in North Vancouver, British Columbia. Bowen Island is a small community of roughly 3,500 permanent residents—a portion of whom commute to work and school on a daily basis from Snug Cove to the mainland—as well as a vacation destination for tourists. TransLink estimates that between 50 and 300 people use transit to access the ferry on a daily basis. According to its estimate, this makes up approximately 30% of all ferry passengers.

The two TransLink shuttle bus routes that serve Snug Cove and Bowen Island are intentionally scheduled to meet arriving and departing ferries, making land–water transit transfers convenient. Additionally, the agencies notify each other of schedule changes so that ferry or bus trips may be rescheduled to match changes and preserve the schedule integration. In the event that a ferry or bus is behind schedule, operators will wait for arriving passengers to ensure that connections are made. This two-way integration of operations, for ferry-to-land and land-to-ferry transfers, was uncommon in survey responses and exhibits a high level of integration. That this cooperation exists between two separate agencies demonstrates a concerted effort on the part of TransLink and BC Ferries to ensure that multimodal and multi-agency trips are reliable.

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CHAPTER FIVE

FARE COORDINATION

Fare coordination between water- and land-based transit varies significantly among the surveyed companies and agencies in this synthesis. Coordination can be as simple as selling bus tickets aboard the ferry vessel (practiced by Vineyard Transit) to a complex system of fare types and zones, some of which include ferry and bus or train travel on the same tickets (practiced by MBTA, Transport for New South Wales, and TransLink). This chapter will discuss the ways and degree to which fare payment for a trip is coordinated among the surveyed agencies at a multimodal interface. This includes an exploration of fare structures, fare instruments and technology, and fare policies including institutional fare arrangements. Fares for transit can vary by type of passenger, length of journey, and transfers; they are often available in single-ride tickets as well as passes for varying lengths of time, from one day to a full year.

FARE STRUCTURE, INSTRUMENTS, AND POLICIES

There were 82 inter- and intra-agency relationships between land- and water-based modes reported in the survey. This number is higher than the total number of physical interfaces (68) because there are several locations where multiple transit agencies serve the same ferry terminal. Of these 82 relationships, 33 offer some type of fare coordination, 32 have uncoordinated fares, and the remaining 17 relationships did not provide a response to the question. Fare coordination could vary from a multimodal ticket available for purchase to a discount on transfers between modes to other arrangements, such as bus ticket sales onboard the ferry vessel.

Unlike most transit, reduced fares for seniors, persons with disabilities, and other discounts are not always available on a ferry. Of the private ferry agencies surveyed, most had only adult and child fares. They also distinguished fares according to whether passengers were on foot or driving a car onboard.

The interfaces that do not have any form of fare coordination are generally single-route ferry operations, with a transit interface located nearby but not in the same facility. These systems require those transferring from transit (when available) to purchase two separate tickets.

The types of fare media used by ferry and transit agencies and companies surveyed include magnetic strip, contactless smart card, tokens, tickets, and cash. Often the fare media used is designed to meet the needs of a specific passenger group. For example, monthly transit passes that include ferries and e-purse loaded smart cards are designed to meet the needs of frequent users. Thirteen agencies (28% of those surveyed) reported using reloadable smart cards at one, or more, of their interfaces. It should be further noted that this represents only three smart card implementations in the United States, with multiple agencies participating in each of the implementations. Even within the regional smart card implementations transfer agreements between participating agencies that are land- and water-based transit systems are uncommon.

For tourists or infrequent users most transit systems offer a day or week pass, a few of which include multimodal travel extending to ferry usage (Sydney, Australia; Boston, Massachusetts; Vancouver, Canada). In certain cases, such as the One Regional Card for All (ORCA Card) in the Puget Sound Region, tourists and infrequent users who do not have a smart card may pay a higher overall fare for travel on both water- and land-based transit (see Figure 13). On the Nantucket Steamship Authority ferry between Woods Hole and Martha's Vineyard, along with schedules, the vessel provides an onboard opportunity to purchase bus tickets for the Vineyard Transit Authority; however, no discount is offered.

Several ferry operators, both private and public, reported providing some kind of discount to users transferring to or from land-based transit. The Cape May–Lewes Ferry between Cape May, New Jersey, and Lewes, Delaware, operates its own shuttle system from the ferry docks to local transit service, park-and-rides, and nearby attractions. If a passenger uses the shuttle to reach the ferry terminal or vice versa, a one-dollar discount is applied to the total fare. This is not done through a smart card but with cash and individual purchase of each single-ride ticket. This is marketed on the website to tourists who might choose to board the ferry and visit the attractions on the other side of the Cape May–Lewes route.

Ferries that are integrated within a metropolitan or regional transit system may be priced by zone, in a similar manner to land-based transit. Transfers for systems with integrated fares usually cover only one direction of travel and can only be used for the immediate next portion of a multimodal trip.

In Bermuda, within Public Transport Bermuda, tokens can be used to transfer between bus and ferry, but tickets can only be used on the bus (sold in booklets of 15). All passes (day, week, and month) are good on the ferry and the bus

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FIGURE 13 Snug Cove Ferry Landing on Rural Bowen Island (*Courtesy*: David Stanley).

system. The passenger must be travelling in the zones for which the token/passes are valid. Zone fares are sold for three or 14 zones (the whole island comprises 14 zones, as shown in Figure 14). The ticket includes a transfer for the next available trip only (bus or ferry) and is not based on a period of time.

NY Waterway, a private company that operates ferry service in New York and New Jersey, recently partnered with NJ Transit to offer a discount to passengers transferring between ferry and bus at the Port Imperial Ferry Terminal. A joint monthly pass is available that provides a $50 discount on ferry fare for several NY Waterway routes departing from that interface. In addition, 10-trip joint light rail and ferry tickets are available for the Hudson–Bergen Light Rail and Weehawken Ferry Terminal (NY Waterway 2012).

SAN FRANCISCO BAY AREA

The Clipper Card in San Francisco provides a transfer discount between San Francisco Municipal Transportation Agency (SFMTA) land-based transit and Golden Gate Ferries. Passengers transferring save 50 cents when a Clipper Card is used as the method of fare payment at the San Francisco Ferry Building, Larkspur, and Sausalito. In addition, Clipper Card users pay almost 50% less than the single-ticket purchase price when travelling on the two ferry routes operated in the Bay Area by Golden Gate Ferries (five other routes are operated by other agencies, as discussed further in chapter seven). This advantage for Clipper Card users is likely a significant incentive to both ride the ferry and to transfer between the ferry and transit at the San Francisco side of the journey. It was also reported that WETA, which operates ferry service between the San Francisco Ferry Building and two locations in Alameda as well as Vallejo, includes two tear-off bus transfers with each ferry ticket that are good for transit access

FIGURE 14 Route and zone map for bus and ferry service in Bermuda (*Courtesy*: Flickr user TenSafeFrogs).

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FIGURE 15 Alameda/Oakland Ferry ticket with tear-off AC Transit bus tickets (*Courtesy*: Kevin Keck).

to the ferry and for the final connection to a destination from the ferry, as can be seen in Figure 15.

WASHINGTON STATE FERRIES—ONE REGIONAL CARD FOR ALL

WSF and transit agencies in the Puget Sound Region participate in the ORCA card program. ORCA can be loaded with any combination of passes and e-purse and is used on eight regional transit providers: Pierce Transit, WSF, Sound Transit, Everett Transit, King County Metro Transit, King County Water Taxi, Community Transit, and Kitsap Transit. Of the 20 land- and water-based transit interfaces in the WSF system, four of those interfaces have no available transit (San Juan Islands: Orcas, Shaw, Lopez, and Friday Harbor). Another five have transit service that does not use the ORCA card for fare payment (Sidney, British Columbia; Anacortes, Washington; Coupeville, Washington; Clinton, Washington; and Port Townsend, Washington). The remaining 11 interfaces in the system allow use of ORCA for fare payment (Figure 16).

The ORCA card features two electronic components: an e-purse and a pass. The e-purse can be loaded with cash and used throughout all participating agencies in lieu of cash. Often these arrangements provide no fare discount; however, there are instances where interagency transfers are offered at reduced fares, or even free, when using the ORCA e-purse as payment. The ORCA Business Passport can be purchased by employers as an employee commuter benefit in the Puget Sound region. It is an unlimited monthly pass that provides access to all regional buses, light rail, and the King County Water Taxi, a passenger ferry operated by the King County Department of Transportation. Passengers who wish to travel using the Water Taxi and one of the participating bus operators can use the Passport to pay for both modes at no additional cost. WSF does not participate in the Business Passport program, but does offer a WSF monthly pass. A passenger can load both a WSF monthly pass and a Business Passport to facilitate fare payment through a single medium for a water- and land-based transit trip by utilizing ORCA.

FIGURE 16 ORCA card reader (*Courtesy*: Oran Viriyincy).

SYDNEY HARBOUR FERRIES, SYDNEY, AUSTRALIA

Sydney Harbour has 11 ferry routes that serve Darling Harbour/Balmain East, Parramatta River, Woolwich/Balmain, Neutral Bay, Mosman Bay, Eastern Suburbs, Manly, and the Taronga Zoo. Separate agencies operate the bus and ferry systems in Sydney, all within the umbrella agency called Transport for New South Wales. Transport for New South Wales, which coordinates ferry and transit service, reported on passenger water- and land-based transit transfers for three interfaces in the system: Circular Quay in the Sydney Central Business District, Manly Town Centre, and Darling Street in Balmain East, a suburb of Sydney (Figure 17).

All ferry service in the Sydney Harbour originates at Circular Quay, which hosts 250 ferry sailings per day. Circular Quay is also served by heavy rail, light rail, and local fixed-route buses across the entire Sydney area. Circular Quay is a very intense transfer point for land- and water-based transfers, with more than 1,000 people transferring per day. Of the overall ferry ridership at Circular Quay, an estimated 15% of the passengers transfer to land-based transit. The same percent of land-based passengers (15%) transfer to water-based transit. Of the passengers who transfer between land- and water-based transit, Transport for New South Wales estimates

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FIGURE 17 Balmain Ferry Dock, Sydney, Australia (*Courtesy*: Flickr User dicktay2000).

that 40% are commuters, 40% are tourists, and 20% are community travelers.

The Sydney transit system is divided into three zones. All light rail, ferry, and bus travel is within Zone 1. Zones 2 and 3 apply to the commuter trains that serve suburban Sydney. Passengers wishing to travel on both ferry and bus or train in Sydney can purchase a pass that covers multiple modes or purchase tickets for a single trip on a single mode. The multi-tickets can be purchased for a single trip or as a day, monthly, or yearly pass. For travel within Zone 1, a MyMulti 1 ticket or pass is valid on Sydney Harbour ferries. A system map of Sydney ferry and transit service is shown in Figure 18. There are also privately operated ferries and the Stockton Ferry that are not included in the coordinated ticketing arrangement.

FIGURE 18 Sydney Transit System Map with ferry map inset (*Courtesy*: Transport for New South Wales).

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CHAPTER SIX

FACILITIES INTEGRATION

DESIGN PRACTICES AND AMENITIES

This chapter provides a brief discussion of the components of integrated land- and water-based transit facilities, followed by two case studies of interfaces that exhibit aspects of facilities integration.

Co-location of Facilities

A significant factor in determining integration of multimodal facilities is the distance a passenger will need to travel on foot between the two modes. Survey respondents reported distances between modes at interfaces ranging from 50 ft to 1.5 miles. Almost all interfaces were reported as having distances of 1,000 ft or less between the points where a passenger steps off the ferry and onto a land-based transit mode. Interfaces that were classified by respondents as integrated (as opposed to separate facilities) had an average of 300 ft between land- and water-based transit. Along with adjacency, visibility is a factor in the degree of integration at an interface, as the ability to make a straight connection from one mode to the next improves the traveler's perception of integration and allows the wayfinding system to be less complex. Of the interfaces surveyed, the most highly integrated facilities are those that house both transit and ferry platforms in the same physical structure. The ferry terminal in Hoboken, New Jersey (discussed in detail in this chapter), is also a train station, and TransLink's SeaBus terminal in downtown Vancouver is served by buses, three dedicated transit rail lines, and a commuter rail line. That many ferry–transit interfaces occur between two separate agencies appears to be a barrier to creating shared facilities. Integration requires additional operating agreements, shared property, and capital investment.

Pedestrian Connections Between Ferries and Transit

There was significant variation in the length between modal connections in the survey responses. Respondents who indicated that an interface's facilities were integrated reported distances as long as 900 ft between ferry and transit, whereas some interfaces with separate facilities were as close as 60 ft (Figure 19).

Pedestrian walkways, signage, and other amenities direct passengers from one mode to the other, and can create a connection even where there are obstacles preventing transit and ferries from being adjacent. Some ferries that carry both car and foot passengers, such as the WSF terminal in Bremerton, Washington, create a more seamless pedestrian experience with an elevated breezeway that transports pedestrians over the path of the unloading cars. Passenger-only ferries with well-integrated facilities may have the boarding platforms of both modes on the same floor level. Facilities intended to host interfaces may also contain pathways to guide pedestrians from one mode to another to assist in the integration of water–land transfers.

Signage

Whether an interface contains a single integrated multimodal exchange facility, or two physically separate facilities, signage is a simple and effective way to assist passengers who wish to transfer from one mode to another. Signs range from fixed directional information to dynamic information that announces arrival and departure times for each mode. Wayfinding systems are important when the two facilities are out of sight of one another so that transferring passengers, tourists and commuters alike, can navigate from one mode to another. The interface of Kitsap Transit and WSF at Bainbridge Island, Washington, is an example of signage that effectively directs passengers from ferries to transit. The two facilities are physically separate, with an outdoor transit center equipped with shelters located adjacent to the ferry terminal's passenger waiting area. Pedestrian passengers exit the ferry on the upper deck through an elevated, enclosed bridge that contains signage directing travelers to land transit, shown in Figure 20. Although the location of the transit center is not immediately visible, the wayfinding system assists passengers intending to make connections.

ADA Accommodations and Facilities

An important part of creating a pedestrian friendly connection between land- and water-based modes is ensuring that all users, including those using mobility aids, can navigate the connection with ease. Curb ramps, wide pathways, and limited use of staircases all contribute to an accessible interface. Land- and water-based transit facilities are typically ADA accessible but still independent of each other. However, some survey respondents mentioned the need for assistance for passengers using mobility aids transitioning between two

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FIGURE 19 San Francisco ferry building pedestrian plaza adjacent to Muni streetcar (*Courtesy*: Kevin Keck).

FIGURE 21 Signs direct passengers to ferry slips; screens announce arrivals and departures at Hoboken Terminal, New Jersey (*Courtesy*: Nelson\Nygaard Consulting Associates).

modes. There was no mention of inaccessible facilities in survey responses, although this does not necessarily indicate that no inaccessible facilities exist. Additionally, there was only one mention of stairs as part of an interface description. TransLink's Waterfront Station served by the SeaBus in Vancouver, British Columbia, has same-level access for ferry-to-bus transfers. Elevators provide access to upper level rail platforms for mobility-limited passengers. It should be noted, however, that TransLink is under a different set of laws and regulations governing accessibility of transit and facilities than locations in the United States.

HOBOKEN, NEW JERSEY

Since 1989, NY Waterway has operated ferry service to Hoboken Terminal, a multimodal heavy rail, light rail, and bus station on the Hudson River in Hoboken, New Jersey. This facility serves a high volume of passengers on all modes every day, with 234 one-way sailings to and from the terminal, 280 New Jersey Transit trains, 546 Port Authority Trans–Hudson (PATH) commuter trains, 394 light rail trains, and 300 New Jersey Transit buses arriving and departing on a daily basis. The facility is entirely ADA accessible and includes signage to direct passengers from one mode to another. Additionally, electronic screens announce arrivals and departures of multiple modes, as displayed in Figure 21. All transfers between modes can be made within 150 ft, with ferry slips and rail platforms easily accessible through the building. Approximately 60,000 people travel through Hoboken Terminal each day, an estimated 25% of whom transfer to and from ferries (Dispenza 2012). The Port Authority of New York and New Jersey (PANYNJ) estimates that 90% of all arriving ferry passengers access land-based transit from the terminal. Ferries connect travelers to the World Financial Center as well as Pier 11 (Wall Street) in Manhattan.

Hoboken Terminal has existed as a combined rail and ferry terminal since 1907, but ferries stopped operating in the 1960s. Ferry service was restored to a temporary slip at the southern end of the terminal in 1989 to provide an alternate connection to Manhattan for passengers on PATH commuter rail, which had been experiencing capacity issues. In 2011, a full reno-

FIGURE 20 Signage directing ferry passengers to transit (*Courtesy*: Nelson\Nygaard Consulting Associates).

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FIGURE 22 Ferry information adjacent to rail waiting area at Hoboken Terminal (*Courtesy*: Nelson\Nygaard Consulting Associates).

FIGURE 24 Elevated busway serves transit center on land-side of Bremerton Transportation Center (*Courtesy*: Nelson\Nygaard Consulting Associates).

vation of five of the six original ferry slips was completed, allowing expansion of ferry service and enhancement of the passenger boarding area (NJ Transit 2009). The restoration of this facility has made it one of the best examples of facilities integration in the United States (Figure 22).

BREMERTON, WASHINGTON

WSF and Kitsap Transit provide ferry and bus services that interface in the small city of Bremerton, Washington, at the Bremerton Transportation Center. WSF provides passenger and vehicle ferries to downtown Seattle; Kitsap Transit operates buses as well as passenger-only ferries from the nearby communities of Port Orchard and Annapolis to Bremerton. Connections between all three services are integrated through a single facility that provides dedicated access for buses and pedestrians. As displayed in Figure 23, passengers unload from the WSF vessels through an elevated, enclosed bridge that connects to the passenger deck of the ferry much as a jet way connects to an airplane. The pedestrian bridge leads into a multimodal transit facility that is accessed by buses on the land side by means of a dedicated ramp that leads up to the level where foot passengers exit the ferry, as shown in Figure 24. The connection is ADA accessible and the waiting area is equipped with printed schedule information about buses and ferries.

Passenger-only ferries access Bremerton's terminal through a separate slip, shown in Figure 25, which is equipped with a covered walkway that directs disembarking ferry passengers into the lower level of the transit center. Passengers can then access the upper level, served by land transit, by means of staircases or elevators. More than 1,000 people transfer between transit and ferries on a daily basis. According to

FIGURE 23 Enclosed pedestrian bridge that connects Washington State Ferry passengers to Bremerton Transportation Center (*Courtesy*: Nelson\Nygaard Consulting Associates).

FIGURE 25 Covered walkway with signage directs passengers to Kitsap Foot Ferry (*Courtesy*: Hayward Seymore).

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WSF, 17% of all ferry riders at this interface access the ferry from transit. The Bremerton terminal is used by commuters and community travelers who make up 75% and 25% of riders, respectively. The intentional integrated design of the Bremerton facility creates a convenient way for travelers to make multimodal trips, reducing the need to access the ferry by car.

Integration in this facility goes well beyond physical appearance. Information and ticket sales are co-located and capital and operating funding for the facility are also fully integrated through a series of agreements between Kitsap Transit and WSF. Although in a separate structure, Kitsap Transit's administrative offices are immediately adjacent to the Bremerton Transportation Center and essentially form part of the complex.

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CHAPTER SEVEN

PASSENGER INFORMATION

This chapter discusses how ferry–transit interface information is communicated to passengers by the surveyed agencies and companies. Passenger information includes the communication of schedules in a coordinated manner and real-time notification of delays to passengers, especially those expecting to transfer between modes.

Both land- and water-based transit often provide information to passengers about multimodal schedules onboard the vehicle or vessel. Almost all systems surveyed that have an interface with land- and water-based transit noted that schedules are available for both modes on paper and online.

COMMUNICATION OF INTEGRATED INFORMATION

Paper schedules provide an opportunity for passengers to view information about both modes side by side and may alert new users to transit services they were not previously aware of. The availability of schedule information replicated by both agencies creates more opportunities for passengers looking to transfer to come into contact with this information. At Colman Dock in downtown Seattle, where WSF services connect downtown Seattle with Bainbridge Island and Bremerton in Kitsap County, the paper schedules for King County Metro Transit Routes 66 and 16 list the ferry schedule times. These paper schedules are available on the bus, at main transit terminals in Seattle, and online. This also occurs for other interfaces served by WSF, particularly communities that rely on ferry service to reach the mainland. All of the systems surveyed maintain a website to communicate schedule and fare information to passengers. Because of the increase in the use of smart phones, and an increased demand for information availability through the Internet, there is also a significant move toward websites compatible with mobile phones.

Almost all surveyed agencies reported that paper schedules were available for both services at terminals where ferries and land-based transit interface. In some cases, electronic signs displayed departure times. A few agencies reported that their signs are updated with real-time arrival information. From the survey it appears more likely that ferry schedules are updated in real-time than bus schedules, particularly where the terminal is oriented around the ferry service. At the South Ferry/Whitehall station, a multimodal facility shared between the MTA and the New York State Department of Transportation (NYSDOT) (Staten Island Ferry), as well as in Hoboken, New Jersey, at the Hoboken Terminal, there is shared wayfinding and schedule information for land- and water-based transportation (see Figure 26). Real-time information is available in Sydney, Australia, for departures and arrivals at the Circular Quay terminal. This information can be accessed through the Internet and mobile phone applications.

Where the facilities for each mode are separate but nearby it is less common that real-time passenger information is available for intermodal transfers. Often a printed schedule is the only form of information available. Many surveyed agencies stated that the agency website provides information about the other mode, if another mode is available. This was most common in larger cities, and for ferry routes offering a significant or critical connection, particularly those that serve remote island communities.

In the case of South Ferry and North Ferry, which connect Shelter Island to Long Island, New York, very little passenger information is made available because the interface is a low-volume connection with a single nondedicated bus route. Additionally, ferry service is demand-driven and does not follow a set schedule. Most systems surveyed follow a regular schedule, which makes communication of passenger information more reliable for those wishing to transfer between modes. Numerous smaller systems that answered the survey stated that their operators will gladly accommodate passengers needing to make intermodal transfers if the passenger speaks directly with a crewmember or transit operator to request information on the transfer. These more informal agreements were very common among surveyed agencies.

WASHINGTON STATE FERRIES AND KING COUNTY METRO TRANSIT

WSF provides a real-time ferry tracking website called VesselWatch (see Figure 27). VesselWatch is updated with information regarding delays and service outages and can be accessed by customers by means of the web. Passengers can also set up text message alerts for notification if their ferry is delayed. VesselWatch could be used in tandem with One Bus Away (developed by a third party with the use of King County Metro data; Figure 28), a real-time bus tracking website and mobile app for King County Metro Transit service, which interfaces with WSF at Colman Dock in Seattle and at Fauntleroy in West Seattle. A passenger could pair the use of these two real-time tracking systems to facilitate critical connections with greater reliability.

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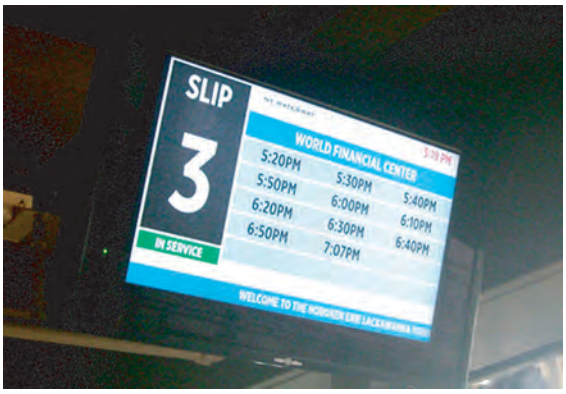

FIGURE 26 Real-time passenger information signage at Hoboken Terminal in Hoboken, New Jersey (*Courtesy*: Nelson\Nygaard Consulting Associates).

STATEN ISLAND FERRY AND THE STATEN ISLAND RAILWAY

Staten Island Ferry connects St. George in Staten Island with Whitehall Station on the south end of the financial district in Manhattan. Whitehall Station offers numerous important intermodal connections to passengers, including the South Ferry MTA subway station. At St. George on Staten Island, passengers can connect with Staten Island Railway, operated by the MTA. The mobile application, "Annadale—Staten Island Ferry and Train Schedule" (developed by a third party with the use of MTA and NYSDOT open data), allows passengers to view schedules for the ferry and the rail system, enhancing information availability and ease of intermodal connections. Figure 29 provides a graphic of this application.

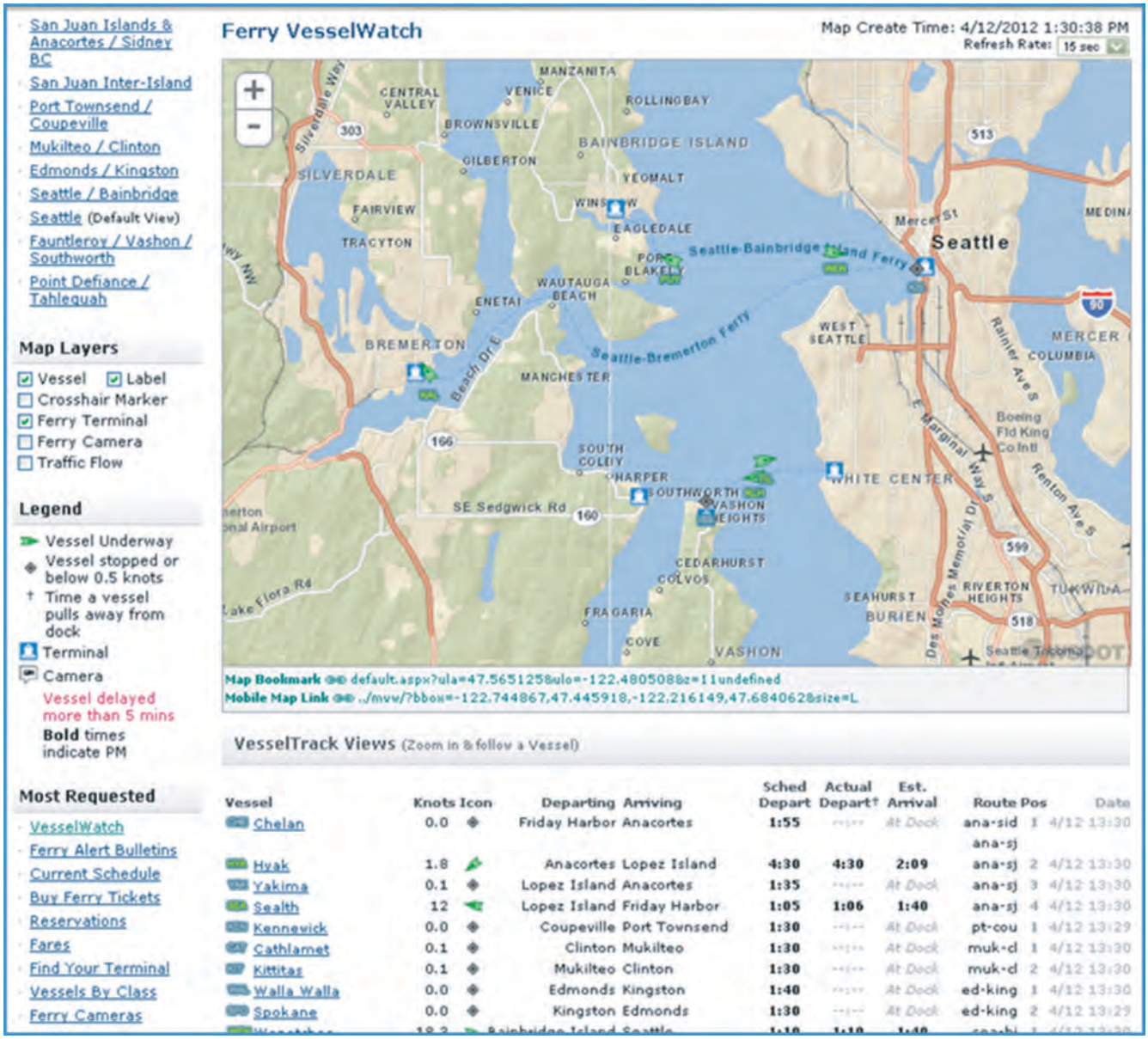

FIGURE 27 Washington State Ferry VesselWatch (*Courtesy*: Washington State Ferries).

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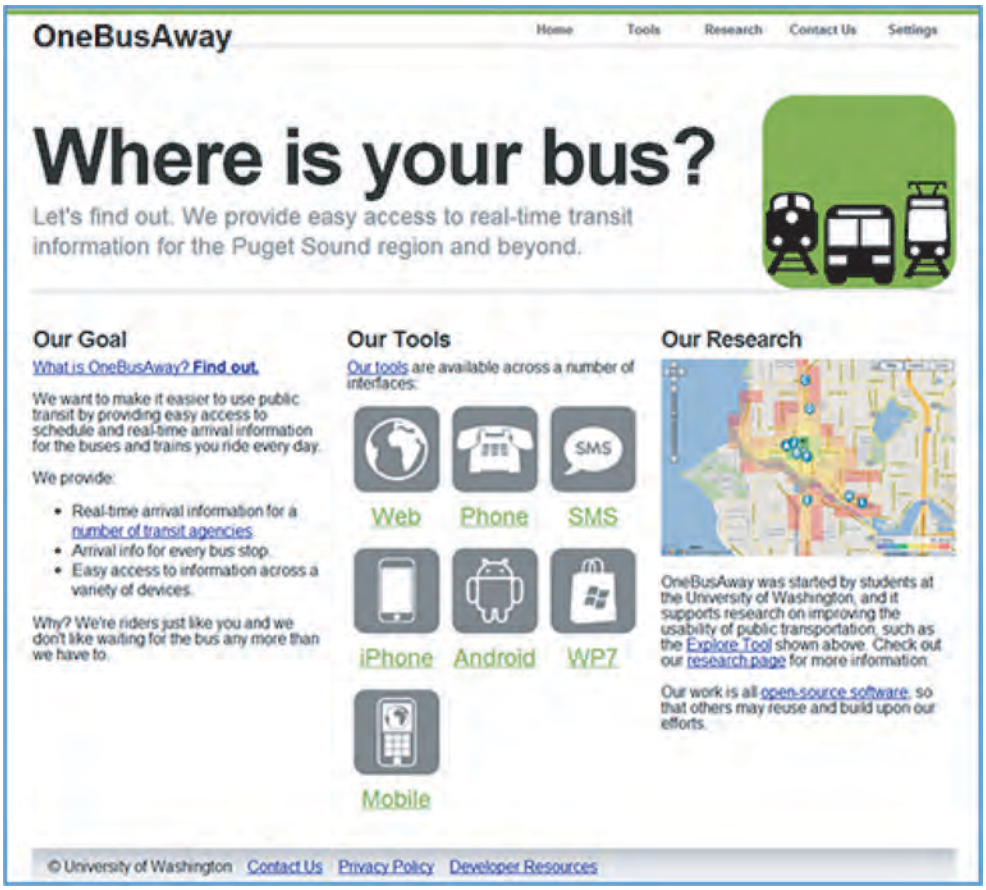

FIGURE 28 One Bus Away real-time tracking tool for King County Metro (*Courtesy*: www.onebusaway.org).

FIGURE 29 Application for Staten Island Ferry and Staten Island Railroad Schedule coordination (*Courtesy*: http://www.annadaleapps.com/).

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SAN FRANCISCO BAY AREA MULTI-AGENCY TRIP PLANNING

In the San Francisco Bay Area, approximately two dozen public transit operators provide service to more than seven million people in nine counties. The website and telephone hotline, 511.org, consolidates information for Bay Area residents on 9,000 miles of bus routes, 470 miles of rail transit, five commuter ferry lines, and the ports, airports, highways, bridges, bikeways, and local streets in the region. Transit and ferry operations interface at eight locations (information about three agencies and four interfaces were surveyed in this report), and 511.org provides real-time departure information for transit at interfaces at the San Francisco Ferry Building (see Figure 30).

WETA and Golden Gate Ferry, who each operate ferry service to the San Francisco Ferry Building, estimate that a high intensity of exchange (301–500 people per day) occurs between water- and land-based transit on a daily basis at this location. This is in agreement with what the SFMTA aka Muni—the land-transit provider—reported, which estimated very high transfer intensity (501–1,000 people per day). All three agencies reported that between 10% and 15% of total ferry riders continue their journey by transferring to land-based transit at this interface. Responses from all three agencies noted that the ferries are used primarily by commuters; between 70% and 90% of all passengers are commuters. Community travelers and tourists make up the remainder of the passengers transferring between water- and land-based transit at this interface.

Real-time departure information is available for SFMTA and Bay Area Rapid Transit train service by means of 511.org. Ferry schedules are also available on 511.org, which can be accessed through text message, mobile application, or website.

NextBus is the city of San Francisco's real-time electronic transit signage and mobile application, providing information at the San Francisco Ferry Building for WETA services between San Francisco and Alameda/Oakland and Harbor Bay as well as Vallejo.

Larkspur Ferry Terminal is served by Golden Gate Ferry and Transit, with intermodal connections between two ferry routes (SF Ferry Building, AT&T Park) and numerous bus routes. Pedestrian wayfinding signs for ferry terminal areas, much as station area maps at rail stations, provide passengers with a useful tool to navigate between services that can be spread out and challenging to locate. As can be seen in Figure 31, the Larkspur Ferry Terminal Transit Information map identifies ferry and bus loading areas, parking, passenger pickup, bicycle routes, and key attractions in the area. Maps such as these are provided by transit agencies or broader transit organizations (511.org in this case) to facilitate the transfer of passengers between modes.

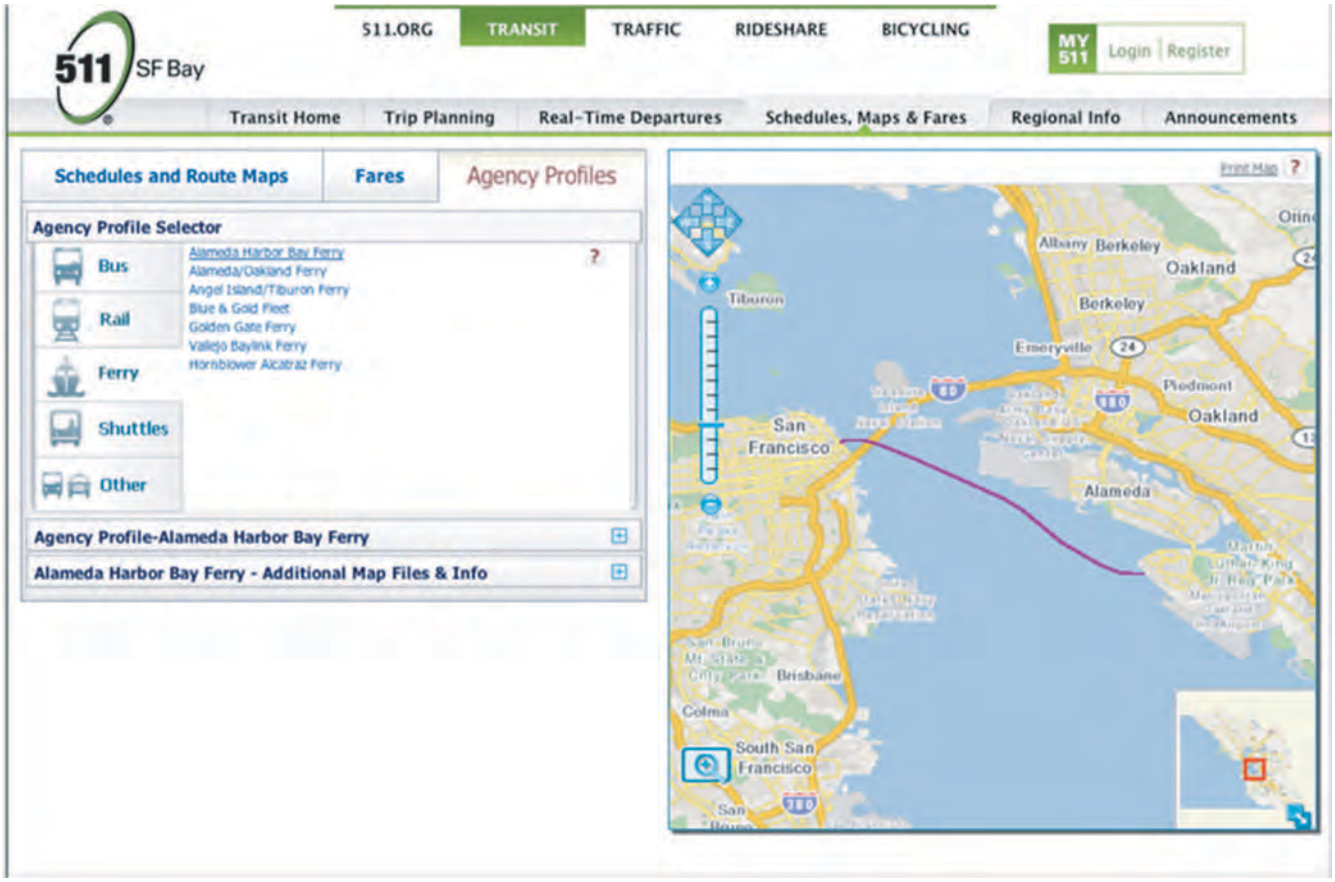

FIGURE 30 511.org schedule and real-time information for San Francisco Bay area (*Courtesy*: 511.org).

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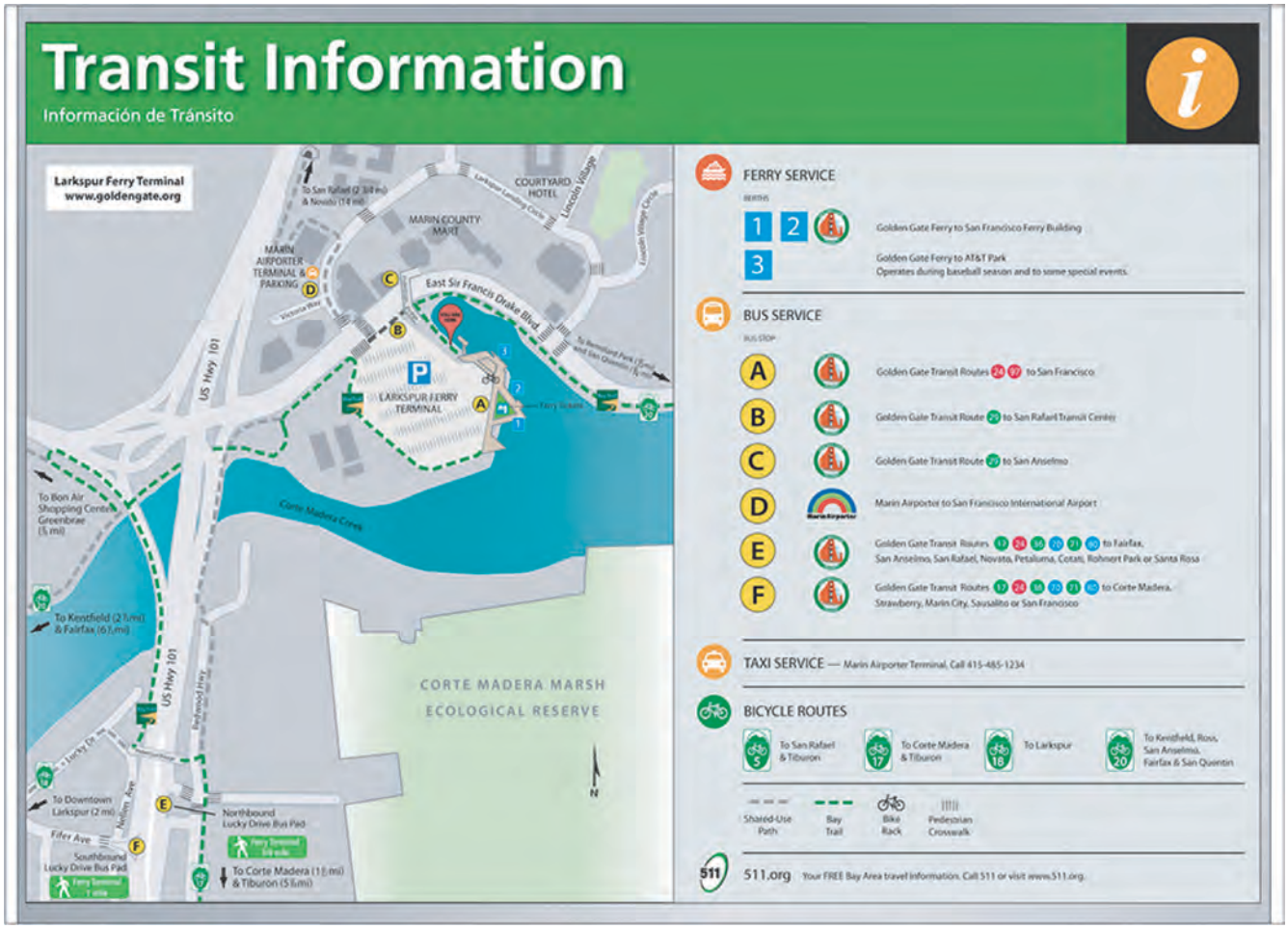

FIGURE 31 Larkspur Ferry Terminal wayfinding map (*Courtesy*: 511.org).

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CHAPTER EIGHT

CONCLUSION

SUCCESSFUL PRACTICES

The synthesis survey uncovered many successful practices in activities, information, and facilities related to integrating passenger exchange and physical operations of water- and land-based transportation systems. The case examples presented in this report have cited several successful practices. The following is a listing of the subject areas of successful practices revealed from the survey effort.

- Operational integration with dedicated transit service:
  - Island Transit and Washington State Ferries (Island County)
  - Kitsap Transit and Washington State Ferries (Kitsap County)
  - New York Waterway ferries and proprietary shuttles (New York and New Jersey)
  - BC Ferries and BC Transit (Snug Cove, British Columbia, Canada).
- Cost-saving pass available for transfer between ferry and transit:
  - TransLink Vancouver SeaBus (Vancouver, British Columbia, Canada)
  - Transport for New South Wales (Sydney, Australia)
  - Public Transport Bermuda
  - San Francisco Bay Area Clipper Card
  - Massachusetts Bay Transportation Authority Fare Zone Pass (Boston, Massachusetts)
  - Puget Sound ORCA (Puget Sound Region, Washington)
  - New York Waterway and MTA (New York City, New York).
- Fully integrated multimodal transit facility:
  - Hoboken Terminal (Hoboken, New Jersey)
  - Waterfront Station (Vancouver, British Columbia, Canada)
  - Lonsdale Quay (Vancouver, British Columbia, Canada)
  - Bremerton Transportation Center (Bremerton, Washington)
  - Whitehall Station (Manhattan, New York)
  - St. George Terminal (Staten Island, New York)
  - Pier 79, West 39th Street Terminal (Manhattan, New York).
- Single-level floor plan for accessible transfers:
  - Waterfront Station (Vancouver, British Columbia, Canada)
  - Lonsdale Quay (North Vancouver, British Columbia, Canada)
  - Bremerton Transportation Center (Bremerton, Washington)
  - Pier 79, West 39th Street Terminal (Manhattan, New York).
- Clear wayfinding system between modes:
  - Waterfront Station (Vancouver, British Columbia, Canada)
  - Lonsdale Quay (North Vancouver, British Columbia, Canada)
  - Bainbridge Island Terminal (Bainbridge Island, Washington).
- Real-time arrival and departure information for all modes:
  - Hoboken Terminal (Hoboken, New Jersey)
  - Waterfront Station (Vancouver, British Columbia, Canada)
  - Lonsdale Quay (North Vancouver, British Columbia, Canada).
- Posting of schedule delays and fare policies for all connecting modes in shared facilities, on agency websites, and in printed materials:
  - 511.org (San Francisco, California)
  - TransLink (Vancouver, British Columbia, Canada)
  - Washington State Ferries (Puget Sound Region, Washington State).

LESSONS LEARNED: CHALLENGES AND SOLUTIONS

- The appropriate degree of water- to land-based transit service integration varies based on a number of factors related to geography, land use, and travel markets. However, there are essentially four motivating factors that appear to give rise to ferry–transit integration. One or more of these factors may be present in each aspect of integration:
  - The land-based transit service is coordinated to the ferry schedule because the transit service is located on an island or remote location, and thus the ferry dock is a good ridership market.
  - The sheer volume of passengers transferring between ferry and land-based transit demands the attention of the agency or agencies involved.
  - Coordination is present in the initial development of services and the ferry–transit interface is fully

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integrated from the beginning or is developed as part of a new or added connection or increased capacity.
  - Coordination is a result of regional or local transportation demand management and/or congestion management strategies. In many cases, ferry–bus integration serves to mitigate vehicle congestion and capacity issues for limited ferry vessel and terminal capacity or to address the capacity and congestion on a parallel roadway.
- The degree of coordination is heavily linked to the frequency of ferry or transit service. High frequencies of ferry or transit service generally coincide with a decreased need to coordinate schedules and operations. Lower frequencies of service are much more common, particularly for ferry service, and demand creative solutions to facilitating integrated ferry–transit activity such as matching headways between land- and water-based systems, facilitating operational communications, and integrating facilities.
- Operational integration requires inter-agency coordination and is mostly applicable where the primary transit market is ferry riders. To avoid inconveniencing other passengers, operational integration will sometimes only exist for a single route, called a dedicated bus or train service in this report. In contrast, service designed to meet many traveler destinations, called multi-purpose service in this report, is less appropriate for operational integration.
- Although some ferry agencies are well-established in their region, and have successfully developed a strong market between terminal destinations, this is not necessarily an indication of the presence of integrated land-based transit services.
- In the survey, complete fare integration, where riders are granted a full-fare transfer from one mode to the other, predominantly exists only within agencies that operate both land- and water-based modes.
- Schedule and real-time information accessible online and optimized for mobile devices allows users to plan trips remotely and facilitates the communication of information across agencies, presenting a more unified service that is likely to appeal to more passengers.
- The physical nature of a ferry terminal may present obstacles to creating fully integrated facilities. Ferry docks are often lengthy, adding to the distance required for passengers to walk to other transit services. In addition, buses require space to queue, load, unload, and maneuver. Wayfinding systems (such as signage) are also a critical element of a successful land- and water-based transit interface.

Based on information gathered in this report, the following items are suggested for future research:

- Impact/difference of private versus public ferry operators on intermodal transfers.
- Impact/difference of rail versus bus to ferry on perception of intermodal transfers.
- Differences between auto/passenger and passenger-only ferries in terms of demographics and travel markets.
- Equity and access in ferry service.
- Are tourists disadvantaged or discouraged by the use of smart cards for transit passes and transfer discounts? Does creation of these instruments to serve frequent users have a negative influence on infrequent users?
- What is the essential difference in the operating "medium" for land-based versus waterborne transit systems? How much does this basic difference influence and impact reliability, and to what degree do conditions such as weather and tides make operational coordination a significant consideration?
- Bicycle connections/issues and the use of ferries and transit.
- Availability of free and paid parking at terminals on transit and ferry ridership.
- Basic determinants for assessing the potential of untapped ferry rider markets.
- Potential of waterfront transit-oriented development to encourage travelers' use of ferries for primary transportation.
- Ability of ferries to compete with or complement land-based transit where there are parallel routes, including the impact of toll roads and/or significant traffic congestion through limited vehicle portals (i.e., Manhattan, San Francisco, and Vancouver) that make land-based travel less reliable, convenient, and attractive.
- Funding issues that influence integration of land- and water-based transit.
- Incentive programs targeted at attracting multimodal riders.

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APPENDIX A

Survey Questionnaire

Introduction

Dear Survey Recipient,

The American Public Transit Association (APTA), through its nonprofit research organization, the Transit Development Corporation, Inc. (TDC), is cooperating in a research project to prepare a synthesis of current practice on TCRP SB-23, Integrating Ferries and Transit. This is part of the Transit Cooperative Research Program (TCRP), which was authorized in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), to be managed by the Transportation Research Board (TRB) in cooperation with the Federal Transit Administration (FTA) and TDC. The synthesis will provide practical information and guidance for transit agencies of all sizes in profiling innovative and successful practices, lessons learned, and gaps in information.

Passenger ferry services are operated by public agencies, private operators, and public-private partnerships throughout the country. However, ferry services seem to be nearly invisible in the public transit industry. The question is asked whether ferries could be integrated better in the public transit matrix to improve mass transit service options and ridership. The objective of this study is to document the practice of developing, improving, or operating passenger ferry services so that they are seamlessly integrated into public transit systems.

This survey questionnaire is being distributed to both transit agencies and private companies that either operate both ferries and transit, or operates one mode and interfaces with the other. If you are not the appropriate person at your company or agency to complete this survey, please forward it to the proper recipient.

Please complete and submit this survey questionnaire by *March 16, 2012*. If you have any questions, please do not hesitate to contact our principal investigator, Tim Payne, at tpayne@nelsonnygaard.com, or (206) 357-7524.

Thank you very much for participating in this survey!

Throughout the survey the term "interface" is used to describe the physical and activity proximity between water-based transit services, ferries and water taxis, and land-based transit services, buses, streetcars, light rail, etc. The intent is to define where there are passenger trips that are completed by using both water and land-based modes of public transportation.

NOTE: *Please understand that this survey allows for filling out information for up to four (4) land transit/ferry interfaces. If your system is part of land transit/ferry interfaces at more than 4 locations, you are encouraged to complete the survey as many times as you'd like, in order to describe all such interfaces at which your agency operates.*

Contact Information

First Name
Last Name
Title
Company Name
Street Address
Suite
City
State/Province
Zip/Postal Code
Country
E-mail Address
Phone Number
Fax Number
Mobile/Cell Phone
URL/Website

General Questions

1) Which of the following does your agency operate? Please check all that apply.
   - [ ] Auto/passenger ferries
   - [ ] Passenger ferries
   - [ ] Water taxis
   - [ ] Fixed route transit bus
   - [ ] Commuter rail
   - [ ] Light rail
   - [ ] Streetcars or trams
   - [ ] Other mode (please specify):

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2) Is your firm or agency publicly supported? Are tax revenues used for a portion of operating and capital costs?
   ( ) Yes
   ( ) No

3) Does the system, either internal to the agency or external to the agency, have a situation where ferries and land-based transit have a close interface; that is, passengers use a land-based mode to access a water-based mode, or vice-versa?
   ( ) Yes
   ( ) No

4) What is the total number of interfaces in which your agency operates? Please include both interfaces that are entirely within your agency, as well as those in which your agency provides only a portion of the operations.

5) Is each interface entirely within your agency, or with any other agency or agencies?
   ( ) Interfaces are entirely within our agency
   ( ) Mix of inter-agency and intra-agency interfaces
   ( ) Interfaces are shared with other agencies
   ( ) No such interfaces exist within our agency's operations

Interface #1 Questions

6) Please briefly describe "Interface #1" in terms of agencies involved and the ferry mode to land transit mode exchange (for example, passenger ferry to local fixed route buses, passenger/vehicle ferry to commuter rail, ferry to streetcar, etc.).

7) Where does this interface occur (for example: in the city of Smithville, at the Smithville to Jamestown ferry)?

8) Which of the following best describes the land-use characteristics around this location?
   ( ) Dense urban downtown in large metro area (over 1 million population)
   ( ) Large city (300,000 to 1 million)
   ( ) Moderate size city (100,000 to 300,000)
   ( ) Smaller city (20,000 to 100,000)
   ( ) Small village/town (1,000 to 20,000)
   ( ) Rural area (under 1,000 people within 1/2 mile of the terminal)
   ( ) Small island community
   ( ) Other (please explain): _____

9) How many years has this interface been in operation? Please enter your answer in numeric format (i.e., "10," not "ten").

10) Does this interface operate seasonally, or does it run year-round? If seasonal, please describe the times when this interface is operational.

11) Does more than one transit route or mode serve a singular ferry route (or vice versa) at this location? Please describe below.

12) Is/are the land-based transit route(s) dedicated to serve this ferry terminal, or does it serve multiple purposes? In the case of multiple transit routes, are some dedicated and some multi-functional?

13) How many one-way sailings per day does the ferry operate to and from this interface? Please enter your answer in numeric format (i.e., "10," not "ten").

14) What is the service level for the land-based transit system at this location? This would best be described as one-way trips per day or frequency of service, and hours the service operates.

15) How would you describe the intensity of the exchange at this interface, in terms of passenger volume exchanged between the ferry and land-based transit on a daily basis?
   ( ) Low—Under 50 people each day
   ( ) Moderate—51 to 300 people each day
   ( ) High—301 to 500 people each day
   ( ) Very High—501 to 1,000 people each day
   ( ) Very Intense—More than 1,000 people each day

   Is this an estimate, or is it based on actual counts of passenger transfer activity?
   ( ) An estimate
   ( ) Based on actual counts

16) What percentage of ferry passengers at this location use a transfer to the land-based transit system? Please indicate if this is a measured number or an approximation.
   ( ) Measured
   ( ) Estimate/approximation

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17) What percentage of land-based transit passengers at this location use a transfer to the ferry system? Please indicate if this is a measured number or an approximation.
    ( ) Measured
    ( ) Estimate/approximation

18) What is the proportional mix of people who use both the ferry and transit services at this interface?
    ___ Percent commuters (people making work and school trips)
    ___ Percent tourists
    ___ Percent community travelers (shopping, medical appointments, personal business, recreation, etc.)

    Are these percentages estimates or based on actual passenger surveys?
    ( ) Estimates
    ( ) Survey counts

19) Is the ferry/transit interface intentionally scheduled to meet, or do connections just happen based on the confluence of schedules and frequency?

20) If the interface occurs between two agencies, is there an effort to pre-notify the other agency of an impending schedule change that will impact land transit-ferry coordination at this location?
    ( ) Yes
    ( ) No

21) When schedule changes occur on either mode, is there a matching change in schedule on the other mode, assuming there is some impact to the land transit-ferry interface?
    ( ) Always
    ( ) Sometimes
    ( ) Sometimes with a lag
    ( ) Never

22) If scheduling coordination is low to non-existent at this location, what would you say are the major reasons (please check all that apply)?
    [ ] Coordination is NOT low to non-existent
    [ ] Volume is too small and the impacts on the balance of the schedule would cause issues for larger amounts of other agency customers
    [ ] Volume is too small and the cost would be very high to ensure good coordination of operating schedules
    [ ] The transit stop/station/platform and ferry terminals are too far apart, or connections are difficult for other reasons, such as topography, physical barriers (i.e., highways), etc.
    [ ] Waiting for ferries would make other parts of the land-based system unreliable. Ferries do not have a standard frequency so coordination on all trips is very expensive
    [ ] Other reason(s) (please specify):

23) What is the approximate distance, (in feet, meters, or other measurement) between the point at which a passenger steps off the ferry and the nearest transit stop/station/platform at this ferry terminal/interface?

24) Are the ferry facility and the transit facility integrated or are they separate facilities?
    ( ) Integrated
    ( ) Separate facilities

25) Briefly describe the facilities for the ferry and transit at this location (using such words/phrases as covered, uncovered, waiting areas, shelter at transit stop, path from ferry to transit covered or inside, features for ADA access, etc.).

26) Are fares collected in a coordinated manner at this interface, or does each agency capture their own fares?
    ( ) Coordinated fares
    ( ) Uncoordinated/separate fares

27) If coordinated, what instruments are used to facilitate the joint fare? Please check all that apply.
    [ ] Transfer
    [ ] Magnetic card
    [ ] Ticket
    [ ] Contactless smart card
    [ ] Day pass
    [ ] Flash pass
    [ ] Other fare instrument(s) (please specify):

28) From a customer perspective, would you say the ferry and transit operations are coordinated at this location?
    ( ) Yes
    ( ) No

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29) How is information about coordination between ferries and transit communicated to customers? Are technology-based solutions being used? Are the technology-based solutions mobile (example, real-time information available through a phone application) or fixed position (example, real-time information display at this ferry/transit terminal)?

30) Is there operational coordination between ferry and transit at this interface? That is, if the ferry is delayed is transit notified to wait? Is the reverse also true?
    ( ) Yes—For all transfers
    ( ) Yes—For ferry to land transit transfers
    ( ) Yes—For land transit to ferry transfers
    ( ) No operational coordination

    Please specify details about such operational coordination below.

31) Are there any more ferry/land transit interfaces, relevant to your operations that you have not yet described in this survey? Please note that if you answer "Yes," you will be asked to complete the above questions again (starting with #6), this time regarding another of your ferry/land transit interfaces.
    ( ) Yes
    ( ) No

NOTE: *The same questions number 6–31 were repeated four times in the online version of the survey. Respondents were also asked to fill out the survey multiple times if more than four interfaces exist in their system.*

Final Questions

110) Are there any new ferry/transit interface points being planned for your system? If yes, is integration between the modes a basic planning and design and principle?
    ( ) Yes, with multimodal integration as a planning/design principle
    ( ) Yes, without multimodal integration as a planning/design principle
    ( ) No new interface points are planned

111) Please leave any additional comments below.

Thank You!

We greatly appreciate your taking our survey; your response is very important to us. If you have any questions or comments, please feel free to contact the principal investigator, Tim Payne, at:

E-mail: tpayne@nelsonnygaard.com
Phone: (206) 357-7524
Mailing Address:
Nelson\Nygaard Consulting Associates
1402 3rd Avenue, Suite #1200
Seattle, WA 98101

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APPENDIX B

List of Surveyed Agencies

AC Transit
Bay Ferries Limited
BC Ferries
BC Transit
Bridgeport & Port Jefferson Steamboat Company
Capital Transit
Casco Bay Island Transit District
Community Transit, Snohomish County, Washington
Corpus Christi Regional Transportation Authority
Delaware River and Bay Authority/Cape May–Lewes Ferry
Everett Transit
Golden Gate Bridge, Highway & Transportation District
Greater Portland Transit District
Inter-Island Ferry Authority, Ketchikan, Alaska
Island Transit, Whidbey Island, Washington
Jefferson Transit, Jefferson County, Washington
King County Department of Transportation, Ferry District
King County Metro Transit
Kitsap Transit
Long Island Rail Road
Martha's Vineyard Transit Authority
Massachusetts Bay Transportation Authority (MBTA)
Melbourne Transit
New York City Transportation, MTA
North Carolina Dept. of Transportation, Ferry Division
North Ferry Co., Inc.
Northern Virginia Regional Commission
Pierce County Public Works
Pierce Transit
Port Authority of New York & New Jersey
Public Transportation Bermuda
San Francisco Municipal Transportation Authority
Shoreline East Commuter Rail
Skagit County Public Works
Skagit Transit
Sound Transit, Puget Sound Region, Washington
South Ferry Company
SouthEast Area Transit
Suffolk County Transportation Division
The Steamship Authority, Martha's Vineyard and Nantucket
TransLink, Vancouver, British Columbia
Transport for New South Wales
Washington State Ferries
Water Emergency Transportation Authority
Whatcom County Public Works
Whatcom Transportation Authority

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APPENDIX C

Interfaces

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TABLE C1
MID-ATLANTIC REGION INTERFACES

Terminal Name	City	Ferry Agency (bold if survey respondent)	Transit Agency (bold if survey respondent)	Land Use at Interface	Daily Ferry Sailings	Peak Transit Frequency	Passenger Volume at Exchange	Sched. Coord.	Op. Coord.*	Ferry and Transit Facilities
Cape May Ferry Terminal	Cape May, NJ	**Cape May Lewes Ferry**	**Cape May Lewes Ferry Shuttle**	Small city	12	On demand	Low	Yes	Yes	Integrated
Greenport	Greenport, NY	**North Ferry Co., Inc**	Suffolk Transit; Long Island Rail Road	Small town	200	Medium	Moderate	No	No	Separate
Hoboken/ NJ Transit Terminal	Hoboken, NJ	NY Waterway	**PANYNJ**	Medium city	234	High	Very intense	No	No	Integrated
Lewes Ferry Terminal	Lewes, DE	**Cape May Lewes Ferry**	DART First State	Small city	12	On demand	Low	Yes	Yes	Integrated
East 34th Street Manhattan	New York, NY	Seastreak; NY Waterway	**NYCTA**	Dense urban	78	High	No data	No	No	Separate
Fulton Ferry Landing Brooklyn	New York, NY	NY Waterway	**NYCTA**	Dense urban	51	High	No data	No	No	Separate
Hunters Point South Long Island City	New York, NY	NY Waterway	**NYCTA**	Dense urban	51	High	No data	No	No	Separate
Ikea Dock Red Hook	New York, NY	NY Water Taxi	**NYCTA**	Dense urban	19	High	Low	No	No	Separate
India Street Brooklyn	New York, NY	NY Waterway	**NYCTA**	Dense urban	51	High	No data	No	No	Separate
North 6th Street Brooklyn	New York, NY	NY Waterway	**NYCTA**	Dense urban	51	High	No data	No	No	Separate
Pier 11 Terminal	New York, NY	NY Waterway	**PANYNJ**	Dense urban	117	High	High	No	No	Separate
Pier 79 Manhattan	New York, NY	NY Waterway	**NYCTA**	Dense urban	454	High	Very intense	No	No	Separate
Schaefer Landing Brooklyn	New York, NY	NY Waterway	**NYCTA**	Dense urban	51	High	No data	No	No	Separate
St. George Terminal Staten Island	New York, NY	NYC DOT	**NYCTA**	Dense urban	109	High	Very intense	No	No	Integrated
Whitehall Terminal Manhattan	New York, NY	NYC DOT	**NYCTA**	Dense urban	109	High	Very intense	No	Yes	Integrated
World Financial Center Terminal	New York, NY	NY Waterway	**PANYNJ**	Dense urban	117	High	Moderate	No	No	Separate
South Ferry Terminal	North Haven, NY	**South Ferry**	Suffolk Transit	Small town	On demand	Low	Low	No	No	Separate

*Operational coordination is for ferry to land transfers only (the bus waits for the ferry), unless otherwise noted.

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TABLE C2
NEW ENGLAND REGION INTERFACES

Terminal Name	City	Ferry Agency (bold if survey respondent)	Transit Agency (bold if survey respondent)	Land Use at Interface	Daily Ferry Sailings	Peak Transit Frequency	Passenger Volume at Exchange	Sched. Coord.	Op. Coord.*	Ferry and Transit Facilities
Charlestown Navy Yard	Boston, MA	**MBTA**	**MBTA**	Large city	39	High	Low	No	No	Separate
Logan Ferry Terminal	Boston, MA	**MBTA**	**MBTA**	Airport	20	High	Very high	Yes	Yes—For all transfers	Integrated
Long Wharf	Boston, MA	**MBTA**	**MBTA**	Large city	85	High	Moderate	No	No	Separate
Bridgeport Ferry Terminal	Bridgeport, CT	**Bridgeport & Port Jefferson Steamboat**	Greater Bridgeport Transit	Medium city	16	Medium	Low	No	No	Separate
Woods Hole Ferry Dock	Falmouth, MA	**The Steamship Authority**	Cape Cod Regional Transit Authority	Small town	56	Low	High	Yes	Yes—For all transfers	Integrated
Hewitt's Cove	Hingham, MA	**MBTA**	**MBTA**	Small city	18	High	Low	No	No	Integrated
Pemberton Point	Hull, MA	**MBTA**	**MBTA**	Small town	10	Low	Low	No	No	Integrated
New London Ferry Terminal	New London, CT	**Cross Sound Ferry**	**Shoreline East**	Small city	26	Low	Low	No	No	Separate
Oak Bluffs Terminal	Oak Bluffs, MA	**The Steamship Authority**	**Vineyard Transit**	Small island community	20	High	Very intense	No	No	Separate
Casco Bay Lines Ferry Terminal	Portland, ME	**Casco Bay Island Transit District**	**Metro Transit**	Small city	14	Medium	Low	No	No	Integrated
Fore River Shipyard	Quincy, MA	**MBTA**	**MBTA**	Small city	24	High	Low	No	No	Separate
Vineyard Haven SSA Terminal	Tisbury, MA	**The Steamship Authority**	**Vineyard Transit**	Small island community	20	High	Very intense	Yes	Yes	Integrated

*Operational coordination is for ferry to land transfers only (the bus waits for the ferry), unless otherwise noted.

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TABLE C3
WASHINGTON STATE INTERFACES

Terminal Name	City	Ferry Agency (bold if survey respondent)	Transit Agency (bold if survey respondent)	Land Use at Interface	Daily Ferry Sailings	Peak Transit Frequency	Passenger Volume at Exchange	Sched. Coord.	Op. Coord*	Ferry and Transit Facilities
Anacortes Ferry Terminal	Anacortes	WSF, Skagit County Public Works	**Skagit Transit**	Small town	37	Low	Low	No	No	N/A
Bainbridge Ferry Terminal	Bainbridge Island	**WSF**	**Kitsap Transit**	Small city	46	Low	Very intense	Yes	Yes	Integrated
Bremerton Transportation Center	Bremerton	**WSF; Kitsap Transit**	**Kitsap Transit**	Small city	30	Low	Very intense	Yes	Yes	Integrated
Edmonds Ferry Terminal	Edmonds	**WSF**	**Sound Transit; Community Transit**	Small city	52	Medium	Low	Varies	No	Separate
Kingston Ferry Terminal	Kingston	**WSF**	**Kitsap Transit**	Small town	52	Medium	Moderate	No	No	Integrated
Mukilteo Ferry Terminal	Mukilteo	**WSF**	**Everett Transit; Community Transit; Sound Transit**	Small city	78	Medium	Moderate	Yes	Varies	Separate
Point Defiance Terminal	Point Defiance	**WSF**	**Pierce Transit**	Small city	40	Low	Low	No	No	Integrated
Port Orchard Ferry Terminal	Port Orchard	**Kitsap Transit Foot Ferry**	**Kitsap Transit**	Small town	68	Medium	Very intense	No	Yes—For all transfers	Integrated
Port Townsend Terminal	Port Townsend	**WSF**	**Jefferson Transit**	Small town	4	Medium	Low	No	No	Separate

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Colman Dock	Seattle	**WSF**	King County Metro	Dense urban	76	Medium	Very intense	No	No	Separate
Southworth Ferry	Southworth	**WSF**	**Kitsap Transit**	Rural area	52	Medium	Moderate	Yes	No	Integrated
Steilacoom Ferry Terminal	Steilacoom	Pierce County Public Works	**Pierce Transit**	Small town	14	Low	Low	No	No	Separate
Vashon Ferry Terminal	Vashon Island	**King County DOT; WSF**	King County Metro	Island community	6	Medium	High	Yes	N/A	Integrated
Tahlequah	Vashon Island	**WSF**	King County Metro	Island community	40	Medium	Low	Yes	No	Separate
Fauntleroy Terminal	West Seattle	**WSF**	**King County Metro, Sound Transit**	Large city	59	High	High	Varies	Varies	Separate
Seacrest Park	West Seattle	**King County DOT**	**King County Metro**	Large city	44	Medium	High	Yes	N/A	Separate
Gooseberry Point	Whatcom County	**Whatcom County Public Works**	**Whatcom Transportation Authority**	Rural area	30	Low	Low	Yes	Yes	Separate
Clinton Ferry Terminal	Whidbey Island	**WSF**	**Island Transit**	Small town	78	High	Very high	Yes	Yes	Integrated
Coupeville Ferry Terminal	Whidbey Island	**WSF**	**Island Transit**	Rural area	26	Medium	Low	Yes	Yes	Separate

*Operational coordination is for ferry to land transfers only (the bus waits for the ferry), unless otherwise noted
N/A = not available.

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TABLE C4
SOUTH AND WEST REGIONS INTERFACES

Terminal Name	City	Ferry Agency (bold if survey respondent)	Transit Agency (bold if survey respondent)	Land Use at Interface	Daily Ferry Sailings	Peak Transit Frequency	Passenger Volume at Exchange	Sched. Coord.	Op. Coord.*	Ferry and Transit Facilities
Larkspur Ferry Terminal	Larkspur, CA	**Golden Gate Ferry**	**Golden Gate Transit**	Small town	42	Low	Low	Yes	Yes	Separate
Oakland Ferry Terminal	Oakland, CA	**WETA**	**AC Transit**; Blue and Gold Fleet	Large city	25	Medium	Low	No	No	Separate
San Francisco Ferry Building	San Francisco, CA	**WETA**	**SFMTA**	Dense urban	33	High	High	No	No	Separate
Sausalito Ferry Terminal	Sausalito, CA	**Golden Gate Ferry**	**Golden Gate Transit**	Small city	9	Medium	Moderate	Yes	No	Separate
Downtown Bayfront	Corpus Christi, TX	**CCRTA**	**CCRTA**	Medium city	9	Medium	Low	Yes	No	Separate
North Beach	Corpus Christi, TX	**CCRTA**	**CCRTA**	Medium city	9	Medium	Low	Yes	No	Separate

*Operational coordination is for ferry to land transfers only (the bus waits for the ferry), unless otherwise noted.

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TABLE C5
INTERNATIONAL INTERFACES (Including Alaska)

Terminal Name	City	Ferry Agency (bold if survey respondent)	Transit Agency (bold if survey respondent)	Land Use at Interface	Daily Ferry Sailings	Peak Transit Frequency	Passenger Volume at Exchange	Sched. Coord.	Op. Coord.*	Ferry and Transit Facilities
Auke Bay Ferry Terminal	Juneau, AK	Alaska Marine Highway System	**Capital Transit**	Small city	3	Medium	Low	No	No	Separate
Snug Cove	Bowen Island, BC, Canada	BC Ferries	**TransLink**	Small island community	31	Low	Moderate	Yes	Yes—For all transfers	Separate
Lonsdale Quay	North Vancouver, BC, Canada	**TransLink**	**TransLink**	Medium city	126	High	Very high	Yes	Yes	Integrated
Sidney Ferry Terminal	Sidney, BC	**WSF**	BC Transit	Dense urban	2	Medium	No data	No	No	Separate
Swartz Bay Ferry Terminal	Sidney, BC	BC Ferries	**BC Transit**	Rural area	15	Medium	Very high	Yes	Yes	Integrated
Tsawwassen Ferry Terminal	Tsawwassen, BC, Canada	BC Ferries	**TransLink**	Small town	140	Low	Moderate	No	Yes	Integrated
Waterfront Station	Vancouver, BC, Canada	**TransLink**	**TransLink**	Dense urban	126	High	Very high	No	No	Integrated
Horseshoe Bay	West Vancouver, BC, Canada	BC Ferries	**TransLink**	Small town	63	Medium	Very high	Yes	Yes	Integrated
Dockyard Ferry Stop	Bermuda	**Public Transportation Bermuda**	**Public Transportation Bermuda**	Small city	5	Low	Moderate	Yes	No	Separate
Hamilton Ferry Terminal	Bermuda	**Public Transportation Bermuda**	**Public Transportation Bermuda**	Small city	5	Low	Moderate	Yes	No	Separate
St. George's Ferry Terminal	Bermuda	**Public Transportation Bermuda**	**Public Transportation Bermuda**	Small city	5	Low	Moderate	Yes	No	Separate
Balmain East	Sydney, NSW, Australia	**Transport for NSW**	**Transport for NSW**	Dense urban	64	High	Very high	Yes	Yes	Separate
Circular Quay	Sydney, NSW, Australia	**Transport for NSW**	**Transport for NSW**	Dense urban	250	High	Very intense	Yes	No	Separate
Manly Wharf	Syndey, NSW, Australia	**Transport for NSW**	**Transport for NSW**	Dense urban	36	Medium	Very intense	Yes	Yes	Separate

*Operational coordination is for ferry to land transfers only (the bus waits for the ferry), unless otherwise noted.

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Abbreviations used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

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